DIVISION 1 – GENERAL REQUIREMENTS

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END OF DIVISION 1
DIVISION 3 - CONCRETE

03000 - General

03001 - Concrete

Due to quality control and structural integrity after the job is completed, all material, products and execution shall conform to ACI 301 and applicable ANSI/ASTM Standards test.

03200 - Concrete Reinforcement

Reinforcing bar supports frequently are exposed to the weather on soffits and other surfaces, and corrode. Plastic supports are required. Particular care should be exercised in preparation of specifications and during inspection to insure proper coverage of reinforcement.

Admixtures

In general, admixtures are not desired. For concrete placed in hot weather, a retardant may be helpful, and for water reduction some admixtures are satisfactory but unless the Architect/Engineer can clearly justify this opinion, the Owner would prefer no admixtures.

Acid Cleaning

No use of acid wash for cleaning of concrete on the building interior is permitted.

Cold Weather Concreting

Should ambient temperature be 32° or less no concreting shall be permitted. Additional all cold weather concreting shall be done in accordance with ACI 604.

Pipe Shafts

All pipe penetrations through concrete slabs must be sealed.

Aluminum Piping, Conduit or Fittings

The use of these items embedded in concrete is not acceptable; unless adequately protected.
Exposed Vertical Concrete Wall Finishes

Design standards should specify the use of “plyform” on all forms work for exposed vertical surfaces.

Exposed FLAT Concrete Work

All large expanse flat concrete surfaces other than typical sidewalks can be colored to reduce glare coming from the reflection of the sun. Coloring and mixing shall be accordance with A/E specifications.

Snap-Tie-Cone-Hole

When snap-ties are used the Architect/Engineer shall coordinate with the District Project Manager to determine the project standard to be used.

Sidewalks and Ramps

Concrete for these items should be poured “checker-board.” This method will ensure straight expansion-joint-filler appearance. Control joints shall be a minimum of one-fourth of the slabs thickness.

Stairs

Poured in place concrete stairs or structural step stairs with pan filled treads are recommended. The design of all stairs shall be in accordance with the current requirements of the Section 423 of the Florida Building Code and applicable codes.

All exterior ramps, stairs, landings and walks shall have an integral non-slip finish. Stairs treads shall have cast in place of nosing.

03511 - Soil-Cement Base Course

Scope of Work

The work specified in this section consists of furnishing all labor, transportation, tools, material and equipment, unless otherwise specified, to construct a compacted base course composed of a combination of soil, Portland Cement and water, and all items called for or that can be reasonably inferred from the drawings, including grading, pulverizing, placing cement, adding material, mixing, compacting and testing as required for a complete job.
Method of Payment

Work under this section will not be paid for as a separate item unless a specific unit price basis is included in the Bid Form.

Products

Portland Cement DOT

Spec, Section 921, “Portland Cement.”

Water DOT

Spec, Section 923, “Water for Concrete.”

Material

Use local or hauled-in clean sand or sand and clay.

Concrete DOT

Spec, Paragraphs 345-2, 345-3, 345-4, 345-6, 345-9, 345-10, 345-11, 345-12 and 345-13, except that the word “Department” shall be taken as “Owner”. All concrete for base repair will be Class 1 concrete, minimum 28-day compressive strength of 2,500 psi.

Curing Material

Cut-back asphalt, Grade RC-70, DOT Spec, Section 916-2.

Execution

Composition and Proportioning

A. Prepare a design mix by an independent testing laboratory and submit to the Engineer for review.

B. Do not process the base until all tests of the soil to be used have been completed and exact proportion of cement required for the particular soil has been determined according to “Expanded Short-Cut Test Methods for Determining cement Factors for Sandy Soils,” Highway Research Bulletin 61, 1952, and/or, when applicable, methods of “Wetting and Drying Test of Compacted Soil-Cement mixtures, “STM D559 (AASHTO T-135).
C. The quantity of water required will be the amount necessary for optimum moisture content in the compacted mixture. This quantity will vary with the nature of the soil and shall have been determined according to “Methods of Test for Moisture-Density Relation of Soil-Cement,” STM D558 (AASHTO T-134).

Preparation of Soil Aggregate

Remove unsuitable material and add suitable material as necessary prior to the application of cement. Pulverize the soil to be treated for sufficient width and depth to give the compacted cross section shown on the plans. Pulverizing shall continue until 80 percent of the soil, by dry weight, exclusive of gravel, shell or stone larger than 3/4 inch, will pass a No. 4 sieve. Manipulate the pulverized soil until the moisture in the soil does not exceed the percentage of the optimum moisture specified for the soil-cement mixture.

Application of Cement

Shape the soil to the approximate cross section shown on the plans, and spread the designated quantity of cement uniformly over the surface in one operation.

Mixed-In-Place Method

Immediately after the cement has been distributed, mix it with the loose soil with a machine that will produce the proper homogeneous mixture. Shape the mixture to the approximate lines and grades sown on the plans.

Central Plan Mixed Method (Optional)

A. Mix the soil, cement and water in a pug mill either of the batch or continuous-flow type. Equip the plan with feeding and metering devices which will add the soil, cement and water into the mixer in the specified quantities. Mix soil and cement sufficiently to prevent cement balls from forming when water is added, and continue until a uniform and intimate mixture of soil, cement and water is obtained.

B. Hand the mixture to the roadway in trucks equipped with protective covers. Place the mixture on the moistened sub grade in a uniform layer by an approved spreader and in such quantity that the completed base will conform to the required grade and cross section. Do not permit dumping of the mixture in piles or windows upon the sub grade.
Compacting and Finishing

A. Compact the base to a density of 95 percent of the maximum density as determined by AASHTO T-134 to the line, grade and thickness shown in the plans.

B. After the mixture is compacted, reshape the surface of the base to the required lines, grades and cross section, and then lightly scarify to loosen imprints left by the compacting or shaping equipment until a uniform, even surface mulch of approximately 1 inch in thickness is obtained. Then thoroughly roll and compact the surface.

C. Complete all of the above mixing, compacting and finishing within six (6) hours.

Construction Joints

A. At the end of each day’s construction, form a straight transverse joint by cutting back into the completed work to form a true vertical face. This joint shall be located such as to exclude all that part of the base at the end of the run which does not have full depth, is not thoroughly compacted, not properly proportioned, or not properly mixed.

B. Build soil-cement for large, wide areas in a series of parallel lanes of convenient length and width meeting the approval of the Engineer. Form straight longitudinal joints at the edge of each day’s construction by cutting back into the completed work to form a true vertical face free of loose or shattered material.

Weather Limitations

During seasons of probability of freezing temperature, do not apply cement unless the temperature is at least 40 degrees F in the shade and rising.

Surface Requirements (Scalping or Hard-Planning)

After compacting and finishing have been completed, and not later than the beginning of the next calendar day after the construction of any section of base, test the surface with a template cut to the required crown and/or with a 10-foot straight-edge lade parallel to the centerline. Correct all irregularities greater than 1/4-inch. Additional wetting before, during and after this final shaping operation shall be required to keep the base continuously moist until the cure coat is applied.

Protection and Curing

Within not more than three daylight house after the hard-planning operations have been completed, the base shall be covered and protected against rapid drying by curing.
Opening to Traffic

Completed sections may be opened to all traffic after seven days.

Maintenance

Maintain the base to a true and satisfactory surface until the wearing surface is constructed. Should any repairs or patching be necessary, they shall extend to the full depth of the base and shall be made in a manner that will assure restoration of a uniform base course conforming to the requirements of these specifications. In lieu of repairing with soil-cement, Class 1 concrete may be used.

Testing

Monitor the construction procedure with the same independent testing laboratory that prepared the approved design mix and perform the following test during placement:

- Determine cement content, moisture content, “in-place” density and thickness (maximum spacing of test holes 300 feet). The testing laboratory shall notify the Contractor immediately of any deviation from the design mix.

- Perform a laboratory density test and prepare two 4-inch-diameter by 4.6-inch-high compression test cylinders for each 300 feet of roadway. Moist cure by 7 days and test for compressive strength. Minimum acceptance standards are as follows:
  
  Thickness:   Average in 1000 feet - 1/4 inch variation  
  Maximum variation in one hole - 1/2 inch
  
  Compressive 300 psi in 7 days (molded laboratory specimens)  
  Strength:     350 psi in 14 days 430 psi in 28 days

Send two copies of all field and laboratory test results to the Engineer within 10 days of completion of said tests. Include the cost of mix design and testing in the unit price bid for the soil-cement base.
03510 - Sub grade Stabilization

General

Related Documents
A. Drawings and general provisions of Contract, apply to work of this Section.

Description of Work
A. Stabilize the designated portions of the pavement sub grade in both cut and fill sections to provide a firm and unyielding sub grade to the uniformity, density, bearing value, lines, grades and thicknesses herein specified or shown in the Drawings. The work includes mixing, compacting and grading for a complete job.

Materials
Local Materials: High bearing-soils or sand clay material. The materials passing the #40 mesh sieve shall have a liquid limit not greater than 30, and plasticity index not greater than 10. Blending materials to meet these requirements will not be permitted unless authorized by the Engineer. When so permitted, the blended material shall be tested and approved before spreading.

Lime rock/Lime rock Overburden: The percentage of carbonates of Calcium and magnesium shall be at least 70, and plasticity index shall not exceed 10. The gradation shall be such that 97% by weight of the material will pass a 1” sieve.

Crushed Shell: Mollusk shell, but not steamed shell (i.e., oysters, mussels, clams, cemented coquina, etc.). Gradation shall be such that at least 97% by weight of the total material passes a 1” sieve, and at least 50% by weight is retained on the #4 sieve. Not more than 20% by weight of the total material shall pass (by washing) the #200 sieve.

Execution
Required Florida Bearing Value (FBV): Unless otherwise specified, the sub grade shall have a minimum Florida Bearing Value of 70. Where local material does not conform to the required FBV, stabilize by uniformly mixing with satisfactory local or hauled in material to depth shown in the Drawings. Perform bearing valve determination per FDOT standard specifications for Road and Bridge Construction, section 160.8.1.
Compaction: Compact the stabilized sub grade in both cuts and fills to a minimum density of 98% of maximum (AASHTO T-180) density. The sub grade shall be shaped to within 1/4 inch of the grades shown in the Drawings.

Maintenance: After the sub grade has been prepared as specified, Contractor shall maintain it free from nuts, depressions and all damage resulting from hauling or handling of any materials, equipment, tools, etc. All work which may become necessary in order to recompact the sub grade shall be at contractor’s expense.

Testing: Provide density and bearing value tests at intervals not to exceed 250 feet for roadways or 10,000 square feet for parking areas.
03512 - Lime rock

General

Related Documents

A. Drawings and general provisions of Contract, apply to work of this Section.

Description of Work

A. Construct lime rock base course on the prepared sub grade as specified herein and in conformance with the lines and grades shown in the Drawings.

Materials

Lime rock: FDOT 200-2

Execution

Spreading: Uniformly spread lime rock by mechanical rock spreader, equipped with a device which strikes off uniformly to laying thickness, and is capable of even distribution. Where a mechanical spreader is not practical such as crossovers, intersections and ramp areas; roadway widths of 20 fee or less; and main roadway areas when forms are used, spreading may be done by bulldozers or blade graders. Remove and replace all segregated areas of fine or course rock with properly graded rock.

Transportation: Transport lime rock to the point of use over rock previously placed, and dump on the end of the preceding spread. Hauling over the sub grade and dumping on the sub grade will not be permitted.

Courses: Construct bases of specified compacted thickness greater than 5 inches in two courses. The thickness of the first course shall be approximately one-half the total thickness of the finished base, or enough additional to bear the weight of the construction equipment without disturbing the sub grade.

Compacting and Finishing: Clean the lower course (where applicable) of foreign material, blade the surface to a cross-section approximately parallel to the finished base. The lower course shall be tested for density prior to spreading the upper course. After the upper course has been spread, scarify and shape the surface to produce the required grade and cross-section after compaction, free of scabs and laminations.
Moisture Content: Material not having the proper moisture content to insure the required density, shall be wetted or dried as required. Mix-in added water uniformly by diskin to the full depth of the course. Wetting and drying operations require manipulation, as a unit, of the entire width and depth of the course which is to be compacted.

Density Requirements: After attaining proper moisture conditions, compact to a density of not less than 98 percent of maximum (AASHTO T-180) density.

Correction of Defects - If, at any time, the sub grade material should become mixed with the base course material, the Contractor shall, without additional compensation, dig out and remove the mixture, reshape and compact the sub grade and replace the materials removed with clean base material, which shall be shaped and compacted as cited herein. Cracks or checks appearing in the base, either before or after priming, which would impair the structural efficiency of the base, shall be removed by rescarifying, reshaping, adding base material, recompacting and repriming without additional compensation.

Priming and Maintaining: Apply the prime coat only when the base meets the specified density requirements, and the moisture content in the top half of the base does not exceed 90 percent of the optimum moisture of the base material. At the time of priming, the base shall be firm, unyielding and in such condition that no undue distortion will occur.

Surface Requirement: Irregularities greater than 1/4 inch, when checked with a template cut to the required crown and with a 15-foot straightedge laid parallel to the center of the roadway, shall be corrected by scarifying and removing or adding rock as required an recompacting the entire area as specified.

Thickness Requirement: Where the base is deficient by more than 1/2 inch, it shall be reworked to the area extent specified by the testing laboratory and to a depth of at least 3 inches by scarifying and adding more base material, so that after proper compaction the thickness will conform to the Drawings.

Testing Density: Provide three density determinations on each day’s final compaction operation on each course. Balding to grade where required shall be completed prior to density testing.

A. Surface: Check the finish surface of the base course with a template cut to the required crown and with a 15-foot straight edge laid parallel to the center of the roadway.

Thickness: Provide test holes at intervals not to exceed 250 feet for roadways or 10,000 square feet for parking areas.
03513 - Asphalt Concrete Paving

General

Related Documents

A. Drawings and general provisions of Contract apply to work of this Section.

Description of Work

A. Extent of asphalt concrete paving work is shown on drawings.

B. Prepared base is specified in “Section 270 of FDOT Standard Specifications for Road and Bridge Construction, latest edition.

C. Prepared sub grade is specified in “EARTHWORK” Section.

Submittals

A. Material Certificates: Provide copies of materials certificates signed by material producer and Contractor, certifying that each material item complies with, or exceeds, specified requirements.

Quality Assurance

A. Codes and Standards: Comply with State highway or transportation department standard specifications, latest edition, and with local governing regulations if more stringent than herein specified.

Products

Materials

General: Use locally available materials and gradations which exhibit a satisfactory record of previous installations.

A. Type S Asphaltic Concrete: FDOT, 331-2, 3, 4, 5.

B. Type III Cement Asphaltic Concrete: FDOT, 333-2, 2, 3, 4 and 5.

C. Asphalt Cement: FDOT, 916-1.

D. Prime Coat: Cut-back asphalt grade RC-70 or RC-250 per FDOT 916-2; emulsified asphalt grade SS-1 or SS1H, per FDOT 916-4, diluted in equal proportions with water, or other types and grades of bituminous material.

E. Tack Coat: Emulsified asphalt; RS-2, SS-1, or SS-1H (diluted in equal proportions with water) per FDOT 916-4. Cut-back asphalt RL-70, or asphalt cement, penetration grade 85-100.
F. Lane Marking Paint: Chlorinated rubber-alkyd type, AASHTO M 248 (FSTT-P-115), Type III or per FDOT 971-12.2.

G. Thermoplastic Traffic Stripes and Markings: Per FDOT standard specifications for Road and Bridge Construction, Section 711.

H. Wheel Stops: Precast of 3,500 psi air-entrained concrete, approximately 6 inches high, and 6 feet 0 inches long with chamfered corners and drainage slots on underside.

Asphalt-Aggregate Mixture and Preparations

A. FDOT 330-5, and FDOT 330-6

Execution

Weather Limitations

A. Mixture shall not be spread when the air temperature is not greater than 40º F, in the shade (away from artificial heat), or there is evidence of a frozen base, or when the wind is blowing to such an extent that proper an adequate compaction cannot be maintained or when sand, dust, etc., are being deposited on the surface being paved.

Any mixture caught in transit by a sudden rain may be laid only at Contractor’s risk. Should such mixture prove unsatisfactory, it shall be removed and replaced at Contractor’s expense. In no case shall the mixture be laid while rain is falling or when there is water on the surface to be covered.

Preparation of Asphalt Cement

A. Heat the asphalt cement in advance of the mixing operations, to within a range of 230º F to 310º F. Maintain the heating operations constant within these limits. Wide temperature fluctuations during the day will not be permitted.
Transportation of Mixture

Transport the mixture in vehicles clean of foreign material properly equipped to be covered during inclement weather. Coat the inside surfaces of the truck with soapy water or approved emulsion containing less than 5 percent oil (not kerosene, gasoline or similar products) and raise beds to drain excess prior to loading.

Preparation of Application Surfaces

A. Cleaning: Thoroughly clean the surface to be covered of all loose and deleterious material before laying any mixture.

B. Patching and Leveling Courses: Where a surface course is constructed on an existing pavement or base and/or where called for in the Drawings, apply patching or leveling courses to bring the existing surface to proper grade and cross-section. Prior to spreading leveling courses, all depressions in the existing surface more than one inch deep shall be filled by spot patching with leveling course mixture, and then thoroughly compacted.

C. Coating Surfaces of Contacting Structures: Paint all structures such as manholes, inlet, valve boxes, etc., with a uniform coating of asphaltic cement.

D. Prime Coat: Prime materials shall be uniformly applied using a pressure distributor at the minimum rates of 0.10 gallons per square yard for lime rock, lime rock stabilized and local rock bases, and 0.15 gallons per square yard for sand, clay, shell and shell stabilized bases. The actual amount to be applied shall be dependent on the character of the surface and shall be sufficient to coat the surface thoroughly without having any access to form pools or to flow off the base. The temperature of the prime material shall be that temperature between 100° F and 150° F, which will insure uniform distribution. The moisture content of the base shall not greater than 90 percent of optimum to obtain adequate penetration.

Apply a light uniform application of cover material and roll with a traffic roller for at least 10 passes before opening to traffic. Where an emulsified asphalt is used for prime coat, the Engineer may require that cover material be hot-asphalt coated with two to four percent asphalt-cement, if necessary, to achieve a prime coat which will remain reasonably intact until the surface course is placed; the application rate shall be approximately 10 pounds per square yard.
Tack Coat

A tack coat will only be required on primed bases in areas that have become excessively dirty and cannot be cleaned, or in areas where the prime has cured to the extent that it has lost adequate bonding effect. Generally, a tack coat will be required on bituminous base or leveling courses before placing the surface course.

Apply tack, suitably heated, at the minimum rate necessary to bond the wearing surface to the base (between 0.02 and 0.08 gallons per square yard). The upper limit may be exceeded for resurfacing concrete. Apply tack sufficiently in advance of the wearing course to permit drying but not so far in advance to allow loss of adhesiveness from dust and other foreign material. No traffic shall be allowed on the tacked surface.

Placing Mixture

A. Mixture shall be placed and spread only after the surface to be overlaid is properly prepared, intact, firm, properly cured and dried. No mixture shall be spread that cannot be finished and compacted during the daylight hours of day of spreading.

   Spread the mixture with mechanical spreaders, except where impracticable. A string line shall be used to obtain an accurate, uniform alignment of the pavement edge. The temperature of the mixture at the time of spreading shall be between 230º F and 310º F.

   1. Checking Depth of Layer: The depth of each layer shall be checked by the Contractor at intervals, not to exceed 25 feet. Any deviation from the required thickness, in excess of the allowable tolerance, shall be immediately corrected.

B. Surface Courses:

   1. Spreading and Finishing: Immediately upon arrival, the mixture shall be dumped into the spreader, spread and struck-off to the full width required and to such loose dept to secure the specified thickness. Excess mixture shall be carried ahead of the screed at all times. Hand rake behind the machine as required

   2. Thickness of Layers: Surface courses of thickness greater than two inches, shall be constructed in approximately equal layers and of less than two inches compacted thickness. Each layer shall be thoroughly compacted and shall conform to these specifications prior to overlaying.
3. Correcting Defects: Prior to rolling, the surface shall be checked, and irregularities adjusted. All drippings, fat sandy accumulations from the screed and fat spots from any source shall be removed and replaced with satisfactory material. No skin patching shall be done. Where a depression is to be corrected while the mixture is hot, the surface shall be well scarified before the addition of fresh mixture.

C. Leveling Courses:

1. Spreading: The initial and intermediate leveling courses shall be placed by a spreader box, working conjunction with two motor graders. The final leveling course shall be placed by a paving machine. However, if the total quantity of leveling to be applied is less than 150 pounds per square yard, the paving machine may not be required.

2. Application Rates: The application rate of leveling mixture shall not exceed 50 pounds per square yard per course except Type S-1 asphaltic concrete leveling shall not exceed 75 pounds per square yard per course. The actual application rate shall be as required to establish the finished lines and grades shown in the Drawings and shall not be limited to any average or typical rate or thickness which may be shown in the Drawings.

3. Leveling Over Existing Concrete Pavement: Remove all excess joint filler to flush with the existing pavement. For broken concrete pavement (with or without existing asphalt surface) the first leveling course shall be placed as soon after, but not later than 2 days after, the cracking and reseating operation.

Compacting Mixture

Density required for asphaltic concrete pavement, after final compaction, shall be at least 95 percent of the laboratory compacted density of the paving mixture. Tests shall be performed every 500 feet for roadways and 50,000 square feet for parking areas.

A. Equipment and Sequences: For each paving or leveling train in operation, the Contractor shall furnish a separate set of rollers, with operators. The rolling shall be done in sequence, and with the equipment as follows, unless otherwise permitted by the Engineer:

1. Seal Rolling - Use tandem steel rollers weighing 5 to 12 tons, following as close behind the spreaders as is possible without pick-up, undue displacement or blistering of the material.

2. Rolling Traffic Roller - Use self-propelled pneumatic-tired rollers, 6 to 10 tons and tire pressure to 55 pounds, following as close behind the seal rolling so the mix will permit. The roller shall cover every portion of the surface with at least five passes.

3. Final Rolling - Use tandem steel roller, weighing 8 to 12 tons after the pneumatic-tired rolling has been completed, but before the pavement temperature has dropped below 140°F.
B. Compaction of Crossovers, Intersections, etc.: Where a separate paving machine is used to pave crossovers, compaction may be done by one 8 to 10 ton tandem steel roller. If crossovers, intersections and acceleration and deceleration lanes are placed with the main run of paving, a traffic roller shall also be used in the compaction.

C. Rolling Procedures: The rolling shall be longitudinal. Where the lane being placed is adjacent to a previously placed lane, the center joint shall be pinched or rolled, prior to rolling of the rest of the lane. Continue across the mat, overlapping each previous roller path by at least one-half the width of the roller wheel. The motion of the roller shall be slow enough to avoid displacement of the mixture, and any displacement shall be corrected at once by the use of rakes, and the addition of fresh mixture if required. Final rolling shall continue until all roller marks are eliminated.

Self-propelled, pneumatic-tired traffic rollers shall proceed at a speed of 6 to 10 miles per hour; the area covered by each roller shall not exceed 4,000 square yards per hour, except that for Type S-1 Asphaltic Concrete, the maximum shall be 3,000 square yards per hour.

D. Number of Traffic Rollers Required: A sufficient number of self-propelled pneumatic-tired rollers shall be used to assure that the rolling will not delay any other phase of the laying operation nor result in excessive cooling of the mixture. In the event that the rolling falls behind, the laying operation shall be discontinued until the rolling operations are sufficiently caught up.

E. Rolling Patching and Leveling Courses: Use self-propelled pneumatic-tired rollers for all patching and leveling courses. Where the initial leveling course is placed over broken concrete pavement, the pneumatic-tired rollers shall weight at least 15 tons. For Type S-1 Asphaltic Concrete leveling courses, use a steel-wheeled roller, to supplement the traffic rollers. The use of a steel-wheeled roller will otherwise be at Contractor’s option.

Areas which are inaccessible to a roller (such as areas adjacent to curbs, headers, gutters, manholes, etc.) shall be compacted by the use of hand tamps or other satisfactory means.

F. Correcting Defects: Rollers shall not deposit gasoline, oil or grease onto the pavement. Any areas damaged by such deposits shall be removed and replaced. While rolling is in progress, the surface shall be tested continuously and all discrepancies corrected to comply with the surface requirements. All drippings, fat or lean areas and defective construction of any description shall be removed and replaced. Depressions which develop before the completion of the rolling shall be remedied by loosening the mixture and adding new mixture to bring the depressions to a true surface. Should any depressions remain after the final compaction has been obtained, the full depth of the mixture shall be removed and replaced with sufficient new mixture to form a true and even surface. All high
spots, joints and honeycomb shall be corrected. Any mixture remaining unbonded after rolling shall be removed and replaced. Any mixture which becomes loose or broken, mixed or coated with dirt or in any way defective, prior to laying the wearing course shall be removed and replaced with fresh mixture which shall be immediately compacted to conform with the surrounding area. Areas of defective surface may be repaired by the use of the indirect heat. No method of repair involving open-flame heaters shall be used.

G. Provisions Applicable to Shoulder Pavement Only: Where sand-asphaltic shoulders are constructed within the limits of curb and gutter, compaction shall be done by light weight rolling equipment, which will not displace the previously constructed curb and gutter.

Joints

A. Fresh mixture shall be laid against the exposed edges at joints (trimmed or formed as provided below) in close contact with the exposed edge so that an even, well compacted joint will be produced after rolling.

1. Transverse Joints: Placing of the mixture shall be as continuous as possible. The roller shall not pass over the unprotected end of the freshly laid mixture except when the laying operation is to be discontinued long enough to permit the mixture to become chilled. When the laying operation is thus interrupted, a transverse joint shall be constructed by cutting back on the previous run to expose the full depth of the mat.

2. Longitudinal Joints: Where a portion of the width of pavement is to be laid and opened to traffic, longitudinal joints shall be formed by rolling exposed edge of the strip first laid. When the adjacent strip is constructed, the Engineer may require the edge of the mixture in place to be trimmed back to expose an unsealed or granular vertical surface. Where the strip first laid is closed to traffic, the edge shall not be sealed but shall be left vertical and the adjacent strip placed against it without trimming.

Surface Requirements and Correction:

A. The finished surface shall not vary more than 3/16 inch when measured by rolling or manual straightedge applied parallel to the center line of the pavement. Any surface irregularities exceeding such limits shall be corrected as specified herein.
1. Manual Straight edging: A 15-foot manual straightedge shall be furnished by the Contractor and shall be available at all times on the work. The Contractor shall designate an employee whose duty it is to handle the straightedge in checking the compacted surfaces.

2. Texture of Finished Surfaces: The finished surface shall have no pulled, torn or loosened portions, and shall be free of sand streaks, sand spots or ripples. (These requirements shall also apply to any areas where it is necessary to apply hand work.) Defective area shall be corrected as follows:
   a. If the correction is made by replacing of the full thickness, it shall extend to at least 50 feet each side of the defective area.
   b. If the correction is made by overlying, the overly shall consist of at least 100 pounds of mixture per square yard at the defective section and shall taper uniformly down from the full thickness of such weight, to zero thickness (feather-edged) at the end of a minimum length of 50 feet each side of the defective area.

Protection of Finished Surface

A. Finished surfaces including courses to be overlaid shall be kept clean and no dumping of any material onto the surfaces shall be permitted. Protect pavement against damage during shoulder construction by providing proper attachments to grader blades. Vehicular traffic shall not be permitted until the pavement has set sufficiently to prevent rutting or other distortion.

Traffic and Lane Markings

A. Cleaning: Sweep and clean surface to eliminate loose material and dust.

B. Striping: Apply Thermoplastic lane marker per FDOT Section 711.
   1. Color: white and yellow as indicated on drawings.

Field Quality Control

A. Thickness Requirements & Corrections
   1. Pavement thickness shall be determined from the length of the core borings as specified herein. The maximum allowable deficiency from the specified thickness and serious deficiency thickness shall be as follows:
      a. Pavement of specified thickness 1 1/2 inches or less
         Maximum allowable deficiency 3/16 inch or more
         Serious deficiency 1/4 inch or more
b. Pavement of specified thickness greater than 1 1/2 inches but less than 2 1/2 inches
   Maximum allowable deficiency 1/4 inch or more
   Serious deficiency 3/8 inch or more

c. Pavement of specified thickness 2 1/2 inches or greater
   Maximum allowable deficiency 1/2 inch or more
   Serious deficiency 3/4 inch or more

2. Contractor shall correct seriously deficient areas either by replacing the full thickness for a length extending at least 50 feet from each end of the deficient area, or (when permitted by the Engineer) by overlaying as specified herein at his own expense.

   As an exception to the above, pavement outside a main roadway area (acceleration and deceleration lanes, crossovers and parking areas) may be left in place, without compensation (except for payment for the bituminous material), when so permitted by the Engineer, even though the thickness deficiency exceeds the serious deficiency tolerance specified above.

   Where the deficiency exceeds allowable but does not exceed serious, Contractor will be allowed to leave such pavement in place, but without compensation other than for the bituminous material contained therein. The areas of such pavement for which no square yard payment will be made shall be the product of the total distance between acceptable cores, multiplied by the width of the lane which was laid at the particular pass in which deficient thickness was indicated. To determine the extent of the deficiencies, additional cores will be taken as required.

3. Correcting Deficiency by Adding New Surface Material: For any case of excess deficiency of the pavement, Contractor will be permitted, if approved by the Engineer for each particular location, to correct the deficient thickness by adding new surface material and compacting to the same density as the adjacent surface. The area to be corrected and the thickness of the new material added shall be as specified herein. All costs of the overlaying and compacting shall be borne by the Contractor.
B. Calculation for Thickness of Pavement

1. Core Borings: The thickness of the pavement shall be determined from the length of cores, at least two inches in diameter, taken at random points along the roadway and the parking areas. Each core shall represent a roadway section not longer than 500 feet or a parking area not less than 10,000 square feet. The average thickness shall be determined from the measured thicknesses, and in accordance with the procedure and criteria specified herein.

If it is found that the specified pavement thickness has not been installed per this specification and if Contractor believes that the number of cores taken by the Owner is insufficient to properly indicate the thickness of the pavement, he may request the owner make additional borings at locations designated by him. The cost of these additional borings shall be deducted from any sums due Contractor unless such borings indicate that the pavement within the questioned area is of specified thickness.

2. Criteria for Calculations:
   a. Average thickness shall be calculated for the total length of project.
   b. When the thickness as measured by the cores is more than 1/2 inch greater than the specified thickness, it shall be considered in the calculation as the specified thickness plus 1/2 inch.
   c. Area of deficient thickness pavement which are left in place with no compensation shall not be taken into account in the calculations.
   d. Where areas of defective surface or deficient thickness are corrected by overlaying with additional material, the thickness used in the calculations shall be the specified thickness for such areas.

C. Testing

1. The contractor shall provide, at this expense, the following tests:
   a. Determination of the job mix formula
   b. Tests of the asphalt cement
   c. Sieve analysis of the aggregate
   d. Determination of bitumen content of the asphalt concrete

The results of the tests are to be provided to the Engineer and Owner.
DIVISION 4 - MASONRY

04000 - General

Weeps and Vents

All exterior walls shall be weeped. Weeps shall be provided. No galvanized tubing is to be used.

04100 - Mortar

Mortar without a color admixture is preferred. ASTM C-27073, Type “S”, shall be used for above grade use and Type “M” will be used for below grade. This may be revised for structural consideration.

Admixtures

Plasticizers, accelerators, retardants, water repellants agents, or other admixtures are not recommended. Prior approval of the Owner is required for admixtures.

04300 - Unit Masonry

For quality control, all materials, products and execution shall meet appropriate ANSI/ASTM Standards.

Tolerances

Tops of all Masonry walls, exterior and interior, where applicable, should allow for expansion and contraction, sealed to eliminate intrusion of elements and infiltration of mammals. Prior approval of Owner necessary for any change.

Mock-ups

Specifications shall require a composite Masonry mock-up. Erect a 4 x 8 foot panel. The panel shall demonstrate the quality of workmanship to include color range, texture of masonry units, bond mortar joints, joint uniformity, etc. Completed masonry work in the building shall conform to the approved panel. The panel shall not be removed until masonry work is complete or until removal is authorized. No masonry work shall be performed until mock up wall is erected and approved.
Concrete Unit Masonry

Concrete block units shall be used wherever feasible for walls. All units shall comply with all structural codes and shall be properly protected at the job site to ensure placing in the wall without excessive moisture content.

Wall exposed on both sides shall be 6” thick (minimum).

All block shall be culled for chips.

All exposed external corners which extend to the floor (or to top of base) is to be bullnosed. Rub out all casting irregularities (so as to result in smooth transition from flat face to rounded corner) before any finish treatment is applied.

Cleaning

All cleaning shall be completed in same day as placement.

Language should be added in the specifications regarding the cleaning of exterior brickwork. Excess mortar on the finish surfaces is not acceptable.

The finished Masonry should be scraped and cleaned with a solution of approved cleaner. Close inspection required prior to recommendation of final acceptance.

04210 - Veneer Masonry System

All veneer masonry proposed and the range of color must have the approval of the Owner before their purchase and use.

Mock-up (Sampled Panel)

A mock-up is required for review and approval. Mock-ups shall be erected in 4 X 8 feet panels including specified mortar and any accessories. When accepted, the mock-up will set the standards for all building Masonry.

No veneer Masonry shall be erected until mock-up is reviewed and approved.

Weeps and Vents

Use treated wick in weep holes.
Cavity Wall

Where concrete blocks are veneer faced with brick or precast units, provide a cavity. Do not use units directly against the concrete block without employing a proven form of waterproofing.

Coursing

Masonry veneer shall be laid with modular coursing, three courses to 8”, unless otherwise required to match existing coursing or to accentuate an architectural feature or pattern.

04500 - Masonry Cleaning

Refer to the Southern Brick and Tile Manufacturing Association for bulletins covering cleaning. Cleaning should be done sufficiently early for the wall to dry thoroughly at least four weeks prior to application of silicone or other recommended waterproofing. Specify that Masonry veneer must be inspected prior to application of waterproofing.

Cleaning Materials

Cleaning agents shall be detergent or solvent cleaners. No acid solution is permitted.

Exterior Waterproofing

Careful analysis and consideration must be given to the type of waterproofing applied to Masonry or stone walls.

See 09900 Painting - Exterior Waterproofing.
DIVISION 5 - METALS

05000 - General

All exterior/interior metals shall be compatible.

05210 – Steel Joists

PART 1 - GENERAL

1.1 DEFINITION

A. The purpose of this guideline is to establish minimum standards for the fabrication and installation of steel joists assemblies.

1.2 APPLICATION

A. This section includes open web steel joists, K series; long span steel joists, LH series; joist girders and joist accessories used for the support of roof and floor assemblies.

1.3 SELECTION CRITERIA

A. Industry Standards And Tests

1. Steel Joist Institute: Specifications for chord and web members
2. Steel Bearing Plates: ASTM A 36/A
3. Carbon Steel Bolts and Threaded Fasteners: ASTM A 307 Grade A
4. High Strength Bolts and Nuts: ASTM A 325
5. Welding Standards: AWS D1.1(steel) and AWS D1.3 (sheet steel)
6. Primer: SSPC-Paint 15, Type I, red oxide; FS TT-P-636

B. Applicable Publications

4. SREF: Structural Design, Load importance Factor. Design shall be based on ASCE 7-98, with a wind load importance factor for educational facilities of 1.1.
5. FS: Federal Standards.
6. OSHA: Occupational Safety and Health Association.
C. Submittals, General Instructions, Product Data, Shop Drawings, Samples, Certificates

1. Shop Drawings: Prepared by the joist manufacturer and showing layout, mark, number, location & spacing. Include anchorage details, bracing, bridging, connection locations, details and attachment of steel joists to other construction.
   a. Shop Drawing Submittals shall be signed and sealed by a professional engineer licensed to do business in the State of Florida.

2. Welding Certificates: Copies of certificates for welding procedures and personnel.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing steel joists with a successful in-service performance.
   1. Manufacturer shall be certified by SJI to manufacture joists complying with SJI standard specifications and load tables.

B. Contractor Qualifications
   1. The contractor doing steel joist erection shall have a license for the work he is installing and be licensed to do business in Orange County, Florida.
   2. The contractor shall comply with the requirements for welding as described in “Structural Welding Code--Steel”; and AWS D1.3 “Structural Welding Code—Sheet Steel.”

1.5 DELIVERY, STORAGE, AND HANDLING

A. The storage, handling and delivery of steel joists shall be as recommended in SJI “Specifications”.

B. Steel joists shall be protected from corrosion, deformation and damage during delivery, storage and handling.

1.6 PREPARATION/FIELD VERIFICATION

A. Steel joists and accessories shall be delivered to the job site marked for sequence of erection.

PART 2 - PRODUCT/SCHEDULE

2.1 MATERIALS

A. Steel: Comply with SJI Specifications for chord and web members.
B. Bearing Plates: ASTM A36/A.
C. Carbon-Steel Bolts and Threaded Fasteners: ASTM A 307, Grade A.
D. Welding Electrodes: AWS Standards.
2.2 PRIMERS
   A. Primer: Meeting the standards listed in SSPC Paint 15, Type 1, red oxide, or FS TT-P-636, red oxide.

2.3 STEEL JOISTS
   A. Manufacture steel joists according to “Standard Specifications for Open Web Steel Joists, SJI Specification” with steel angle top and bottom chord member.
   B. Comply with AWS requirements for and procedures for shop welding.
   C. Top chord extensions shall comply with SJI Type R.

2.4 JOIST ACCESSORIES
   A. Bridging: Provide bridging anchors of material, size and type required by SJI Specifications.

PART 3 - QUALITY ASSURANCE DURING EXECUTION

3.1 SAFETY
   A. Safety Guidelines to be used in the erection and installation of steel joist systems shall be in accordance with OSHA Standards

3.2 EXAMINATION
   B. Examine support substrates and embed plates for location and compliance with installation tolerances.

3.3 INSTALLATION
   A. Supporting structures shall be complete and secure with all accessories and embeds in place before steel joists are installed
   B. Installation shall be in accordance with manufacturers installation instructions.
   C. Install Joists plumb, square and securely fastened to support construction according to SJI Specifications.
   D. Field weld joists to supporting steel bearing plates. Comply with AWS requirements for welding, appearance and quality of welds and methods for correcting welding work.
   E. Bolt joists to supporting steel framework using high strength bolts.
   F. Install bridging concurrently with joist erection and before construction loads are applied. Anchor ends of bridging at top and bottom chords when terminating at walls and beams.
3.4 FIELD QUALITY CONTROL

A. The owner will engage a testing agency to test and inspect welds and bolted connections. Retesting or re-inspection of conditions failing to meet specified requirements shall be done at the Contractor's expense.

1. Field welds will be visually inspected and tested according to AWS D1.1.
2. Bolted connections will be tested and verified according to procedures in ASTM 325.

3.5 REPAIRS AND CORRECTION

A. Repair damaged galvanized coatings on galvanized items using galvanized repair paint according to ASTM A 780.

B. Use touchup paint to re-prime field connections that have been burned by welding, rusted, or abraded.

1. Clean and prepare surfaces by hand-tool cleaning.
2. Apply shop primer to surfaces.

END OF 05210
05500 - Metal Fabrications

Use galvanized steel angles in all exterior masonry, stone or precast concrete walls and in all interior walls where used in conjunction with stone. Cutting and or trimming of galvanized metals is not permitted.

05520 - Handrails and Railings

**Finishes** - All exterior galvanized metals should be painted in conjunction with the overall color scheme.

Flashing, gutters, drain spouts, etc. should be mill aluminum or coater per project specifications.

All handrail and railing shall comply to SREF.
06100- Wood Blocking & Curbing

Pressure Treated Lumber

Pressure treated material shall be used for all lumber in contact with concrete, masonry or steel. Wolmanizing process is considered best of the treatments for lumber in buildings. Bolident salts are excellent and treatment is equivalent to Wolmanizing if pressure treatment of 100/150 psi used.

Finish Carpentry

Laminated Plastic

All millwork shall be laminated with a plastic laminate. This material shall meet flame spread rating requirements of NFPA 101 (latest edition) for interior finish consistent with the occupancy classification.

Back-Painting

Wood to be back-painted before setting should be specifically called for under Division 9 so there is no room for question on the part of the Contractor.

Millwork

If door sections are used to make up closet walls, the edges should be concealed where possible since the veneers exposed to view present an unsightly appearance.

If floor-to-ceiling openings are used (door and transom), check location of the ducts and pipe with engineers!
DIVISION 7 - THERMAL & MOISTURE PROTECTION

07000 - General

Shower Room Floors

Leakage in shower and drying rooms have been a most serious problem. This area must be addressed specifically in the drawings and specification to eliminate maintenance problems. Fiberglass pans are excellent for this purpose.

A (24) hour water test should be required prior to placement of the finish flooring; if leaks occur, another test should be required after repairs are made.

Shower Room Walls

Ceramic tile on a masonry wall is insufficient to prevent water from permeating a shower room wall. Parging or painting the back of the wall and providing a through-wall flashing near the base is one means of conducting the water back to the shower room floor. Also the use of Durawall is an acceptable product.

Dissimilar Metals

Great care should be exercised in the use of dissimilar metals, and where used, proper precaution should be taken.

Fiberglass pans are recommended.

Scuppers

Overflow scuppers should be provided in parapet walls to prevent water building up even though drains are in the specifications.

Gravel Stops

Where no gutter occurs but gravel stops are used over exterior entrances or decorative panels, specify a high gravel stop to prevent water from spilling over with resulting stain effect from the metal.
07115 - Elastomeric Sheet Waterproofing

The use of this material is acceptable for existing roofs or flat roofs. Insulation shall be monitored by third party consultant. All new roof construction shall be a standing seamless roof.

Include sheet butyl, PVC, EPDM, CPE, CSPE, neoprene, hypalon, or composite laminated membrane waterproofing products to function as principal moisture stop in arresting predominantly in a horizontal application, adhesive bonded, self-adhered, loose laid, or mechanically secured installation.

Slab on Grade

Careful attention shall be paid to the design of slabs on grade to prevent damage to membranes during construction. For special areas and where damp-proofing is considered necessary for any slab on grade; a double slab system is preferred in order to reduce chances of a punctured membrane. A product equal to “Bituthane” by W.R. Grace should be considered under the wear slab. The design of all sidewalks shall include a waterproof membrane.

Special consideration shall be given to design where a Radon Barrier is required.

Vertical Surfaces

A through-wall damp proofing membrane is necessary to prevent moisture in the soil from extending up the wall by capillary.

07175 - Water Repellent Coating

Include a breathable water or solvent based liquid application to masonry or cementitious surfaces as a repellent coating to retard moisture absorption to above grade porous surfaces, and for stain or soil resistance to inter-surfaces of all structures on the facility. All exposed masonry shall have water repelling coating.

07190 - Vapor and Air Barriers

Include a method used to continue a seal formed by a vapor and air barrier for each building enclosure construction, and to seal gaps between adjacent materials forming wall and roof opening.
PART 1 - GENERAL

1.1 SUMMARY
A. Section includes parallel polyisocyanurate roof insulation and accessories.

1.2 SUBMITTALS
A. Product data:
   1. Roof insulation boards
   2. Fasteners
   3. Installation instructions for HCFC FREE Polyiso insulation board
   4. Product Data as per ASTM 2129 Standard for Data Collection for Sustainability Assessment of Building Products

B. Insulation manufacturer’s certification that HCFC FREE Polyiso materials meet Zero ODP (Ozone Depletion Potential) and Zero GWP (Global Warming Potential) specification requirements.

1.3 QUALITY ASSURANCE
A. The insulation is to meet the physical properties of ASTM C 1289, Type II; Class 1. The insulation shall provide a minimum Long Term Thermal Resistance (LTTR) value of 6.0 per inch. 6.0 per inch shall be the basis for establishing thickness in inches required. The use of aged R-values based on the RIC-TIMA conditioning procedure 281-1 is not acceptable.

B. Hydrocarbon blowing agents: Third generation, using Zero Ozone Depletion (ODP) as in compliance with the US EPA requirements of January 1, 2003 requirement to eliminate production of HCFC 141b.

C. Roof system shall be designed to meet wind-loading requirements for Florida Building Code, 2001 with 2003 revisions. Refer to Structural Drawings for wind velocity

1.4 DELIVERY, STORAGE, AND HANDLING
A. Deliver products in manufacturer’s original packaging, dry, undamaged, with seals and labels intact.
B. Store products in weather protected environment, clear of ground and moisture, and in accordance with manufacturer’s instructions.

C. Protect from direct exposure to sunlight.

D. Do not install insulation that has become wet or damaged.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Products of the following manufacturers will be considered for polyisocyanurate roof insulation providing they can furnish products equal to those specified and are approved by the membrane manufacturer, and does not restrict the terms of the roofing warranty.

2. Celotex, Tampa, Florida; http://www.celotex.com/
3. Firestone Building Products, Carmel, Indiana
6. Rmax, Inc., Dallas, Texas; http://www.rmaxinc.com/

B. Parallel Roof Insulation: Insulation shall have glass fiber reinforced facer sheets on both sides integrally laminated to the polyisocyanurate core material. Insulation shall meet FM Class 1 construction.

1. Total LTTR value shall be minimum 20, unless otherwise indicated.
2. Achieve LTTR by a minimum assembly of two layers totaling 4-inches in thickness. Use additional layers depending on board thickness.
3. Cover Board: Glass mat faced gypsum board with water resistant core, 1/2-inch thickness. Dens Deck roof board by Georgia Pacific. Cover board shall be as tested when a tested assembly is required.
4. Compressive Strength: 25 pounds per square inch minimum.
5. Board Size: 4’ x 8’ maximum

C. Fasteners: Metal fasteners and the insulation shall be approved by the membrane manufacturer to assure that required conditions are met to provide a membrane manufacturer's roof warranty. The type of fastener shall be appropriate for the substrate to achieve maximum withdraw and anti-corrosion characteristics. The membrane manufacturer approved fasteners shall also meet the following requirements:
1. FM 4470 SPRI Corrosion Test Procedure for Roofing Fasteners. To pass, the fasteners shall not accumulate more than 15 percent red rust after the "required number cycles" in the Kesternich cabinet.
   
a. The required number of cycles is as currently recommended by FM and SPRI, but in no case shall it be less than 15.

D. Adhesives: Shall conform to manufacturer's recommendations.

2.2 COMPATIBILITY OF PRODUCTS

A. Verify the compatibility of products specified in this Section with products specified in Section 07412. Substitution of and components that would restrict or limit the Roof Guarantee will not be accepted.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with insulation manufacturer's instructions and recommendations for the handling, installation, and bonding or anchorage or insulation to substrate.

B. Roof Insulation: Lay in multiple courses. Edges shall be butted to provide moderate contact but not deformed or placed in surface compression. Neatly cut and fit insulation around projections and vertical surfaces. Edges shall be mitered at ridges and elsewhere to prevent open joints or irregular surfaces. Stagger end joints in adjoining courses or base course. Stagger joints in succeeding layers with joints of layer below.

C. All rigid roof insulation shall be attached to the roof deck in strict accordance with ASCE 7-98 requirements.

3.2 COORDINATION

A. Installation of insulation shall be coordinated with other relative work preceding and subsequent to actual installation of insulation. This includes, but is not necessarily limited to, the following:

1. Installation of nailers, blocking, and insulation strips.
2. Installation of roof curbs.
3. Installation of flashings.
4. Installation of roof membrane.
3.3 GENERAL INSTALLATION PROVISIONS

A. Inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

B. Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.

C. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.

D. Install each component during weather conditions and Project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.

07270 - Fire Stopping

Include products intended to be used to close fire stop openings created when site conditions require forming of cutting walls, partitions, or floors. This fire stop material is used to close openings and continue a fire resistance rating uninterrupted. No flammable materials shall be used.
07412 - Preformed Metal Roofing

PART 1 - GENERAL

1.1 SUMMARY

A. Preformed metal roofing and related Work as specified herein, and as required for a complete and watertight installation. Work under this Section includes, but is not limited to:

1. Metal roofing and fascia
2. Flashing, closures, and cap trim
3. Metal gutters and downspouts
4. Vent roof jacks and mechanical curbs

1.2 SUBMITTALS

A. Shop Drawings: Show profile and gage of items, location and type of fasteners; location, gage, shape, and method of attachment of trim; and other details as may be required for a weather tight installation.

1. Do not proceed with manufacture prior to review of shop drawings. Do not use Drawings prepared by Architect for shop or erection drawings.
2. Shop drawings shall show methods of erection, elevations, and plans of roof panels, sections, and details, anticipated loads, flashings, roof curbs, vents, sealants, interfaces with materials not supplied, and proposed identification of components parts and their finishes.
3. Shop Drawings shall bear the seal and signature of Structural Engineer registered in the State of Florida.
4. Calculations for wind load design shall be stamped, sealed and signed by a Professional Engineer in the State of Florida verifying compliance with ASCE 7-98.
5. Submit laboratory test report showing roof assembly compliance with SSTD 12-99.

B. Submit 3 copies of appropriate color selection materials.

C. Final Statement of Compliance: Submit to the Architect, addressed to the Board of Education for Osceola County.

C. Submit pre-roofing conference meeting minutes.

D. Submit warranties as specified herein.
1.3 QUALITY ASSURANCE

A. Applicable standards:

3. ASTM A792-AZ55: Specifications for steel sheet, aluminum-zinc alloy coated (galvanized) by the hot dip process, general requirements (galvalume).
4. ASTM E283-84: "Air Infiltration Test."
5. ASTM E331-83: "Water Penetration Test."

B. Manufacturer's qualifications: Minimum of 10 years experience in manufacturing panels of this nature, in a permanent, stationary, indoor production facility

C. The installer shall have been actively installing the type of roofing system defined in these Specifications for a minimum of 5 years and be approved by the manufacturer of the system being installed.

D. Design: The preformed metal roof system shall be designed to sustain the specified loads in accordance with governing building codes in the county and state that this Project is located in. Components of the preformed metal roof system shall meet the design loads and applied in load combinations as specified in governing building codes, without exceeding the allowable working stresses.

1. Roof system shall be designed to meet wind-loading requirements for the Florida Building Code, 2001 with 2003 revisions. Refer to Structural Drawings for wind velocity.

E. When tested in accordance with ASTM E 1680 and ASTM E 1646, the panel assembly shall show no more than 0.01 cfm/ft2 of air infiltration at 6.24 psf test pressure and no water leakage at 15 psf test pressure for 15 minutes with a volume spray of 5 gallons per hour.
F. Structural: Uniform load capacity shall be determined by testing in accord with the principles of ASTM E 1592 adapted to testing of formed sheet panels by clarifying specific sections of this standard as follows:

1. Roof test specimens shall be representative of the main body of the roof, free from influence of perimeter conditions. The setup shall be continuous over one or more supports and contain at least 5 panel widths.
2. No roof attachments are permitted at the sides other than the standard gable or rake condition. For uplift tests, at least one end seal shall be flexible and in no way restrain the crosswise distortion of panels. One end may simulate an eave condition if at least 12 feet away from the mid-roof clip under evaluation.
3. Roofing panels and accessories shall be production material of the same type and thickness proposed for use on the project.
4. Longitudinal seals or plastic film shall not span any crevice or cracks that may tend to separate under pressure (e.g. plastic films used to seal the chamber must be applied into the side seam of the panel so as to apply a uniform static pressure to the entire cross section of the panel).

G. Weather tightness: When tested in accord with the principles of NAAM TM-1, the roof system without sealant in the ribs shall show no leakage when exposed to dynamic rain and wind velocity up to 70 mph for 5 minutes.

H. Thermal Cycle Test: An assembly consisting of clips, 3 or more panels in width, and spanning 3 or more supports with clips positively loaded to 10 pounds shall resist 100,000 thermal cycles and show no visible signs of wear from the exterior and erode no more than 25 percent of the panel of clip material from the underside (non-exposed surfaces).

I. The roofing manufacturer’s representative shall inspect the roof within one year after the Date of Substantial Completion.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver panels to job site properly packaged to provide against transportation damage.

B. Handling: Exercise extreme care in unloading, storing, and erecting panels to prevent banding, warping, twisting, and surface damage.

C. Storage: Store materials and accessories above ground on well skidded platforms. Store under waterproof covering. Provide proper ventilation to panels to prevent condensation build-up between panels.
1.5 JOB CONDITIONS

A. Pre-Roofing Conference

1. Prior to the installation of the roofing and associated work, meet at the project site with the installer, the installer of each component of associated work, the installers of deck or substrate construction to receive roofing work, the installers of other work in and around roofing that must follow the roofing work (including Mechanical Work), the Architect, and other representatives directly concerned with performance of the work, including (where applicable) insurers, test agencies, product manufacturers, governing authorities, and the Owner. Record (by Contractor) the discussions of the conference and the decisions and agreements (or disagreements) reached and furnish a copy of the record to each party attending. Review foreseeable methods and procedures related to the roofing work including, but not necessarily limited to, the following:

   a. Review project requirements (Drawings, Specifications, and other Contract Documents).
   b. Review required submittals, both completed and yet to be completed.
   c. Review status of substrate work (not by the Metal Roofing Installer), including drying, structural loading limitations, and similar considerations.
   d. Review required inspection, testing, certifying, and accounting procedures.
   e. Review regulations concerning code compliance, environmental protection, health, safety, fire, and similar considerations.
   f. Consider each party's extant judgment, as advanced in the interest of successful completion of Work.

1.6 WARRANTY

A. Furnish a written guarantee covering the roofing and flashing work including the installation of products in the system, against defects in materials and workmanship for a period of 2 years. Guarantees are not intended to serve as protection against poor workmanship or inferior or improper materials at the time the roof is installed, but are for the purpose of protecting the Owner against future failures during the intended life of the roof covering.
B. The manufacturer for the preformed metal roofing shall also furnish to the Owner a written guarantee covering the finish of exposed coated metal surfaces against blistering, peeling, cracking, flaking, checking, chipping, rusting, and excessive chalking and color change for a period of 20 years.

1. Also provide a manufacturer's 20 year weather tightness warranty equal to Industry Standard weather tightness warranty.

C. Guarantee/warranty shall include, but not be limited to, preformed metal roofing, fascias, roof insulations, flashings, cap flashings, closures and trims, fasteners, accessories, sealants, gutters, and watertight connection to downspouts.

D. Guarantee/warranty period shall begin on the Date of Substantial Completion for the Project or such date that the roof is accepted by the Architect and Owner.

E. Repairs required, either permanent or temporary, to preformed metal roofing or roof flashings under this guarantee to keep the roof watertight shall be started within 3 days after notice of the need for repairs. Should the Contractor fail to make such repairs within a reasonable time period, the Owner may have such repairs made and charge the cost to the Contractor.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Basis of Design: Preformed metal roofing shall be minimum 2 inches high, vertical leg field crimped, standing seam panels with concealed fasteners. Basis of design: VSR Panel, as manufactured by Butler Mfg. Co., Kansas City, Missouri.

B. Products of the following manufacturers will be considered, providing their products equal or exceed the quality specified; and they can provide products of the type, size, function, and arrangement required.

1. Architectural Metal Systems, Inc., Eufaula, Alabama
2. Berridge Manufacturing Co., Huston, Texas
5. Steelox Roofing Systems, Mason, Ohio.

C. Finish to be factory applied Galvalume “Plus” coating over thoroughly cleaned and pretreated galvanized coated steel. Coating to be applied prior to fabrication of roofing components.
D. Metal sheets or coils selected for forming into panels must be cut to size before receipt of finish coating or have cut edges specially coated with similar film of same applied finish after being sized. Actual finish and coating method intended for provision must appear on submitted shop drawings.

2.2 DESIGN OF SYSTEM

A. Panel shall be designed in accordance with sound engineering methods and practices and in accordance with the latest edition of AISI's "Specification for the Design of Cold Formed Steel Structural Members."

B. Roof structure shall be designed with proper recognition for the "floating system" which must exist to have a roof panel that meets expansion and contraction requirements.

C. Panel shall be designed so that damaged panels may be replaced without interfering with adjacent panels. Replacement shall not require the use of through the roof fasteners.

2.3 MATERIALS

A. Panels shall be fabricated in full lengths from ridge to eave without end laps. Panels shall be 16 inches wide maximum with concealed anchors that resist wind uplift yet permit expansion and contraction with temperature changes. Standing ribs 2 inches high minimum shall have a continuous groove capillary break. Ribs shall be securely locked over anchor clips with an electrically driven, field operated, roll forming tool. Individual panels shall be removable for replacement of damaged material. A minimum of two, 3/8-inch high intermediate stiffener ribs shall be located in the flat pan to minimize oil-canning and telegraphing of structural members, striated panels are also acceptable. Panels shall be Galvalume “Plus” prefinished 50 ksi steel per ASTM A792.

1. 24 gauge “Galvalume” panels finished with clear coat.
2. Galvalume sheet shall be produced in accordance with ASTM A792 with coating designation of AZ55.
4. Oil coating shall be kept at a minimum. Clean panels of all oil prior to shipment.
5. Use clean, dry gloves during handling and installation.
6. Care shall be exercised to prevent the roofing panels from sliding over each other during shipment and installation.
7. Galvalume shall have a clear coat applied at the factory. Coating shall be a clear acrylic coating applied to both sides of the sheet. Acrylic coating shall contain chromium. Basis of Design: Galvalume Plus by Bethlehem Steel.
8. Onsite fabrication, painting, rolling or forming of sheet metal roofing is not permitted.

B. Clip angle "bearing plate" shall be a minimum of 18 gauge 36,000 psi G90 hot dip galvanized steel. The concealed backing plate shall have recessed pre-punched holes for deck attachment.

C. Concealed clips shall be not less than 24 gauge galvanized coated, 50,000 psi minimum yield or nonmagnetic stainless steel. Clip design is to be such that it will accommodate expansion and contraction requirements while being anchored securely to structure.

D. Concealed fasteners shall be self drilling, self tapping sheet metal screws of SAE #1022 steel with .0003 inch minimum zinc coating meeting Federal Specification QQ-Z325 Type II.

E. Exposed fasteners shall be self tapping, stainless steel sheet metal screws. Provide self drilling, self tapping screws where required by conditions.

F. Roofing panels shall be manufactured in continuous lengths to eliminate perpendicular panel end laps. End laps will not be allowed.

2.4 ROOF SYSTEM ACCESSORIES

A. Ridge Cap

1. Closure strips formed to fit the roof panel profile shall be provided as required. The closure shall be closed cell "EPDM" synthetic rubber or factory formed metal closure to match roofing panel, or manufacturer’s standard watertight detail and components.

2. Integrated steel roof curbs shall be fabricated with sides made in the form of roof panels and seamed directly to the roof panel during erection. Weather tight end laps shall require the roof panel to lap over the curb flange on the high side and curb flange to lap over the roof panel on the low side.

B. Gutter, Downspout, Trim, and Flashings

1. Gutters, downspouts, ridge cap, and curbs shall be furnished in 24 gauge Galvalume “Plus” finish on all exposed sides and edges, matching the roof panel finish. Unexposed sides and edges shall be standard baked-on finish. Form to configuration indicated on the Drawings. Provide gutter straps of 24 gauge Galvalume “Plus” finish to match gutter and roof panels. Provide manufacturers standard gutter design.
2. Fascia, eave, and rakes shall be 22 gauge Galvalume “Plus” finish on all exposed sides and edges.

C. Sealant: The standard of quality shall be that of a reputable and established sealant manufacturer, approved by the manufacturer of the metal building in which the sealant is used. Sealants shall have good cohesion as well as good adhesion to the protective coated metal and shall not be corrosive to components on which it is applied. Each shall have adequate handling characteristics during normal ranges of construction or erection temperatures. The sealant shall be one that will retain its weather sealing properties under the conditions for which it is used and each (sealant) is recommended for only the applications listed hereafter.

1. Extrudable sealant, non-migratory, nondrying, and non-skinning synthetic elastomer base material conforming to the National Association of Architectural Metal Manufacturer's NAAMM Standard SS-1a-68, and except for the "tack free time", shall conform to the performance requirements of Federal Specification TTC-598-b Type 1. Use at the following locations:

   a. Factory applied sealant in longitudinal ribs of standing seam roof panels.
   b. Spot sealing laps (where applicable) of standing seam roof panels.
   c. Sealing ridge cover and miscellaneous flashing.
   d. Sealing curbs for roof accessories.

2. Extruded butyl material conforming to performance requirements of Military Specification #MIL-C-18969B Type II Class B. With the exception of the "compressor set" requirement, it shall also conform to the National Association of Architectural Metal Manufacturer's NAAMM Standard #SS-1b-68 Class A for no skinning resilient preformed compounds. Size of tape shall be that recommended by the building manufacturer. Use at the following locations:

   a. Sealing swaged end laps of standing seam roof panels.

3. Extrudable sealant, nondrying (but skinning) and no migratory synthetic elastomer base material, conforming to the performance requirements of Federal Specification TT-C-598-b Type 1. Use at the following locations:

   a. Sealing ridge channels
   b. Sealing exposed seams, butts, and laps at roof curbs
D. Prefabricated Metal Roof CURBS: Fabrication of the prefabricated metal roof curbs shall be furnished by the same manufacturer as the roof covering sheets to assure an exact match with roof configuration. Metal gage shall equal or exceed the following: Cricket metal-24 gage; curb metal-14 gage. The finish for both the cricket and curb metal shall be equal or exceed the roof covering sheet. Component connections between the prefabricated metal roof curbs, cricket, and base sheet shall be continuous welded to obtain watertight connections. Exposed surfaces shall match the color finish of the roof sheets. Color shall match color of roof panels.

E. Pipe Flashings: EPDM (ethylene propylene diene monomer) flashings for vent pipe penetrations in metal roof. Provide clamping rings, sealant, and fasteners recommended by manufacturer.

F. Membrane Underlayment:
   3. "TW Metal and Tile Underlayment," Tamko Roofing Products, Joplin, Missouri; www.tamko.com

G. Provide manufacturers standard valley flashing for valleys. Gauge and finish shall match roof panels as a minimum. All valleys shall be watertight and shall be included in the manufacturers standard roof water tightness warranty. Provide all items as required for a complete installation in every respect.

H. Any composite roofing system to include insulation, shall comply with the requirements of ASTM C 1301 for LTTR (Long Term Thermal Resistance).

PART 3 - EXECUTION

3.1 INSTALLATION

A. Areas on which insulation and metal roofing is to be installed shall be completely secured and free of dirt and debris.

B. Notify Architect in writing of defects in substrate that would be detrimental to metal roofing installation prior to start of Work.

C. Start of insulation and metal roofing installation shall constitute acceptance of substrates by this Contractor.
D. Membrane Underlayment:

1. Install membrane underlayment over 100% percent of the roof area in accordance with the membrane manufacturer’s written installation instructions.
2. Membrane shall be installed directly on top of the oriented strand board, roof and deck insulation specified in Section 07220, Roof and Deck Insulation.

3.2 METAL ROOFING INSTALLATION

A. Erection of the preformed metal roofing system shall be performed in accordance with the manufacturer's erection drawings.

B. Set bearing plates on surface of insulation board at standing slip angle locations.

C. Install concealed clips on top of bearing plates with self drilling shoulder screws into metal roof deck below. Size and length of screws and bearing plates shall be as recommended by manufacturer.

D. Install concealed backing plates on surface of insulation at locations where panel end laps occur. The concealed backing plate shall be continuous under panel end laps. The backing plates shall be fastened to the metal deck with self drilling screws at 16 inches on center.

E. Interlocking ribs shall be crimped together by an electric powered mechanical device in accordance with the roof manufacturer's instructions, immediately after securing in place.

F. Preformed metal roofing, fascia, and gutter work shall be watertight and weather tight, lines and angles sharp and true, plain surfaces free from waves and buckles. Workmen shall be experienced in the trade and thoroughly capable of performing the Work in accordance with these requirements.

G. Fasteners are to be concealed wherever possible. Exposed fasteners shall be stainless steel painted to match.

H. Brake formed cap, trim, closure, and flashing sections are to be furnished with a minimum of joints.

1. Brake formed members with exposed corner intersections shall have corner pieces shop fabricated. Other miscellaneous trim corners may be field cut, mitered, or butted.
2. Trim shall be of the same material as, and have a finish to match, the metal roofing panels.
I. Install roof jacks at pipe penetrations in metal roofing and roof curbs at all roof mounted equipment indicated on the Drawings. Provide required fastened, foam rods, plastic cement, and other sealant or material to provide watertight and weather tight construction.

J. Install panels and accessories in strict accordance with the panel manufacturer's written instructions and the approved shop drawings. Use electrically driven "crimper tool" for closing seams wherever possible. Attach panels to framing members per the manufacturer's written instructions, providing fixed anchorage or allowing thermal movement where specified on shop drawings.

K. Use appropriate clips, fasteners, braces, and anchors as indicated on the Drawings and any other items required for a complete installation and as recommended by manufacturer.

L. Make repairs and perform additional work necessary to provide a roof watertight and acceptable to the Architect prior to start of roofing guarantee.

M. The installation shall be designed to safely resist the positive and negative loads.

N. Roof panels shall be able to support walking loads without excessive distortion or telegraphing of the structural supports. For the maximum span used on the project, panels shall withstand a 250 pound concentrated load applied to a 4 square inch pad located at the center of the panel flat without buckling of the rib or noticeable permanent distortion of the panel.

O. Roof panel and flashing attachments shall be designed to accommodate the thermal expansion and contraction of the exterior material through a total of 150 degrees F. temperature change.

P. Factors of safety on design loads to ultimate strength of fasteners shall be as stated in the industry standard for the material into which the fastener is driven.

1. AISI for steel

Q. Provide all items and accessories as required for a complete installation in every respect.

3.3 GENERAL INSTALLATION PROVISIONS

A. Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.
B. Inspect materials immediately upon delivery and again prior to installation. Reject damaged and defective items.


E. Recheck measurements and dimensions, before starting each installation.
07416 – Preformed Curved Metal Roofing

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Preformed curved metal roofing.

B. Refer to Section 07412 – Preformed Metal Roofing for the following requirements:

1. Submittals
2. Quality Assurance
3. Delivery, Storage, and Handling
4. Pre-Roofing Conference
5. Warranty Issues

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Basis of Design: Curved preformed metal roofing shall be 2-3/8 inches high, vertical leg, standing seam panels with concealed fasteners. Basis of design: “Series 300” as manufactured by Imetco, Tucker, Georgia.

B. Products of the following manufacturers will be considered, providing their products equal or exceed the quality specified; and they can provide products of the type, size, function, and arrangement required.

2. Berridge Manufacturing Company, San Antonio, Texas

C. Finish, Basis of Design: Factory applied Galvalume “Plus” Bethlehem Steel. Coating to be applied prior to fabrication of roofing components.

D. Metal sheets or coils selected for forming into panels must be cut to size before receipt of finish coating or have cut edges specially coated with similar film of same applied finish after being sized. Actual finish and coating method intended for provision must appear on submitted shop drawings.
2.2 DESIGN OF SYSTEM

A. Refer to Section 07412 – Preformed Metal Roofing

2.3 MATERIALS

A. Panels shall be fabricated in full lengths from ridge to eave with end laps patterned in a repeating arrangement. Panels shall be 16 inches wide maximum with concealed anchors that resist wind uplift yet permit expansion and contraction with temperature changes. Standing ribs 2-3/8 inches high, with 1” wide cap. Ribs shall be securely locked over anchor clips with an electrically driven, field operated tool. Individual panels shall be removable for replacement of damaged material. A minimum of two, intermediate stiffener ribs shall be located in the flat pan to minimize oil-canning and telegraphing of structural members, striated panels are also acceptable. Panels shall be Galvalume “plus” prefinished 50 ksi steel per ASTM A792.

1. 24 gauge “Galvalume” panels finished with Galvalume “Plus” as defined above are acceptable.
2. Galvalume sheet shall be produced in accordance with ASTM A792/A792M and shall have a coating designation of AZ55.
3. Care shall be exercised to prevent the roofing panels from sliding over each other during shipment and installation.

B. Clip angle "bearing plate" shall be a minimum of 16 gauge 36,000 psi G90 hot dip galvanized steel. The concealed backing plate shall have recessed pre-punched holes for deck attachment.

C. Concealed clips shall be not less than 16 gauge galvanized coated, 50,000 psi minimum yield or nonmagnetic stainless steel. Clip design is to be such that it will accommodate expansion and contraction requirements while being anchored securely to structure.

D. Concealed fasteners shall be self drilling, self tapping sheet metal screws of SAE #1022 steel with .0003 inch minimum zinc coating meeting Federal Specification QQ-Z325 Type II.

E. Exposed fasteners shall be self tapping, stainless steel sheet metal screws. Provide self drilling, self tapping screws where required by conditions.

F. Roofing panels shall be manufactured in continuous lengths to eliminate perpendicular panel end laps. End laps will be allowed as specified herein.
G. Gutter, and Downspouts

1. Gutters, downspouts, shall be furnished in 24 gauge Galvalume “Plus” on all exposed sides and edges, matching the roof panel finish. Unexposed sides and edges shall be Galvalume “Plus” finish. Form to configuration indicated on the Drawings. Provide gutter straps of 24 gauge Galvalume “Plus”, color and finish to match gutter and roof panels. Provide manufacturers standard gutter design.

   a. All downspouts from grade to an elevation of 8 feet above grade shall be 18 gauge Galvalume “Plus”.

2. Fascia, eave, and rakes shall be 22 gauge Galvalume “Plus” finish on all exposed sides and edges in Galvalume “Plus”.

2.4 ROOF SYSTEM ACCESSORIES

A. Trim, and Flashings: Fascia, eave, and rakes shall be 22 gauge Galvalume “Plus” finish on all exposed sides and edges.

B. Sealant: The standard of quality shall be that of a reputable and established sealant manufacturer, approved by the manufacturer of the metal building in which the sealant is used. Sealants shall have good cohesion as well as good adhesion to the protective coated metal and shall not be corrosive to components on which it is applied. Each shall have adequate handling characteristics during normal ranges of construction or erection temperatures. The sealant shall be one that will retain its weather sealing properties under the conditions for which it is used and each (sealant) is recommended for only the applications listed hereafter.

   1. Extrudable sealant, non-migratory, nondrying, and non-skinning synthetic elastomer base material conforming to the National Association of Architectural Metal Manufacturer's NAAMM Standard SS-1a-68, and except for the "tack free time", shall conform to the performance requirements of Federal Specification TTC-598-b Type I. Use at the following locations:

      a. Factory applied sealant in longitudinal ribs of standing seam roof panels.
      b. Spot sealing laps (where applicable) of standing seam roof panels.
      c. Sealing ridge cover and miscellaneous flashing.
      d. Sealing curbs for roof accessories.

C. Underlayment: Refer to Section 07412 – Preformed Metal Roofing
PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with installation requirements of Section 07412 – Preformed Metal Roofing.

B. Curve panels to radius as indicated on the drawings.
PART 1 - GENERAL

1.1 SUMMARY

A. Section includes modified bituminous sheet roofing system.

1.2 SUBMITTALS

A. Product Data:
   1. Manufacturer's technical data, installation instructions and recommendations for each type of roofing product required
   2. Data substantiating that materials comply with requirements
   3. Maintenance instructions

B. Shop Drawings: Include roof outline, dimensions, penetrations, insulation type and thickness, piece layout, parapet size and location, and other information that may affect the suitability and installation of the roofing system.
   1. Calculations for wind load design shall be sealed and signed by a Professional Engineer in the State of Florida verifying compliance with ASCE 7-98
   2. Submit laboratory test report showing roof assembly compliance with SSTD 12-99.

C. Copy of draft warranties

D. Pre-Roofing Conference minutes

E. Mock-up

F. Manufacturer’s Inspection Reports

G. Final Statement of Compliance: Submit to the Architect, addressed to the School District of Osceola County.

1.3 QUALITY ASSURANCE

A. All SBS membrane systems shall be a multi-layer, homogenous roofing sheet assembly with a granular surfacing on the cap sheet layer. All roofing sheets shall be made with identical SBS blend formulations and manufactured using the same process for sheet construction.
B. **Performance Features:** All SBS membrane systems shall have the following performance features as a minimum:

1. Each SBS sheet shall be manufactured as an independent waterproofing layer. The independent waterproofing layer design will allow for phased construction between layers.
2. Granule Surfacing: The finish membrane system shall have a factory applied granule surfacing to allow for ease of inspection, maintenance and repair.
3. Detail Treatments: The SBS membrane terminations and associated roof penetrations shall be waterproofed using manufacturer’s detail configurations.
4. Underwriter's Laboratories Rated: The SBS membrane system shall be UL rated Class A without the necessity for maintenance oriented coating or surfacing.

C. Roof system shall be designed to meet wind-loading requirements of Florida Building Code, 2001 with 2003 revisions. Refer to structural drawings for wind velocity.

D. Obtain from the roofing manufacturer copies of each roof inspection and furnish a copy to the Architect. Inform the roofing manufacturer, with regard to warranties, that warranties shall be issued, based upon the acceptance of the roofing work, and that deficiencies noted on inspection reports have been corrected. The manufacturer shall not refuse or restrict the provisions of its warranty, based upon deficiencies noted on inspection reports, especially any report that may not have been furnished to the Architect. Inspections shall be weekly. The Architect will not approve final payment of roofing work until final and interim inspection reports and warranty are in hand. The Architect's representative shall accompany the manufacturer's inspector and Roofing Installer during final inspection prior to issuing manufacturer's warranty.

   1. The roofing manufacturer’s representative shall inspect the roof within one year after the Date of Substantial Completion.

E. **Manufacturer’s Qualifications:** Manufacturer shall have 10 year minimum experience manufacturing SBS roofing similar to that specified.

F. Roofing firm (installer) must have at least 5 years successful experience in the type of roofing system specified.

G. The roofing installer shall have on the job whenever roofing work is being done, a foreman/supervisor with a minimum 3 years experience in the type of roofing specified or the roofing manufacturer's technical field representative.
H. Roofing and associated work shall be performed by a single firm called the "Installer" in this Section, so that there will be undivided responsibility for the specified performance of components.

I. Quality Assurance Program: Provide primary roofing materials manufactured under a quality control/quality assurance program. A certificate of analysis for reporting the tested values of the actual materials being supplied for the project will be required prior to project closeout.

J. Mock-up

1. Mock-up Size: 10 x 10 feet including insulation, surfacing, and typical base and counter flashings specified at location designated.
2. Mock-up may remain as part of the work.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original, unopened containers and rolls with labels intact and legible. Materials having fire resistance classifications shall be delivered to the Project with labels attached as required. Deliver materials in sufficient quantity to allow continuity of work.

B. Product shall be stored indoors or in protected areas outdoors to providing protection against wetting and moisture absorption. Emulsion shall be stored in temperature above 40 degrees F.

1. Materials stored outdoors shall be on raised platforms and cover top and sides with waterproofed materials properly tied down. Remove wet products from project site.
2. Handle roll goods as to prevent damage to edge or ends.
3. Provide continuous protection of products during delivery, storage, handling, and application.
4. Do not store roofing materials in concentrated areas of roof deck.

1.5 JOB CONDITIONS

A. Pre-roofing Conference

1. Prior to the installation of the roofing and associated work meet at the project site with the installer, the installer of each component of associated work, the installers of deck or substrate construction to receive roofing work, the installers of other work in and around roofing that must follow the roofing work (including Mechanical Work, if any), the Architect and other representatives directly concerned with performance of the work, including (where applicable) insurers, test agencies, product
manufacturers, governing authorities, and the Owner. Record the discussions of the conference and the decisions and agreements (or disagreements) reached and furnish a copy of the record to each party attending. Review foreseeable methods and procedures related to roofing work, including, but not necessarily limited to, the following:

a. Contract Documents  
b. Submittals, both completed and yet to be completed  
c. Status of substrate work (not by the roofing installer), including drying, structural loading limitations, and similar considerations  
d. Availability of materials, tradesmen, equipment, and facilities needed to make progress and avoid delays  
e. Required inspection, testing, certifying, and accounting procedures  
f. Weather and forecasted weather conditions, and procedures for coping with unfavorable conditions, including the possibility of temporary roofing.  
g. Regulations concerning code compliance, environmental protection, health, safety, fire, and similar considerations  
h. Procedures of protection for roofing throughout the construction period  
i. Consider each party's extant judgment, as advanced in the interest of successful completion of the work.

B. Weather Condition Limitations

1. Proceed with roofing and associated work only when weather conditions will permit unrestricted use of materials and quality control of the Work being installed, complying with the requirements and with the recommendations of the roofing materials manufacturer.

   a. Proceed only when the Installer is willing to guarantee the work as required and without additional reservations and restrictions.

2. Apply in dry weather on a dry deck only. Where rain or inclement weather occur during application, the Work shall stop and not resume until the weather has cleared and the deck is properly dry.

1.6 ROOF MAINTENANCE MANUAL

A. Submit a Roof Maintenance and Inspection Manual with warranties and project closeout submittals. (Final payment will not be made until roof maintenance manual is submitted).
B. Manual shall be bound in a 3 ring binder with name of project, Owner, Architect, and Contractor on front cover.

C. Include the following:

1. Cover letter recommending that 2 roof maintenance inspections be conducted per year. Also, cover letter shall include instructions directing the Owner to inform (copy) the manufacturer as well as the Roofing Contractor when reporting roofing problems, regardless of when they occurred during the warranty period.
2. Table of Contents.
3. Visual inspection checklist indicating specific flashings and details to be inspected. Include items such as base flashing seams, reglets and counter flashings, roof edge flashings, roof penetration flashings, roof curb flashings, boot flashings, roof drain areas, parapet wall flashings, copings, roof membrane seams, and skylight flashings. Applicable items shall be listed per project.
5. Roof plan indicating penetrations, detail locations, roof drains, and seams.

1.7 WARRANTIES

A. Provide a written guarantee warranting the roof insulation and flashing work, including the installation of products furnished by others and installed under the Section of Work, against defects in materials and workmanship for a period of 2 years from the Date of Substantial Completion.

1. Guarantee shall include, but not be limited to, roofing, roof insulation, sheet metal flashings and gravel stops, gutters and downspouts, roofing flashing, expansion joints, control joints, and curbs at roof openings.
2. Guarantee period shall begin on the Date of Substantial Completion for the project or such date that the roof is accepted by the Architect and Owner, if the date is after the Date of Substantial Completion.
3. Manufacturer shall perform annual inspections for the initial three years of warranty.
4. Repairs required, either permanent or temporary, to roofing or roof flashings under this guarantee to keep the roof watertight shall be made within 3 days after notice of the need for repairs. Should the Contractor fail to make such repairs within the time period, the Owner may have such repairs made and charge the cost to the Contractor.
B. In addition to the guarantee above, provide to the Owner a written warranty from the roofing membrane manufacturer, warranting the roofing system membrane, insulation, and flashing against leaks and defects in materials and workmanship for a period of 20 years from the Date of Substantial Completion. This shall be a “No Dollar Limit” type of warranty.

PART 2 - PRODUCTS

2.1 MODIFIED BITUMEN ROOFING SYSTEM

A. Basis of Design: SBS membrane system by Soprema Roofing and Waterproofing, Inc., Wadsworth, Ohio

B. Products of the following manufacturers are acceptable, providing their products and systems equal or exceed the quality and standards specified.

1. GAF Materials Corporation, Wayne, New Jersey
2. Johns Manville, Littleton, Colorado
3. Siplast, Irving, Texas
4. M.B. Technologies, Fresno, California

C. Provide SBS membranes to comply with ASTM D 6163, Type I, Grade G

2.2 MATERIALS

A. Base Membrane: Elastophene HD, 120 mils thick, 90 pounds per square with fiberglass reinforcement and fine sand bottom and top surface

B. Cap Membrane: Elastophene FR, 138 mils thick, 91 pounds per square with fiberglass reinforcement mat and embedded ceramic granules on top

C. Asphalt: Type IV hot steep asphalt, ASTM D-312-IV

D. Base Flashing: Sopralene 180 Flam, 118 mils thick, non-woven polyester

E. Cap Flashing: Sopralast 50 TV Aluminum

F. Walkway Pads: Mineral-granule-surfaced, slip-resisting pads, acceptable to roofing system manufacturer
G. Miscellaneous Materials:

1. Roofing Granules: Ceramic-coated roofing granules, No. 11 screen size with 100 percent passing No. 8 sieve and 98 percent of mass retained on No. 40 sieve, color to match roofing membrane.

2. Provide fasteners, primers, sealants, and other miscellaneous materials as approved by the manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All materials shall be installed by "mopping-in" with hot asphalt as specified, except cap ply flashing may be torched.

B. Install the modified bitumen membrane in strict accordance with the manufacturer's written instructions. Application temperature of asphalt shall be EVT (+ or -) 25 degrees F. for proper adherence.

   1. Minimum Application Temperature: 425 degrees F.

C. Install flashing and expansion joints in strict accordance with the manufacturer's written instruction. Flashing requirements include, but not limited to, curbs and walls, stacks, vents, and other roof protrusions.

D. Miscellaneous Materials: Install fasteners, primers, solvents, sealants, and other materials in accordance with the membrane manufacturer's written instructions.

E. Install base and ply sheets in solid mopping of asphalt at the rate of 20-25 pounds per 100 square feet, side and end laps without fish mouths or wrinkles.

F. Install cap membrane in solid mopping of asphalt at the rate of 20-25 pounds per 100 square feet, with side and end laps, staggered between plies.

G. Flashing sheet shall be installed to flash up and over the top of all parapet walls, no exceptions.

H. Pedestrian Walkway Traffic Pad:

   1. Install a 1 1/2 roll width of cap sheet around roof top mechanical equipment and as shown on the Drawings

   2. Install a 10 inch square of walkway pad under each conduit/piping support

   3. Install using notched trowel with recommended cement to a minimum 3/8” thick
3.2 GENERAL INSTALLATION PROVISIONS

A. Inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

B. Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.

C. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.


E. Recheck measurements and dimensions, before starting each installation.

F. Install each component during weather conditions and Project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.

G. All new materials shall be sealed from moisture intrusion at the end of each day. Phased construction is not allowed.

3.2 CLEAN-UP

A. Remove masking, protection, equipment, materials, and debris from the work and storage areas and leave areas in an undamaged and acceptable condition.

3.3 MANUFACTURER'S INSPECTION

A. Upon completion of the work and prior to final payment, the membrane manufacturer's representative, in the presence of the Owner and Architect, shall inspect roofing work. Discrepancies shall be recorded and immediately rectified. Final payment will not be issued until the manufacturer's representative has given his/her approval for roofing work.
PART 1 - GENERAL

1.1 SUMMARY

A. Section includes mechanically attached flexible sheet roofing system.

1.2 SUBMITTALS

A. Product Data:

1. Manufacturer's technical data, installation instructions and recommendations for each type of roofing product required
2. Data substantiating that materials comply with requirements
3. Maintenance instructions

A. Shop Drawings: Include roof outline, dimensions, penetrations, insulation type and thickness, piece layout, parapet size and location, and other information that may affect the suitability and installation of the roofing system.

1. Calculations for wind load design shall be sealed and signed by a Professional Engineer in the State of Florida verifying compliance with ASCE 7-98
2. Submit laboratory test report showing roof assembly compliance with SSTD 12-99.

B. Copy of draft warranties

C. Pre-Roofing Conference minutes

D. Mock-up

E. Manufacturer’s Inspection Reports

Final Statement of Compliance: Submit to the Architect, addressed to the School District of Osceola County.
1.3 QUALITY ASSURANCE

A. The Roofing Contractor shall obtain from the roofing manufacturer copies of each roof inspection and furnish a copy to the Architect. The Contractor shall inform the roofing manufacturer, with regard to warranties, that warranties shall be issued, based upon the acceptance of the roofing work, and that deficiencies noted on inspection reports have been corrected. The manufacturer shall not refuse or restrict the provisions of its warranty, based upon deficiencies noted on inspection reports, especially any report that may not have been furnished to the Architect. Inspections shall be weekly. The Architect will not approve final payment of roofing work until final and interim inspection reports and warranty are in hand. The Architect's representative shall accompany the manufacturer's inspector and Roofing Installer during final inspection prior to issuing manufacturer's warranty.

1. The roofing manufacturer’s representative shall inspect the roof within one year after the Date of Substantial Completion.

B. Roofing firm (installer) must have at least 5 years successful experience in the type of roofing system specified.

C. A foreman/supervisor with a minimum 3 years experience in the type of roofing specified or the roofing manufacturer's technical field representative shall be present at all times when roofing work is being preformed.

D. Roofing and associated work shall be performed by a single firm called the "Installer" in this Section, so that there will be undivided responsibility for the specified performance of components parts including, but not limited to, the following (even though some parts may be subcontracted to others):

1. Insulation and saddles, Section 07220.
2. Metal flashing and counter flashing in connection with roofing, Section 07600.
3. Prefabricated metal reglets, Section 07600.
4. Provide wood insulation stops, wood nailers, and blocking required for installation of new roof and sheet metal in conformance with requirements of Section 06100.

E. The wind load design shall be based upon the requirements of the Florida Building Code, 2001 revision 2003. Refer to the Structural Drawings for wind Velocity.

F. All roofing materials shall be labeled Class A per ASTM E 108 and shall be certified by a nationally recognized independent testing laboratory.
1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original, unopened containers and rolls with labels intact and legible. Materials having fire resistance classifications shall be delivered to the Project with labels attached as required. Deliver materials in sufficient quantity to allow continuity of work.

B. Product shall be stored indoors or in properly protected areas outdoors to provide continuous protection against wetting and moisture absorption. Emulsion shall be stored in temperature above 40 degrees F.

1. Materials stored outdoors shall be on raised platforms and cover top and sides with waterproofed materials properly tied down. Remove wet products from project site.
2. Handle roll goods as to prevent damage to edge or ends.
3. Provide continuous protection of products during delivery, storage, handling, and application.
4. Do not store roofing materials in concentrated areas of roof deck.

1.5 JOB CONDITIONS

A. Preroofing Conference

1. Prior to the installation of the roofing and associated work meet at the project site with the installer, the installer of each component of associated work, the installers of deck or substrate construction to receive roofing work, the installers of other work in and around roofing that must follow the roofing work (including Mechanical Work, if any), the Architect and other representatives directly concerned with performance of the work, including (where applicable) insurers, test agencies, product manufacturers, governing authorities, and the Owner. Record (by Contractor) the discussions of the conference and the decisions and agreements (or disagreements) reached and furnish a copy of the record to each party attending. Review foreseeable methods and procedures related to roofing work, including, but not necessarily limited to, the following:

a. Review project requirements (Drawings, Specifications and other Contract Documents).

b. Review required submittals, both completed and yet to be completed.

c. Review status of substrate work (not by the roofing installer), including drying, structural loading limitations, and similar considerations.

d. Review availability of materials, tradesmen, equipment, and facilities needed to make progress and avoid delays.
e. Review required inspection, testing, certifying, and accounting procedures.
f. Review weather and forecasted weather conditions, and procedures for coping with unfavorable conditions, including the possibility of temporary roofing.
g. Review regulations concerning code compliance, environmental protection, health, safety, fire, and similar considerations.
h. Review procedures needed for protection of roofing during the remainder of the construction period.
i. Consider each party's extant judgment, as advanced in the interest of successful completion of the work.

B. Weather Condition Limitations

1. Proceed with roofing and associated work only when weather conditions will permit unrestricted use of materials and quality control of the Work being installed, complying with the requirements and with the recommendations of the roofing materials manufacturer.

   a. Proceed only when the Installer is willing to guarantee the work as required and without additional reservations and restrictions.

2. Apply in dry weather on a dry deck only. Where rain or inclement weather occur during application, the Work shall stop and not resume until the weather has cleared and the deck is properly dry.

1.6 ROOF MAINTENANCE MANUAL

A. Roofing membrane manufacturer shall submit a Roof Maintenance and Inspection Manual with warranties and project closeout submittals. (Final payment will not be made until roof maintenance manual is submitted).

B. Roof Maintenance and Inspection Manual shall be bound in a 3 ring binder with name of project, Owner, Architect, and Contractor on front cover.

C. Roof Maintenance and Inspection Manual shall include:

1. Cover letter recommending to the Owner that 2 roof maintenance inspections should be conducted per year.

2. Table of Contents.
3. Visual inspection checklist indicating specific flashings and details to be inspected. Include items such as base flashing seams, reglets and counter flashings, roof edge flashings, roof penetration flashings, roof curb flashings, boot flashings, roof drain areas, parapet wall flashings, copings, roof membrane seams, skylight flashings, etc. Applicable items shall be listed per project.


5. Roof plan indicating penetrations, detail locations, roof drains, and seams.

1.7 WARRANTIES

A. Furnish a written guarantee warranting the roofing insulation and flashing work, including the installation of products furnished by others and installed under this Section of the Work, against defects in materials and workmanship for a period of 2 years from Date of Substantial Completion.

1. Guarantee shall include, but not be limited to, roofing, roof insulation, sheet metal flashings and gravel stops, gutters and downspouts, flexible flashings, expansion joints, control joints, and curbs at roof openings.

2. Guarantee period shall begin on the date of Substantial Completion for the Project or such date that the roof is accepted by the Architect and Owner, if the date is after the date of Substantial Completion.

3. Repairs required, either permanent or temporary, to roofing or roof flashings under this guarantee to keep the roof watertight shall be made within 3 days after notice of the need for repairs. Should the Contractor fail to make such repairs within the time period, the Owner may have such repairs made and charge the cost to the Contractor.

B. In addition to the guarantee above, provide to the Owner a written warranty from the roofing membrane manufacturer, warranting the roofing system membrane, insulation, flashing, walkways, and expansion joint covers against leaks and defects in materials and workmanship for a period of 10 years from the Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 FLEXIBLE SHEET ROOFING SYSTEM

A. Refer to Section (07220) for the description of the roof deck insulation and substrates.

B. Basis of Specification: Flexible sheet roofing system indicated is based on products and installation details as manufactured by Seaman Corp., “FiberTite EIP”.

Div. 7 35 4/10/2015
C. Products of the following manufacturers are also acceptable:

1. Flex International Membrane, Morgantown, PA

2.2 ROOFING MEMBRANE

A. Roofing membrane shall be an ethylene interpolymer (EIP) alloy, reinforced with knitted polyester fabric conforming to the following physical properties:

<table>
<thead>
<tr>
<th>MATERIAL PROPERTY</th>
<th>TEST (UNITS)</th>
<th>METHODS</th>
<th>PRODUCT DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness Minimum</td>
<td>ASTM D-751 (inches)</td>
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<td>.045</td>
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<tr>
<td>Tensile</td>
<td>ASTM D-751 (lbs.)</td>
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<tr>
<td>Strength</td>
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<td>Elongation</td>
<td>ASTM D-751 (%)</td>
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<tr>
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<td>ASTM D-751 (lbs.)</td>
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<td>100</td>
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<tr>
<td>Puncture Resistance</td>
<td>Fed. Std. 101B Method 2031 (lbs.)</td>
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<td>250</td>
</tr>
<tr>
<td>Water Vapor Transmission</td>
<td>ASTM E-96 Proc. A (gm/m2/24 hours)</td>
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<tr>
<td>Water Absorptive 14 days @ 70°F Maximum</td>
<td>ASTM D-471 (%)</td>
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<tr>
<td>Dimensional Stability</td>
<td>ASTM D-1204 (%)</td>
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<tr>
<td>Low Temperature Flexibility</td>
<td>ASTM D-2136 (F)</td>
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<td>-30</td>
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<tr>
<td>Factory Seam Strength</td>
<td>ASTM D-751, Grab Method (%) of Fabric Strength</td>
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<tr>
<td>Shore &quot;A&quot; Hardness</td>
<td>ASTM D-2240</td>
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<tr>
<td>Accelerated Weathering</td>
<td>Carbon Arc with water spray</td>
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<td>5,000 hrs.- no cracking, blistering, or crazing</td>
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<tr>
<td>Hydrostatic Resistance</td>
<td>ASTM D-751 Method A. Proc. 1 (psi)</td>
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<td>500</td>
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<td>Wicking Test Maximum</td>
<td>U.S. Army Natick Test (inches)</td>
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<tr>
<td>Flame Resistance</td>
<td>Mil-C-20696C Type II Class 2</td>
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<td>Pass</td>
</tr>
<tr>
<td>MATERIAL PROPERTY</td>
<td>TEST METHODS</td>
<td>PRODUCT DATA</td>
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</tr>
<tr>
<td>---------------------------</td>
<td>---------------</td>
<td>--------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Oil Resistance</td>
<td>Mil-20696C</td>
<td>No swelling, cracking, or leaking</td>
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</tr>
<tr>
<td>Hydrocarbon Resistance</td>
<td>Mil-C-20696C</td>
<td>No swelling, cracking, or leaking</td>
<td></td>
</tr>
</tbody>
</table>

1. Exposed Face Color: White or cream.
2. Reinforcing Scrim: Polyester, nylon, fiberglass.
3. Membrane shall be manufactured with DuPont Evaloy Kee resin modifiers by DuPont Company, Wilmington, Delaware.
4. Membrane shall be U.L. Class A Rated.

### 2.3 FASTENING DEVICES

A. Membrane attachment shall utilize 2 inch barbed round, hot dipped, galvanized stress plate (Part No. 300). Membrane fastener shall be as listed within manufacturers approved fastener list.

B. Any deviation from the manufacturers approved fastener list shall require written approval from Technical Service Department.

### 2.4 ACCRESSORIES

A. Sealants, Mastics, and Solvents: As supplied or approved by the manufacturer. All sealants, mastics and solvents shall be listed on the Submittal Form. A short description of its use shall also be included.

B. Roof Walkway Materials: Walkways/protection boards shall be as furnished or approved by the Seaman Corporation, FiberTite Division. Contact FiberTite technical department for installation instructions.

C. Expansion Joints: Expansion joints shall be flashed with EIP membrane or prefabricated from neoprene, factory bonded to 26 gauge hot dipped G-90 galvanized or 20 oz. copper metal flashing.

D. Overnight Seal: Maintain a watertight seal during any interruption of roof construction or at the end of each day. Phased construction may not be allowed.

### PART 3 - EXECUTION

### 3.1 INSPECTION OF SURFACES

A. Inspect roof deck surface as to suitability for roofing. Do not proceed with roofing work until unsatisfactory conditions have been corrected.
B. Examine surfaces for inadequate anchorage, low areas that will not drain properly, foreign material, ice, wet insulation, and unevenness or any other defect which would prevent the execution and quality of application of the membrane roofing as specified.

C. Clean all exposed metal surfaces such as pipes, pipe sleeves, drains, duct work, pitch pockets, etc., by removing loose paint, rust and any asphalt or coal tar pitch of any kind. Remove and discard lead sleeves at soil stacks.

3.2 INSTALLATION OF WOOD NAILERS

A. Install treated lumber at the same heights as insulation layer. Wood nailers are to be installed at all perimeters.

B. Nailers shall be installed and anchored in such a manner to resist a force of 75 lb. per linear foot in any direction.

C. Nailers around curbs and expansion joints are required.

3.3 INSTALLATION OF FLEXIBLE SHEET MEMBRANE

A. Quality Control

1. Initiate a QC program to govern all aspects of the installation of the roofing system.
2. Appoint a representative for the daily execution of the QC program which will include but is not limited to the inspection and probing of all heat welding incorporated within the system.
3. If inconsistencies in the quality of the welds are found, all work shall cease until corrective actions are taken to insure the continuity of all field and detail welding.
4. Installation shall follow approved Shop Drawings and manufacturer’s published installation instructions.

B. Paneled Rolls

1. 10 ft., 15 ft., and 20 ft., wide rolls shall be installed snug, but not taut, utilizing chalk lines, and maintaining (good lay flat) characteristics.
2. Adjoining rolls shall overlap the fastened edge a minimum of 4 1/2 inc. maintaining proper roll staggering as to avoid back water seams.
3. Stagger the factory welds so that each weld falls equal distance between the factory welds on adjacent rolls.
C. Non Paneled Rolls

1. When job conditions necessitate the utilization of roll roofing application procedures, follow all standard Manufacturers Written Installation Specifications, in addition to the following:
   a. Install rolls so that rolls overlap 5" to the back line of the underlying, adjacent roll.
   b. Stagger the rolls so that the tails, or roll ends do not line up.

D. Perimeter Sheets

1. A minimum of two perimeter sheets shall be installed, paralleled to all exterior roof perimeters, including parapet walls, expansion joints and other changes in the plane of the deck.
2. Install perimeter sheets square to chalk lines with proper staggering to avoid back water seams.
3. Adjoining rolls shall overlap the fastened edge a minimum of 4 1/2" maintaining proper staggering to avoid back water seams.
4. Additional perimeter sheets may be required at roof perimeters, with a minimum of 24" above the plain of the deck. Consult the Manufacturer for additional perimeter fastening data.

E. Perform pullout testing on all desks not approved by Factory Mutual for mechanical attachment.

1. Attach panels wit patterns established or compliance with ASCE 7.

F. Welding

1. All field seams exceeding 10 ft. in length shall be welded with an approved automatic welder.
2. All field seams must be clean and dry prior to initiating any field welding.
3. Remove foreign materials from the seams (dirt, oil, etc.,) with Acetone, MEK, or approved alternative. Use Clean cotton cloths and allow approximately five minutes for solvents to dissipate before initiating the automatic welder. do not use denim or synthetic rags for cleaning.
4. All welding shall be performed only by qualified personnel to ensure the continuity of the weld.
5. All finished seams shall exhibit a homogeneous bond a minimum of 1 1/2" in width.
G. Inspection

1. Initiate daily inspections of all completed work which shall include, but is not limited to the probing of all field welding with a dull pointed instrument to assure the quality of the application and insure that any equipment or operator deficiencies are immediately resolved.

2. Insure that all aspects of the installation (sheet layout, attachment, welding, flashing details, etc.) are in strict conformance with the most current Manufacturers Specifications and Details.

3. Excessive patching of field seams because of inexperienced or poor workmanship will not be accepted at time of Final Inspection for Warranty.

4. Any deviation from Manufacturers Specifications or details requires written approval from the manufacturer prior to application to avoid any warranty disqualifications.

3.4 FLASHING

A. Clean all vents, pipes, conduits, tubes, walls, and stacks to bare metal. All protrusions must be properly secured to the roof deck with approved fasteners. Remove and discard all lead, pipe and drain flashings. Flash all penetrations according to approved details.

B. Remove all cant strips and loose wall flashings.

C. Flash all curbs, parapets and interior walls in strict accordance with approved details.

D. All flashing shall be totally adhered to approved substrate with FTR #201 mastic applied in sufficient quantity to insure total adhesion.

E. The base flange of all membrane flashing shall extend out on to the plane of the deck, beyond the wood nailer to a maximum width of 8".

F. Vertical flashing shall be terminated no less than 8" above the plane of the deck with approved termination bar or metal cap flashing.

G. Vertical wall flashings terminations shall not exceed 30" without additional, parallel horizontal rows of termination bar between the deck and the termination point of the flashing. Spacing between horizontal rows shall not exceed 24".

H. Complete all inside and outside corner details with membrane as recommended by the manufacturer.
I. Probe all seams with a dull, pointed probe to insure the weld has created a homogeneous bond.

3.5 CORNERS

A. All inside/outside corners shall be installed in strict accordance with details for a complete watertight installation. Non-reinforced membrane, either field fabrication sheets or pre-sized inside/outside corners shall be used.

3.6 PENETRATION ACCESSORIES

A. Install penetration accessories in strict accordance with approved details. Insure penetration accessories have not impeded in any way the working specification of the penetration. (Refer to the related trade for the technical specification).

3.7 FLASHING (METAL)

A. All perimeter edge details are to be fabricated from clad metal or an approved two piece locking system.

B. Insure all fascias are 2" lower than the bottom of the wood nailers.

C. Fasten all metal flashing to wood nailers or approved substrates with approved fasteners 8" O.C.

D. Break and install clad metal in strict accordance with approved details, insuring proper attachment, maintaining 1/2" expansion joints.

E. Solidly weld clad expansion joints with a 5" strip of membrane welded to clad metal (Cover Plates).

3.8 ROOF DRAINS

A. Flash all roof drains in strict accordance with manufacturers roof drain details - Replace all worn parts that may cut the membrane or prevent a watertight seal. Replace all drain bolts or clamps holding the drain compression ring to the drain basin. Unreinforced 60 mil membrane or lead sheet may be used as drain flashing. Lead shall be set in mastic. Lead sheets and drain basins must be free of any asphalt or coal tar pitch residue prior to installation.

3.9 EXPANSION JOINTS

A. Flash all expansion joints in strict accordance with approved details. Fasten all expansion joint material according to specifications. Insure the expansion material has sufficient material to expand to the widest point in expansion without causing undue stress on the expansion joint material.
B. If the expansion joint is a "factory system" insure installation instruction and warranties have been submitted.

3.10 TEMPORARY SEALS

A. At the sign or rain, install temporary watertight seal where the exposed edge of the completed new roofing terminates at the uncovered deck or existing roof surface. If the old roof surface is covered with slag; spud back an area 6" from where the membrane will be sealed to the deck. Use a sufficient size strip of membrane or tape to bridge the new membrane and the roof deck. If using membrane, the strip must be welded to the new roofing membrane and cemented to the cleaned roof deck.

B. Prior to the commencement of work, remove all temporary seals if they will cause a water dam and any exposed roof cement if used. Do Not Track Roof Cements Onto The Roof Membrane.

C. All new materials shall be sealed from moisture intrusion at the end of each day. Phased construction is not allowed.

3.11 INSTALLATION OF WALKWAY PADS

A. Consult manufacturer for walkway installation procedures.

3.12 CLEAN-UP

A. Remove masking, protection, equipment, materials, and debris from the work and storage areas and leave areas in an undamaged and acceptable condition.

3.13 MANUFACTURER'S INSPECTION

A. Upon completion of the Work and prior to final payment, the membrane manufacturer’s representative, in the presence of the Owner, Architect, and Construction Manager shall inspect the Work. Discrepancies shall be recorded and immediately rectified. Final payment will not be issued until the manufacturer's representative has give his approval for the Work.

3.14 TECHNICIANS TRAINING

A. Prior to the Date of Substantial Completion, hold a training secession for the Owners Roofing Technicians to certify them to perform warranty repairs and modifications for subsequent penetrations.
07536 - Roofing “Special Treatment”

Architect/Engineers General Terms and Conditions for roofing is included in Appendix L.

07631 - Gutters and Downspouts

Where gutters and downspouts are used, the hangers, straps and shoes should be completely detailed and/or described. Gutters and downspouts should be held 1” from the building wall to allow air to circulate between gutter/downspout and wall surface.

07900 - Joint Sealants

Specify that this work be done by experienced mechanics. Ensure the highest quality of sealants be used for each individual application. There is no substitute for life-cycle costs in a sealant product. All sealants shall have a minimum of 15 years manufacturer’s warranty or ASTM C920 or latest edition.
08100 - Requirements for Fire Rated Glazing
Compliant with FBC, Latest Edition

60 Minute Walls:

- 20 Minute Rated Doors
- Safety Glazing, Category II
- Wireless
- Individually labeled for Safety and Fire Rating
- Glazing Exempt from Hose Stream Endurance testing
- Basis-of-Design, TGP’s Fireglass 20

- 45 Minute Rated Borrowed Lites
- Sidelites, Transoms, individually “Punched Openings”
- Safety Glazing, Category II, all locations
- Individually labeled for Safety and Fire Rating
- MUST have Hose Stream Endurance Testing
- ¾” Laminated low-iron glass w/intumescent
- Basis-of-Design, TGP’s Pyrostop

120 Minute Walls:

- 90 Minute Rated Doors and Borrowed Lites
- Safety Glazing, Category II
- Wireless
- Individually Labeled for Safety and Fire Rating
- MUST have Hose Stream Endurance Testing
- Basis-of-Design, TGP’s Firelite Plus

Fire Rated Framing:

- Must not exceed 120 Square Feet in surface area
- No lineal greater than 144” in length
- Exceptions only “as tested.”
SECTION 08110 – HOLLOW METAL

Substitutions or Alternates not permitted unless noted below.

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Preferred Manufacturer and Catalog Series</th>
<th>Acceptable Alternative Manufacturers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hollow Metal Frames</td>
<td>Curries</td>
<td>M Series</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ceo SU Series</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Steelcraft F Series</td>
</tr>
</tbody>
</table>

Product Notes and Applications:

Interior Frames:
Profile: Varies
Gauge: 14 @ all openings (But will accept 16 Gauge @ Openings 2’6” and smaller
Steel: Cold-rolled steel @ Interior Openings
Welding: Continuous face welded, dressed and ground smooth, prime paint

Exterior Frames:
Profile: Varies
Gauge: 14
Steel: A60 galvanized @ Exterior Openings
Welding: Continuous face welded, dressed and ground smooth, prime paint

- Frames shall include shipping bar at bottom to insure frame integrity during shipping. All shipping bars shall be removed prior to frame installation. Install frames per manufacturers and SDI (Steel Door Institute) standards and instructions.
- Fire rated frames require metal applied label indicating rating designation.
- Reinforce frames for surface mounted hardware and cut-out, drilled and tapped to receive mortised hardware.
- Electrified Openings: Doors shall be pre-wired with sufficient number of concealed wires to accommodate electric function of specified hardware. Provide Molex type standardized plug in connectors to accommodate up to twelve wires.
- All Door Openings 3’4” wide and larger are to have a “High Frequency” type extra reinforcement applied to the top hinge prep/reinforcement.
SECTION 08110 – HOLLOW METAL

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<table>
<thead>
<tr>
<th>Item Description</th>
<th>Preferred Manufacturer and Catalog Series</th>
<th>Acceptable Alternative Manufacturers</th>
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<tbody>
<tr>
<td>Hollow Metal Doors</td>
<td>Curries</td>
<td>707 Series</td>
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<tr>
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<td>747 Series</td>
</tr>
<tr>
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<td>CECO</td>
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<td>Regent/Medallion</td>
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<td>Steelcraft</td>
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<tr>
<td></td>
<td></td>
<td>L &amp; B Series</td>
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</tbody>
</table>

Product Notes and Applications:

Interior Doors:
Series: 707N
Gauge: 18
Steel: Cold-rolled
Edges: Seamless - tack weld, grind smooth, fill and touch-up paint

Exterior Doors:
Series: 747N with Insulating Type Core
Gauge: 16 gauge
Steel: A60 galvanized
Edges: Seamless - tack weld, grind smooth, fill and touch-up paint

- Fire rated doors require metal applied label indicating rating designation.
- Doors shall be internally reinforced for surface mounted hardware and cut-out, drilled and tapped to receive mortised hardware.
- Electrified Openings: Doors shall be pre-wired with sufficient number of concealed wires to accommodate electric function of specified hardware. Provide Molex type standardized plug in connectors to accommodate up to twelve wires.
SECTION 08210 – Wood Door

Substitutions or Alternates not permitted unless noted below.

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Preferred Manufacturer and Catalog Series</th>
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<tbody>
<tr>
<td>Wood Doors</td>
<td>Graham</td>
<td>Marshfield</td>
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<td></td>
<td>GPD PC Series</td>
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</tr>
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<td></td>
<td>GPD FD 45</td>
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<tr>
<td></td>
<td>GPD FD 60</td>
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<tr>
<td></td>
<td>GPD FD 90</td>
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</tbody>
</table>

**Product Notes and Applications:**

Construction: Manufacturers Standard

Core: Particleboard @ non-rated and 20-minute rated openings

Mineral @ 45, 60 and 90-minute rated openings

Face veneer: Plain Sliced Red Oak

Edges: Same as face veneer

Matching: Pairs within the same opening

Warranty: Lifetime of installation

- Pre-fit for opening size and pre-machine for hardware as specified.
- Fire rated doors require metal applied label indicating rating designation.
- Doors shall be internally reinforced (Blocking) for attachment of hardware without the use of through bolts at all Mineral Core fire rated doors.
- Electrified Openings: Doors shall be pre-wired with sufficient number of concealed wires to accommodate electric function of specified hardware. Provide Molex type standardized plug in connectors to accommodate up to twelve wires.
08500 - Metal Windows

**General**

Consideration should be given to the provision of operable windows as a means of ventilation in the event air-conditioning equipment is not in operation. Consideration should also be given to the use of double panes (thermopane) with outer shield of solar glass especially if window area exceeds 3% of wall area. Glass should be installed so it can be cleaned from the inside of the building. Operable windows shall be provided with positive locking dances.

Consideration shall be given to all metal windows having dual pane glass and thermal break-insulation filled frames.

All classroom windows, unless otherwise advised by the District Project Manager, shall be equipped with audiovisual blinds or acceptable window coverings.

Guardrails will be necessary at all full height glass panels in accordance with applicable codes.
SECTION 08710 – Door Hardware

Substitutions or Alternates not permitted unless noted below.

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Preferred Manufacturer and Catalog Series</th>
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</thead>
<tbody>
<tr>
<td>Butt Hinges</td>
<td>Hager BB1279 BB1191 BB1168 BB1199</td>
<td>Stanley FBB179 McKinney TA2714</td>
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<td>Stanley FBB191 McKinney TA2314</td>
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<td>Stanley FBB168 McKinney T4A3786</td>
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<tr>
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<td>Stanley FBB199 McKinney T4A3386</td>
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</tbody>
</table>

**Product Notes and Applications:**

- Interior wood doors.
- Interior hollow metal doors.
- Out swinging lockable doors shall have NRP hinges.
- Width of hinges shall be sufficient to clear trim and wall conditions as shown on the drawings.
- Size: 4 ½” x 4 1/2” for doors up to 3’-0” in width, 5” x 4 ½” for doors over 3’-0” in width. Provide approved continuous hinges at high traffic door locations.
- *Electric Hinges: Provide sufficient number of concealed wires to accommodate electric function of specified hardware. Locate electric hinge at center location. Provide mortar guard for each electric hinge specified. Provide Molex type standardized plug in connectors to accommodate up to twelve wires.
- *All exterior doors, gymnasium and, cafeteria doors to use full mortise continuous hinges. See continuous hinge page.
SECTION 08710 – Door Hardware

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<th>Item Description</th>
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<tbody>
<tr>
<td>Continuous Hinges</td>
<td>McKinney MCK 25HD</td>
<td>Roton 780-224HD</td>
</tr>
</tbody>
</table>

**Product notes and applications:**
- All exterior doors, gymnasium and cafeteria doors must use full mortise continuous hinges.
- Hinges shall be full door height less ½” for clearance.
- All hinges shall be Full Mortise “gear type”.
- Aluminum is the base for material of hinges.

*Electrified Hinge: Provide sufficient number of concealed wires to accommodate electric function of specified hardware. Provide Molex type standardized plug in connectors to accommodate up to twelve wires.

<table>
<thead>
<tr>
<th>Item Description</th>
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<th>Acceptable Alternative Manufacturers</th>
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<tbody>
<tr>
<td>Pivots &amp; Floor Closers</td>
<td>LCN</td>
<td>Door-O-Matic</td>
</tr>
</tbody>
</table>

**Product notes and applications:**
- Pivots and floor closers are not accepted by SDOC
SECTION 08710 – Door Hardware

Substitutions or Alternates not permitted unless noted below.

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Preferred Manufacturer and Catalog Series</th>
<th>Acceptable Alternative Manufacturers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Transfers</td>
<td>Von Duprin</td>
<td>Locknetics</td>
</tr>
</tbody>
</table>

Product notes and applications:
- All door hardware will require the hinges to transfer the power to electrified hardware items. See hinge description for further details.

SECTION 08710 – Door Hardware

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<table>
<thead>
<tr>
<th>Item Description</th>
<th>Preferred Manufacturer and Catalog Series</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Flush Bolts</td>
<td>Ives</td>
<td>McKinney</td>
</tr>
<tr>
<td></td>
<td>FB 458 Series Manual Flush Bolts</td>
<td>McKinney</td>
</tr>
<tr>
<td></td>
<td>FB 41 / 42 Series Automatic Flush Bolts</td>
<td>McKinney</td>
</tr>
<tr>
<td></td>
<td>DP1 Series Dust Proof Strike</td>
<td>DP1 Series Dust Proof Strike</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Glynn Johnson</td>
</tr>
</tbody>
</table>
Product notes and applications:

- Manual flush bolts as necessary for code compliance. Install with dust proof strike.
- Provide extended top rod for oversized doors when using manual flush bolts.
- Automatic flush bolts are not approved by SDOC unless required under NFPA80 regulations.
SECTION 08710 – Door Hardware

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<table>
<thead>
<tr>
<th>Item Description</th>
<th>Preferred Manufacturer and Catalog Series</th>
<th>Acceptable Alternative Manufacturers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cylinders and Keying</td>
<td>Corbin-Russwin</td>
<td>SDOC – GGM System</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NONE</td>
</tr>
</tbody>
</table>

Product notes and applications:

- All Locks to have 6 Pin D or H series Cylinders or Cores.
- Key blanks shall be supplied with Corbin Russwin factory stamped or coined “Do Not Duplicate”
- All cylinders and keys shall be furnished with Visual Key Control.
- Cylinders shall be an integral part of the locks as manufactured by specified lock supplier. Substitution of foreign made cylinders or components will not be allowed and also will be cause for rejection of supplier.

SECTION 08710 – Door Hardware

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<table>
<thead>
<tr>
<th>Item Description</th>
<th>Preferred Manufacturer and Catalog Series</th>
<th>Acceptable Alternative Manufacturers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortise Locksets</td>
<td>Corbin-Russwin</td>
<td>ML2000 Series x NSA trim design</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sergeant 8200</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Schlage L9000</td>
</tr>
</tbody>
</table>
Product notes and applications:

- Exterior Openings may require a Mortise lockset to meet or exceed any windstorm requirements by the Hollow Metal Door/Frame supplier.
- Install custom strikes to match existing frame preparations when new lock is scheduled to be installed in existing frame. Existing frames to be modified to accept new custom strikes.
- Cylindrical locks shall be compatible with SDOC’s removable core key system requirements.
- Locking Function Descriptions

**Mortise Type**

<table>
<thead>
<tr>
<th>Mortise Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>ML 2010 – NSA - Passage Function</td>
</tr>
<tr>
<td>ML 2060 – NSA - Privacy Function</td>
</tr>
<tr>
<td>ML 2057 – NSA - Storeroom Function</td>
</tr>
<tr>
<td>ML 2052 – NSA - Security Classroom Function</td>
</tr>
<tr>
<td>ML 2051 – NSA - Office Function</td>
</tr>
</tbody>
</table>

**SECTION 08710 – Door Hardware**

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<tr>
<th>Item Description</th>
<th>Preferred Manufacturer and Catalog Series</th>
<th>Acceptable Alternative Manufacturers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cylindrical Locksets</td>
<td><strong>Corbin-Russwin</strong> CL 3300 Series x NZD trim design</td>
<td><strong>Sergeant</strong> 10 Line&lt;br&gt;<strong>Schlage</strong> D Series</td>
</tr>
</tbody>
</table>
Product notes and applications:

- These are to be used for all Interior Openings. Plus, any Exterior Openings that don’t require a Mortise lockset to meet or exceed any windstorm requirements by the Hollow Metal Door/Frame supplier.
- Install custom strikes to match existing frame preparations when new lock is scheduled to be installed in existing frame. Existing frames to be modified to accept new custom strikes.
- Cylindrical locks shall be compatible with SDOC’s removable core key system requirements.
- Locking Function Descriptions

**Mortise Type**

- CL 3310 – NZD - Passage Function
- CL 3320 – NZD - Privacy Function
- CL 3357 – NZD - Storeroom Function
- CL 3352 – NZD - Security Classroom Function
- CL 3351 – NZD - Office Function

**SECTION 08710 – Door Hardware**

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<th>Item Description</th>
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<th>Acceptable Alternative Manufacturers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Padlocks</td>
<td>Corbin-Russwin</td>
<td>PL 5070-258</td>
</tr>
</tbody>
</table>
Product notes and applications:

- Padlocks are to be used at all door types that require a locking function but are not standard type Man Doors (Hollow Metal/Wood/Aluminum).
- Cylindrical locks shall be compatible with SDOC’s removable core key system requirements.
  * Doors may include Overhead, Chain Link, Shutter Type Openings

SECTION 08710 – Door Hardware

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<tr>
<th>Item Description</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Keypad Locksets</td>
<td>Corbin-Russwin Access 800</td>
<td>Schlage</td>
</tr>
</tbody>
</table>

Product notes and applications:

- These are to be used in the event a stand alone access control lock is required.
- Install custom strikes to match existing frame preparations when new lock is scheduled to be installed in existing frame. Existing frames to be modified to accept new custom strikes.
- Locking Function Descriptions
**SECTION 08710 – Door Hardware**

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<tr>
<th>Item Description</th>
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<th>Acceptable Alternative Manufacturers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric Strikes</td>
<td><strong>Von Duprin</strong></td>
<td>Locknetics Folger Adam</td>
</tr>
</tbody>
</table>

- Provide sufficient number of concealed wires to accommodate electric function of specified hardware. Provide Molex type standardized plug in connectors to accommodate up to six wires.

**SECTION 08710 – Door Hardware**

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<tr>
<th>Item Description</th>
<th>Preferred Manufacturer and Catalog Series</th>
<th>Acceptable Alternative Manufacturers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exit Devices</td>
<td><strong>Corbin-Russwin</strong></td>
<td>ED 5000 Series x N9 Trim Design Von Duprin 98 Series 32D Yale 7000 Series</td>
</tr>
</tbody>
</table>
Product notes and applications:

- Exit devices shall be heavy duty cold forged steel construction and all finished parts shall be of stainless steel construction.
- Provide ED 5000 Series exit devices with US 32D for all applications
- Single doors: Use rim exit device as required
- Pairs of doors: Use double rim type devices by a non keyed mullion at all pair openings.
- Cross corridor doors / Interior: Use surface vertical rod exit devices, less bottom rod as preferred securing device.
- Exit device cylinder dogging is the preferred method of dogging devices. Only provide dogging with all non-rated devices.
SECTION 08710 – Door Hardware

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<th>Item Description</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Removable Mullions</td>
<td>Corbin-Russwin 900 Series</td>
<td>Von Duprin</td>
</tr>
</tbody>
</table>

Product notes and applications:

- Types: Only provide removable type WITHOUT use of a Cylinder.
- Provide multi wire Molex connectors when electric or monitor strikes are used. This allows mullion removal without damaging electrical connections.
- Preferred method of securing most pairs of doors when using rim exit devices.
- Examples:
  
  7’ Door Height = 907 + with UL Rating = 907A  
  8’ Door Height = 908 + with UL Rating = 908A

SECTION 08710 – Door Hardware

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<tr>
<th>Item Description</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Push/Pulls</td>
<td>McKinney</td>
<td>Rockwood</td>
</tr>
<tr>
<td></td>
<td>P055 Series Push Plates</td>
<td>70 Series Push Plates</td>
</tr>
<tr>
<td></td>
<td>DP503 Series Door Pulls</td>
<td>106 x 70 Series Door Pulls</td>
</tr>
<tr>
<td></td>
<td>PB812 Series Push/Pull Bars</td>
<td>BF15847 Series Push/Pull Bars</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ives</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8200 Series Push Plates</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8300 Series Door Pulls</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9100 Series Push/Pull Bars</td>
</tr>
</tbody>
</table>
Product notes and applications:

- Mounting methods to be concealed type wherever possible.
- Provide decorative thru bolts at free ends of push / pull bars and pulls when used with exit devices.
- Push plate size: 4” x 16” minimum, except when limited by door stile.
- Acceptable materials: Stainless Steel

SECTION 08710 – Door Hardware

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<tr>
<th>Item Description</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Coordinators</td>
<td>Ives</td>
<td>COR Series</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Glynn Johnson</td>
</tr>
<tr>
<td></td>
<td></td>
<td>COR Series</td>
</tr>
</tbody>
</table>

Product notes and applications:

- Provide filler bars for total opening width, closer mounting brackets, carry bars, and special preparation for top latches where applicable.

SECTION 08710 – Door Hardware

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<tr>
<th>Item Description</th>
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</thead>
<tbody>
<tr>
<td>Door Closers</td>
<td>Corbin-Russwin</td>
<td>DC 6000 Series</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Norton 7500 Series</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LCN 4040 Series</td>
</tr>
</tbody>
</table>
Product notes and applications:

- Closers shall have non-ferrous covers, heavy duty forged steel arms, and separate valves for adjusting backcheck, delayed action, closing and latching cycles and adjustable spring to provide sizes 1 through 6.
- Provide non-sized closers, adjustable to meet maximum opening force requirements of ADA.
- Provide drop plates, brackets, or adapters for arms as required to suit details.
- Mount closers on room side of corridor doors and inside of exterior doors. Where possible install closers on door for optimum aesthetics.
- Standard hold open arms are preferred where required. Avoid using PSH or CPSH arms on interior openings. No track arm type closers are acceptable.
- Steel through bolts are mandatory on all wood door applications.
- For metal door applications the factory machine screws shall be drilled and tapped.
- A special SRI finish is required at all Exterior Gate type doors.

SECTION 08710 – Door Hardware

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<th>Item Description</th>
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<th>Acceptable Alternative Manufacturers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Energy Operators</td>
<td>Dorma</td>
<td>Norton</td>
</tr>
</tbody>
</table>

Product notes and applications:

- Provide wall-mounted actuator switches by the same manufacturer as the operator. Provide weather-resistant types at exterior applications. Locate in accordance with ANSI A117.1.
- Conform to ANSI/BHMA standard A156.19 and meet UL requirements for fire rated openings.
SECTION 08710 – Door Hardware

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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Door &amp; Frame Protection</td>
<td>Ives</td>
<td>Kick Plates</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Door Edge Guards</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jamb Guards</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rockwood</td>
</tr>
<tr>
<td></td>
<td></td>
<td>McKinney</td>
</tr>
</tbody>
</table>

Product notes and applications:

- Size: Kick plates 10” high, Mop plates 6” high, Armor plates 36” high.
- Width: 2” less door width (LDW) at single doors when mounted on push side. 1” LDW at pairs and when mounted on pull side.
- Material: Stainless Steel minimum .050 Thickness

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<tr>
<th>Item Description</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Overhead Stops / Holders</td>
<td>Glynn Johnson</td>
<td>90 Series</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100 Series</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rixson</td>
</tr>
<tr>
<td></td>
<td></td>
<td>#9 Series</td>
</tr>
<tr>
<td></td>
<td></td>
<td>#1 Series</td>
</tr>
</tbody>
</table>
Product notes and applications:

- Install overhead stops where conditions limit the use of wall stops and floor stops would be a tripping hazard.
- Use special template closers to allow offset arms for surface applied stops.
- Finishes are to be as follows:
  1) Interior Doors to have 26D or 652 finish (no sprayed finish)
  2) Exterior Doors to have 32D or 630 finish (no sprayed finish)

SECTION 08710 – Door Hardware

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<th>Item Description</th>
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</thead>
<tbody>
<tr>
<td>Wall and Floor Stops</td>
<td>Ives</td>
<td>Rockwood</td>
</tr>
<tr>
<td></td>
<td>WS401 Series Wall Stop</td>
<td>400 Series Wall Stop</td>
</tr>
<tr>
<td></td>
<td>FS441 Series Floor Stop</td>
<td>441 Series Floor Stop</td>
</tr>
<tr>
<td></td>
<td>FS446 Series Stop/Holder</td>
<td>490 Series Door Stop/Holder</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Glynn Johnson</td>
</tr>
</tbody>
</table>

Product notes and applications:

- All stops shall be cast. Wrought stops are not acceptable.
SECTION 08710 – Door Hardware

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<th>Item Description</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Magnetic Holders</td>
<td>LCN</td>
<td>Rixson FM-990 Series</td>
</tr>
<tr>
<td></td>
<td>SEM 7800 Series</td>
<td>Door-O-Matic</td>
</tr>
</tbody>
</table>

Product notes and applications:
- Wired to release upon activation of fire alarm. Verify required voltage.

SECTION 08710 – Door Hardware

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<th>Item Description</th>
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</thead>
<tbody>
<tr>
<td>Thresholds and Gasketing</td>
<td>National Guard 896 Series Stop Threshold</td>
<td>Pemko 2005 T Series Stop Threshold</td>
</tr>
<tr>
<td></td>
<td>5050 Series Smoke Gasket</td>
<td>S88D Series Smoke Gasket</td>
</tr>
<tr>
<td></td>
<td>9600 Series Door Sweep</td>
<td>18062CNB Series Door Sweep</td>
</tr>
<tr>
<td></td>
<td>16A Series Rain Drip</td>
<td>346C Series Rain Drip</td>
</tr>
<tr>
<td></td>
<td></td>
<td>McKinney MCK2005 Series Stop Threshold</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MCKS88 Series Smoke Gasket</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MCK18062 Series Door Sweep</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MCK346 Series Rain Drip</td>
</tr>
</tbody>
</table>
SECTION 08710 – Door Hardware

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<tbody>
<tr>
<td>Key Cabinet</td>
<td>Lund</td>
<td>KEY Control</td>
</tr>
</tbody>
</table>

Product notes and applications:

- Provide wall mounted key cabinet with one hook for each lock or cylinder plus an additional 50 percent expansion.
- Key cabinet shall be set up and indexed ready for owner’s use.
SECTION 08710 – Door Hardware

Substitutions or Alternates not permitted unless noted below.

School District Keying Procedures and Standards

All Keying schedules are to be reviewed and approved by the State Russwin/Corbin Representative prior to ordering of and installation of all locking hardware.

Keying Scheme Abbreviations:
SDOC-School District of Osceola County
GGM-County Great Grand Master
GM-Grand Master/School Master
M-Master/Building Master
CK-Change Key/Room Key
MECH-All Mechanical Rooms
KGM-Kitchen, Grand Master (all kitchens)
KM-Individual Kitchen Master
CTRL-County Control Key

A. Schools to be keyed under the SDOC GGM System
B. All locks to have Russwin 6pin D or H series cylinders/cores. To be determined by SDOC Locksmith.
C. Schools to be keyed to a master key (GM) Corbin Russwin to determine. Each building will have individual master (M). Each classroom will have a (CK) change key.
D. Mechanical Rooms shall be keyed to the (GGM,GM) and the county issued (MECH) mechanical key.
E. The kitchen shall be keyed separate from the school master utilizing bittings determined by the SDOC Locksmith. The kitchen needs to be keyed under SDOC GGM, KGM KM. To be keyed under SDOC GGM, KGM KGM. Back door needs to have a (CK) change key for deliveries. Uncombined cores are to be supplied for the kitchen areas.
F. 5-(M) building masters are required.
G. 12-(GM) keys are required.
H. 3-(CK) keys per lockset.
I. No (GGM, KM or CTRL) keys are to be cut or issued.
J. All IDF/MDF rooms are to be keyed to GGM, GM, and MECH.
K. All Gates Keyed GGM, GM, MECH, & CK – Qty of 50 Change Key’s
L. 200 Extra blanks – factory stamped “Do Not Duplicate” required.
M. 2 copies of bitting list supplied to SDOC Maintenance Department.
SECTION 08710 – DOOR HARDWARE

Substitutions or Alternates not permitted unless noted below.

**FINISHES AND BASE MATERIALS:**

A. **BASE METALS:** Produce door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18 for finishes.

B. **FINISHES:** *Verify requirements for individual projects*

1. Standard: Comply with BHMA A156.18.
2. BHMA Designations: Comply with base material and finish requirements indicated by the following:
   a. BHMA 600 (USP): Primed for painting, over steel base metal.
   b. BHMA 626 (US26D): Satin chromium plated over nickel, over brass or bronze base metal.
   e. BHMA 652 (US26D): Satin chromium plated over nickel, over steel base metal.
   f. BHMA 689 (ALUM): Aluminum painted, over any base metal.
C. FINISH SCHEDULE:

<table>
<thead>
<tr>
<th>HARDWARE ITEM</th>
<th>FINISH AND BASE MATERIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Exterior Butt Hinges:</td>
<td>BHMA 626 (US26D)</td>
</tr>
<tr>
<td>2. Interior Butt Hinges:</td>
<td>BHMA 652 (US26D)</td>
</tr>
<tr>
<td>3. Continuous Gear Hinges:</td>
<td>BHMA 628 (US28)</td>
</tr>
<tr>
<td>4. Pivot Sets:</td>
<td>BHMA 626 (US26D)</td>
</tr>
<tr>
<td>5. Flush Bolts:</td>
<td>BHMA 626 (US26D)</td>
</tr>
<tr>
<td>6. Locks and Latches:</td>
<td>BHMA 626 (US26D)</td>
</tr>
<tr>
<td>7. Cylinders:</td>
<td>BHMA 626 (US26D)</td>
</tr>
<tr>
<td>8. Exit Devices</td>
<td>BHMA 630 (US32D)</td>
</tr>
<tr>
<td>9. Removable Mullions</td>
<td>BHMA 600 (USP)</td>
</tr>
<tr>
<td>10. Push / Pulls:</td>
<td>BHMA 630 (US32D)</td>
</tr>
<tr>
<td>11. Coordinators:</td>
<td>BHMA 600 (USP)</td>
</tr>
<tr>
<td>12. Closers:</td>
<td>BHMA 689 (ALUM)</td>
</tr>
<tr>
<td>13. Automatic Operators:</td>
<td>BHMA 689 (ALUM)</td>
</tr>
<tr>
<td>14. Protection Plates:</td>
<td>BHMA 630 (US32D)</td>
</tr>
<tr>
<td>15. Overhead Stops / Holders:</td>
<td>BHMA 626 (US26D)</td>
</tr>
<tr>
<td>16. Wall and Floor Stops:</td>
<td>BHMA 626 (US26D)</td>
</tr>
<tr>
<td>17. Magnetic Holders:</td>
<td>BHMA 628 (US28)</td>
</tr>
<tr>
<td>18. Thresholds and Gasketing:</td>
<td>BHMA 628 (US28)</td>
</tr>
<tr>
<td>19. Key Cabinet:</td>
<td>BHMA 600 (USP)</td>
</tr>
<tr>
<td>20. Electric Strikes:</td>
<td>BHMA 630 (US32D)</td>
</tr>
</tbody>
</table>
PART 1 - GENERAL

1.1 SUMMARY

A. Provide labor, materials, and equipment necessary to furnish and install automatic door operators as shown on the Drawings and as specified herein. The automatic door operator shall consist of the following major components:

1. Power operator
2. Flush wall switch, interior and exterior

1.2 QUALITY ASSURANCE

A. Automatic door operator shall comply with the requirements of ANSI Standard A117.1. Providing accessibility and usability for physically handicapped people.

B. Automatic entrances shall comply with American National Standard for power operated doors, ANSI A156.10. Provide custom designed installation utilizing slow opening, low powered automatic doors as described in paragraph 1.1.1 of ANSI A156.10, not opening to back check faster than 3 seconds and requiring no more than 15 lbf to stop door movement.

C. Manufacturer: Provide units produced by a firm with not less than 5 years successful experience in the fabrication of automatic door operator units of the type required for this Project.

PART 2 - PRODUCTS

2.1 MANUFACTURER AND OPERATOR TYPE

A. Basis of Design: "Senior-Swing" by Dor-O-Matic Division, Republic Industries, Inc., Harwood Heights, Illinois.

B. Products of the following manufacturer's are acceptable, providing their products equal or exceed the quality specified, and they can provide products of the type, size, function, and arrangement required.

1. Horton Automatics, Corpus Christi, Texas
2. Besam Inc., East Windsor, New Jersey
3. Norton Door Controls, Charlotte, North Carolina
C. Provide materials and equipment necessary for the proper installation of a surface applied "Senior Swing" handicap low energy power operated door system.

1. Unit shall be completely electromechanical with micro compressor control requiring no micro switches on the operator.
2. In the handicap mode, the activating switch, on either side of the door, shall open the door slowly to back check (80 degrees) in 3 to 6 seconds and to fully open position in 4 to 7 seconds. The door shall remain open 5 to 30 seconds. After the time delay, the door will close from 90 degrees to 10 degrees in 3 to 6 seconds and from 10 degrees to full closed in 1-1/2 to 2 seconds. The power boost feature shall increase the closing force from 6 lbf to 15 lbf against wind pressure. Manual opening force shall not exceed 15lbf. Control box and motor/gear box shall be contained in a full door width extruded aluminum housing, 4-1/2 inches wide by 5-3/4 inches high, designed for surface applied, interior application.
3. Operator in no activated mode shall be manual with no push-n-go feature.
4. Activation Switches: Low voltage, stainless steel wall mount type. Exterior shall a custom unit to be post mounted on an electrified bollard. Switches shall be wired to operating unit. (No RF switches required).
5. Provide door decals visible from either side, instructing the user as to the operation and function of the door.
6. Door operator shall be installed on stop side of doors. Provide mounting plates, angles, and brackets as required.

D. Finish: Match aluminum door and frame finish.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine the doors and frames for which automatic door operators are to be installed.
B. Install automatic door operators in strict accordance with manufacturer's instructions.
C. Automatic door operators shall be installed as a complete system with peripheral items and concealed wiring as required.
D. Coordinate the time delay setting for holding the door open with the Owner’s representative.
3.2 ADJUST AND CLEAN

A. Clean aluminum surfaces and adjacent area. Remove excess dirt and other substances.

B. Demonstrate operation and maintenance of operator and peripheral items to the Owner.

END OF SECTION 08720
08800 - Glazing

The types of glass and location should be indicated on the drawings or in the specifications as follows:

Assign a “type number” to each type of glass being used on the job;

Void lengthy descriptions of the glass on the drawings, merely locating each by the simple note, “glass type 1”, “glass type 2”, etc.

Precisely define each of the glass types in the specifications.

Use obscure glass in toilet and bathroom windows.

Window glass should be replaceable from inside the building wherever feasible.

Future replacement of glass

Windows should be glazed in the closed position and left closed for several weeks. This applies particularly to awning or projected types.

Safety glass shall be used in all hazardous locations to comply with Life Safety Code, etc.
SECTION THREE
DIVISION 9 - FINISHES

09200 - Lath and Plaster

09260 – Gypsum Board Assemblies

PART 1 - GENERAL

1.1 SUMMARY:
A. The purpose of this standard is to identify the metal studs used for interior non-load-bearing gypsum board partitions. The partitions are lightweight, fire and sound resistant assemblies that consist of gypsum panels that are screw attached to the steel framing.

1.2 RELATED DOCUMENTS:
A. DGM 09261 Abuse Resistant Gypsum Wall Board
B. Underwriters Laboratories Inc.: Fire Resistance-Rated Assemblies indicated by design designations.

1.3 REFERENCES
A. Florida Building Code (FBC)
   www.sbcci.org/floridacodes.htm
B. State Requirements for Educational Facilities (SREF)
   Chapter 423 of FBC
   www.sbcci.org/Florida%20Building%20Code/changed/ch-4/Sec%20423.pdf
D. United States Gypsum Company SA923.

E. STC Ratings: Sound Transmission Characteristics measured in accordance with ASTM E 90-90.

1.4 QUALITY ASSURANCE

A. Contractor Qualifications: Employ only experienced Contractors (Installers) skilled in the successful installation of the specified materials and assemblies on similar projects for a minimum of five (5) years. Installers shall be state-certified or licensed Sub-Contractors, or locally registered Sub-Contractors in Osceola County, Florida.

B. Manufacturer Qualifications: Employ only manufacturers with at least five (5) years experience making the specified materials as a current catalog and regular production item.

   1. Verify that Shop Drawings have been successfully submitted, reviewed and returned before installation of metal framing.

C. Source Limitations: Unless specifically noted otherwise, provide products of the same manufacturer for each type of unit specified. This includes studs, channels, rails, brackets, bridging and fasteners.

1.5 DELIVERY STORAGE AND HANDLING

A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer.

B. Store materials in original packing or shipping crates, on pallets, inside a roofed structure, out of the weather and free of moisture.

1.6 SUBMITTALS

A. Manufacturer’s Product Data sheets shall be required for each item specified.

B. Shop Drawings shall be submitted for each building material named in this standard.

C. Samples and a request for substitution shall are required for non-specified manufacturer’s products submitted for approval as a Substitution.

1.7 WARRANTY

A. Project Warranty shall be as stated in Division 1 of the Specifications.

B. Installer’s Warranty

   1. The metal stud contractor shall agree to repair or replace components of the wall system that fail in materials or workmanship within the specified warranty period.
C. Unless otherwise stated in this Guideline, duration of all warranties shall begin on the date of Substantial Completion.

PART 2 - PRODUCT SYSTEM

2.1 ACCEPTABLE MANUFACTURERS AND SPECIFIC PRODUCTS

A. Steel Framing and Furring:
   1. National Gypsum Company.
   2. Unimast, Inc.
   3. Clark Steel Framing Systems.
   4. Dietrich Industries, Inc.
   5. Consolidated Systems, Inc.

2.2 STEEL PARTITION AND SOFFIT FRAMING

A. ASTM C 754 and C 645 are referred to in steel studs and steel framing that receive screw-attached gypsum board.
   1. Stud height and spacing shall be based on L/240

B. United States Gypsum Company SA923 has details for UL rated partitions and framing conditions at wall corners and wall openings that can be referenced. SA923 also identifies Sound Transmission Characteristics (STC) for wall assemblies.

C. Metal door and borrowed light frames shall be 16 ga., double stud steel framing, 3-5/8” minimum.

D. Steel stud spacing may be placed on 12”, 16” or 24” centers. It is the recommendation of SDOC to have all steel stud spacing on 16” centers.

2.3 FABRICATION

A. Steel studs are rolled formed and have a corrosion resistant coating, hot-dip galvanized in accordance with ASTM A 653.

2.4 ALLOWABLE SUBSTITUTIONS: Products other than those named in Acceptable Manufacturers and Specific Products above may be substituted when in conformance with individual requirements stated in Component Characteristics and approved by SDOC Standards And Design.

2.5 BASIS OF DESIGN type specifications shall NOT be used in the preparation of this Section. The Architect shall clearly specify a minimum of three named manufacturers complete with type and specific product selected.
PART 3 - QUALITY ASSURANCE DURING EXECUTION

3.1 DESIGN CONSIDERATIONS

A. For steel stud partition detailing, fire ratings and sound transmission the United States Gypsum Company has a published “Handbook” that defines minimum standards for metal stud framing systems. These standards shall be followed by the design professional.

3.2 INSTALLATION ENVIRONMENTAL CONDITIONS:

A. Specified items in this standard shall not be delivered or installed until the building is enclosed. Enclosed means the exterior walls are erected and the roof system is installed.

3.3 PARTITION INSTALLATION

A. Attach steel runners at floor and ceiling to structure with mechanical fasteners spaced at 24” on center.

B. Position steel studs vertically with open side facing in the same direction, and connect to top and bottom runners with 2 (two) positive attachments per stud flange.

3.4 SPECIAL INSTALLATION PROCEDURES/ADJUSTMENT PROCEDURES

A. Provide all items and accessories as required for a complete installation. Proceed with installation only after unsatisfactory conditions have been corrected. Installation of any items indicates all conditions are satisfactory and acceptance of previous Work by other Contractors.
PART 1 - GENERAL

1.1 DEFINITION: Gypsum wallboard (GWB) panels for interior partitions that have been specifically engineered to provide increased resistance to abrasion, indentation and penetration than standard, paper-faced gypsum panels. Refer to ASTM C11 for other gypsum industry definitions and terminology.

1.2 APPLICATION:
   A. Intended Use
      1. Use as a finished wall material in lieu of CMU on selected corridors and partitions within and between classrooms.
      2. Use only from floor level to height 8 or 9 feet above finished floor, depending on length of panel used. Use standard GWB products of matching thickness above the abuse resistant product.

   B. Justification
      1. More cost effective than CMU.
      2. Offers increased flexibility for future modifications than heavier, more rigid and more permanent wall assemblies.
      3. Similar to durability of CMU.
      4. Provides less institutional appearance than CMU.
      5. Easier to repair and maintain.
      6. Faster installation time than CMU.

   C. Limitations
      1. Shall not be used in areas of known intense use (gymnasiums, dance studios, etc.).
      2. Shall not be used in areas subject to continuous moisture, high humidity or extreme temperatures (kitchens, locker/shower rooms, swimming pools, etc.)
      3. Not intended for use in ceilings, although abuse resistant products may have some special applications.

1.3 SELECTION CRITERIA
   A. Gypsum Wallboard (GWB) panels for interior partitions that have been specifically engineered to provide:
      1. Increased resistance to abrasion,
      2. Increased resistance to indentation, and
      3. Increased resistance to penetration than standard, paper-faced gypsum panels.
A. Industry Standards and Tests
   5. ASTM C1288-95 Standard for non-asbestos fiber cement flat sheets.

B. Applicable Publications
   1. SREF: 1999 Section 2.3(9)(b)
   2. Masterspec Section 09620

1.5 QUALITY ASSURANCE
A. Contractor Qualifications: Employ only experienced Installers skilled in the successful installation of the specified materials and assemblies on similar projects for a minimum of five years. Installers shall be state-certified or licensed Sub-Contractors, or locally registered Sub-Contractors in Osceola County, Florida.

B. Manufacturer’s Qualifications: Employ only manufacturers making the specified materials as a regular production item.

C. Pre-Construction Conference
   1. Review use and installation of specified materials and assemblies with Contractor and Subcontractor.
   2. Review acceptable level and quality of finishes with Contractor, Installation Subcontractor and Painting Subcontractor. Compare to mock-up, if required.

D. Mock-Up: If it is necessary to assess the quality of finishes or should the use of the product be unusually complex, the Contractor shall provide a full size mock-up of the assembly showing all details and finishes. Upon approval, mock-up shall establish acceptable level of quality and may be incorporated into the Work.

E. Preparation: Provide material and construction identical to those tested for required fire resistance and STC sound ratings as stated in assemblies shown in Contract Documents.

1.6 SUBMITTALS
A. Certifications
   1. Statement by Manufacturer that product meets specifications.
   2. Statement by Manufacturer that product complies with industry standards and tests.
B. Samples: Submit samples of each product specified.
C. Product Data Sheets: Provide Product Data Sheets of each product specified.
D. Special Instructions regarding product’s peculiarities (if any) in applying taping, finishing and priming/painting.
E. Shop Drawings showing locations and proposed details of expansion and control joints. Shop Drawings shall also show attachments to other units of work.

1.7 COMMISSIONING

A. Contractor Statement of Compliance: Certification by the Contractor that fire and sound rated assemblies have been built in accordance with the Contract Documents and the specified ratings required of each assembly.

PART 2 - PRODUCT SYSTEM

2.1 COMPONENTS

A. Fire Ratings: Maintain fire ratings as required by reference or direct requirement in current editions of SREF, State Uniform Building Code for Public Educational Facilities Construction (UBC), Florida Building Code (FBC) and Standard Building Code (SBCCI).

B. STC Ratings\(^1\): Maintain the following general STC ratings:
   1. Wall/ceiling assembly between corridors and classrooms: STC 45
   2. Wall/ceiling assembly between adjacent classrooms: STC 45
   3. Wall/ceiling assembly between corridors and offices: STC 50
   4. Wall/ceiling assembly between offices: STC 50
   5. Wall/ceiling assembly at music, dance, theaters, etc.: STC 55

2.2 ACCEPTABLE PRODUCTS:

A. Abuse Resistant GWB: United States Gypsum Company 5/8” Fiberock brand VHI Abuse Resistant gypsum fiber panel or other equal products as approved by SDOC Standards Development.

B. Joint Compound: Setting-type such as USG Sheetrock brand Durabond.

C. Metal Bead and Trim: USG Sheetrock brand paper-faced metal bead and trim.

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\(^1\) The STC ratings indicated are guidelines only. Individual situations may require in-depth study. The level of continuous background noise (i.e. HVAC) has significant impact on quality of construction and must be coordinated with other design parameters including budget.
2.3 ALLOWABLE SUBSTITUTIONS: From time-to-time, SDOC Standards Development may approve other products and additional items meeting both Guidelines and Specifications when submitted in accordance with the Substitution provisions contained in Division 1.

PART 3 - QUALITY ASSURANCE DURING EXECUTION

3.1 INSTALLATION ENVIRONMENTAL CONDITIONS: Comply with ASTM C840 requirements or gypsum board manufacturers written recommendations, whichever is more stringent.

3.2 SEQUENCING
A. Prior to installation of fixed ceilings, the Architect shall conduct an above ceiling review with SDOC and report deficiencies in the Work in writing back to the Contractor.
B. The Contractor shall not proceed with the Work until deficiencies have been corrected and re-reviewed.

3.3 INSTALLATION PROCEDURES
A. Framing shall be in strict accordance with manufacturer’s instructions.
B. Framing shall be with 20 ga members only, installed at 16” centers for abuse resistant GWB assemblies.
C. Install panels vertically with ends of boards 3/8-inch above finished floor.
D. Joint Treatment
   1. Provide setting-type joint compound (non-lightweight type) for pre-fill and tape embedment coats.
   2. Provide drying-type (non-lightweight type) joint compound for finish coats.
E. Level of Finish
   1. Provide Level 4 finish in accordance with GA-214-96. All joints and interior angles shall have tape embedded in joint compound and one additional coat of joint compound applied over all joints and interior angles. Fasteners heads, trim flanges and accessories shall be covered with two separate coats of joint compound.
   2. Joint compound and panel surfaces shall be smooth and free of tool marks and ridges.
   3. Spray apply finish coat of “smooth pebble” texture of joint compound to all surfaces. Sample texture finish shall be reviewed with Architect and SDOC. Approved sample shall be representative of acceptable level of finish.
F. Control Joints
   1. In general, design control and expansion joints similar to standard GWB products.
   2. Provide control joints in uninterrupted straight planes every 30 feet. (Note that a full height doorframe to the ceiling may be considered a control joint.)
   3. Provide a control joint where a partition, wall or ceiling traverses a building expansion joint.

G. Seal Construction of STC-rated assemblies at perimeters, behind control and expansion joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations.

H. Comply with ASTM C919 and manufacturer’s written recommendations for locating trim and closing off sound-flanking paths around and through gypsum board assemblies, including sealing around partitions extending above acoustical ceilings.

I. Primer
   1. Prime finished panels with a quality drywall primer to equalize the porosities between surface paper and joint compound.
   2. Primer shall be made specifically for drywall as recommended by, and the same brand as, the applied final drywall finish (paint or epoxy) manufacturer.

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09300 - Tile and Marble

General

The Architect/Engineer should determine preferences for finishes from conferences with the District Project Manager. All grout shall be sealed.

Quarry Tile

Because of its enduring quality, ease of maintenance and fire resistance, quarry tile is a desirable material for quarry kitchens.

Ceramic Tile

Ceramic tile shall be used for floors and walls or wainscot in toilets as well as in some laboratories and utility rooms. Toilet floors shall have sealed grout.
J. PERFORMANCE REQUIREMENTS

1. Purpose: Provide a factory manufactured tile product which is easily cleanable, has an impervious surface which protects the substrate from penetration of liquids spilled or room-use (i.e. kitchens, toilet rooms, showers).

   a. Level Surfaces: Minimum 0.6.
   b. Step Treads: Minimum 0.6.
   c. Ramp Surfaces: Minimum 0.8.

3. Summary of tile types and location:
   a. Kitchen Floors: mud-set, non-slip variety of either quarry tile (NSQT) or porcelain tile (NSPT) sloped to drain, using epoxy mortar with epoxy grout.
   b. Kitchen Serving Area Floors: either thin-set quarry tile (QT) or non-slip porcelain tile (NSPT) using epoxy mortar with epoxy grout. Kitchen serving area tile may match Kitchen floor with the exception that the serving area is not required to have the non-slip tile. Typically, these areas are not sloped to drain.
   c. Group Toilet Room Floors: thin-set ceramic floor tile (CFT) using latex-Portland cement mortar with epoxy grout.
   d. Shower Floors: mud-set unglazed ceramic mosaic floor tile (CMT) or porcelain mosaic floor tile (PMT) sloped to drain, using standard Portland cement mortar with latex-Portland cement grout.
   e. Wall Tile: thin-set glazed ceramic wall tile (CWT) using latex-Portland cement mortar with latex-Portland cement grout. Wall tile in restrooms shall be 50” on the plumbing wall only. Shower walls shall be full height. All other walls in restrooms shall be painted.
   f. Thresholds and Sills: thin-set marble thresholds and sills using latex-Portland cement mortar.

K. QUALITY ASSURANCE

1. Installer Qualifications:
   a. An employer of workers trained and approved by manufacturer for installation and maintenance of units required for this Project.
      1) Experienced: When used with an entity, "experienced" means having successfully completed a minimum of 5 projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

2. Manufacturer Qualifications:
   a. A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
3. Preinstallation Conference:
   a. Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination".


L. SUBMITTALS DURING CONSTRUCTION

1. Product Data and Samples: For each type of product indicated.
2. Shop Drawings: Indicate plans, elevations, sections, details and attachments to other work.
3. Extra Materials: 2% of each type of type, color and pattern installed.

M. MATERIALS, PRODUCTS, EQUIPMENT, MANUFACTURED UNITS

1. Acceptable Tile Manufacturers/Distributors:
   a. American Olean: [www.aotile.com](http://www.aotile.com)
   b. Crossville Ceramics Company, LP: [www.crossville-ceramics.com](http://www.crossville-ceramics.com)
   c. DalTile: [www.daltile.com](http://www.daltile.com)
   d. Florida Tile Industries, Inc.: [www.ftile.com](http://www.ftile.com)
   e. Shaw Commercial Hard Surface: [www.shawfloors.com](http://www.shawfloors.com)
   f. Trinity Tile Group: [www.trinitytile.com](http://www.trinitytile.com)

<table>
<thead>
<tr>
<th>Kitchen Floors</th>
<th>American Olean</th>
<th>Crossville Ceramics</th>
<th>DalTile</th>
<th>Florida Tile</th>
<th>Shaw Commercial</th>
<th>Trinity Tile Group</th>
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<tbody>
<tr>
<td></td>
<td>Sure Step® (NSQT)</td>
<td>Cross-Dot (NSPT) Cross-Tread (NSPT) Ecocycle (NSPT)</td>
<td>Suretread™ (NSQT)</td>
<td>Metropolitan Quarry Basics® X-Colors (NSQT)</td>
<td>Quarry Tile (NSQT)</td>
<td>Metropolitan Quarry</td>
</tr>
<tr>
<td>Kitchen Serving Area Floors</td>
<td>Quarry Tile (QT) Quarry Naturals® (QT)</td>
<td>Cross-Dot (NSPT) Cross-Tread (NSPT) Ecocycle (NSPT)</td>
<td>Quarry Tile (QT) Quarry Textures™ (QT)</td>
<td>Metropolitan Quarry Basics® Clear Tones (QT)</td>
<td>Quarry Tile (QT)</td>
<td>Metropolitan Quarry</td>
</tr>
<tr>
<td>Group Toilet Room Floors</td>
<td>Terra Granite™ (CFT) Terra Paver®, Unpolished</td>
<td>American Classics (PFT)</td>
<td>Vitrestone Select (CFT) Porcelalto™ (PFT)</td>
<td>Granite (CFT) Liberty (CFT) Tough-One (CFT)</td>
<td>Zodiac (CFT)</td>
<td>Interceramic Metallic II</td>
</tr>
</tbody>
</table>

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2. Acceptable Setting and Grout Manufacturers:
   a. American Olean Tile Co., Inc.
   b. H.B. Fuller Co.
   c. Laticrete International, Inc.
   d. Mapei Corporation
   e. Summetville Tiles, Inc.

3. Product Performance:
   a. Non-Slip Quarry Tile (NSQT) and Non-Slip Porcelain Tile (NSPT): Unglazed, nominal 6” square vitreous clay or porcelain tile units with water absorption no higher than 3.0 percent. In addition to the recommendation for slip resistance listed in paragraph “A” above, these types of floor tiles shall contain supplementary means to provide an extra level of non-slip surface performance. This may be in the form of surface textures or metallic abrasives added to the actual clay material. These additional methods are necessary due to the preponderance of water and grease on kitchen floors and the chemicals used in their cleaning.
   b. Quarry Tile (QT): Unglazed, nominal 6” square vitreous clay or porcelain tile units with water absorption no higher than 3.0 percent. Although the design intent is for this tile to match the color range of the non-slip variety described above, it is not mandatory.
   c. Ceramic Floor Tile (CFT): Nominal 2” x 2” units with moisture absorption less than 3.5%. Tile may be either glazed or unglazed, meeting the slip-resistance in paragraph “A” above.
   d. Ceramic Mosaic Tile (CMT) and Porcelain Mosaic Tile (PMT): Unglazed impervious natural clay or porcelain units no larger than 3” x 3” with a moisture absorption less than 0.5%.
   e. Glazed Ceramic Wall Tile (CWT): Nominal 4” x 4” units with a high-gloss or semi-gloss impervious glazed finish fused to a ceramic tile body that may be non-vitreous but with water absorption not exceeding 20%. Furnish Master Grade Certificate signed by both tile manufacturer and Tile Sub-Contractor stating that installed tile meets ANSI 137.1 and provide manufacturer’s minimum ten-year glaze wear warranty.

<table>
<thead>
<tr>
<th>Shower Floors</th>
<th>Unglazed Ceramic Mosaics (CFT)</th>
<th>Cross-Colors Mosaics (PMT)</th>
<th>Keystones (PMT)</th>
<th>Unglazed Mosaics (PMT)</th>
<th>Unglazed Mosaics (PMT)</th>
<th>Lone Star Mosaics</th>
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</thead>
<tbody>
<tr>
<td>Glazed Wall Tile</td>
<td>Bright (CWT)</td>
<td>N/A</td>
<td>Semi-Gloss™ (CWT)</td>
<td>Bright (CWT)</td>
<td>Tone Series (CWT)</td>
<td>Interceramic IC Brites</td>
</tr>
</tbody>
</table>
f. Cove Base: Provide matching tile sanitary cove base in rest rooms and kitchens and serving areas. Base used in showers may match glazed wall tile.

g. Marble Thresholds: Use at doorways of dissimilar floor materials shall have beveled edges at 1:2 slope, aligning lower edge of bevel with adjacent floor finish. Height of bevel shall not exceed ½” with finish bevel to match face of threshold. Marble thresholds will be uniform, fine-to-medium-grained white stone with gray veining, conforming to ASTM C503, minimum abrasion resistance of 10-12 per ASTM C 1353 or ASTM C 241 with honed bottom, ¼” radius on outstanding edges.

h. Marble Sills: Comply with recommendations and requirements of MIA, with a minimum abrasion-hardness value of 10 per ASTM C 241. Provide matched marble from a single quarry for each type, variety, color and quantities required. Minimum thickness shall be ½-inch.

i. Waterproofing Membrane: Use at “thick-set” applications and where floor has minimum slope to drain(s); non-plasticized chlorinated-polyethylene sheet, 40-mil thickness.

N. FINISHES

1. Tile Systems Schedule:

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<tr>
<th>Material</th>
<th>Setting Method</th>
<th>Grout</th>
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<tr>
<td>Kitchen Floors</td>
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<tr>
<td>(Food Prep; Slab on grade)</td>
<td>Non-Slip Quarry Tile (NSQT)</td>
<td>Mud Set (slope to drain) F132-02 ANSI A108.1 Epoxy ANSI A108.6 ANSI A118.3</td>
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<tr>
<td>Kitchen Serving Floors</td>
<td>Non-Slip Porcelain Tile (NSPT)</td>
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<td>Group Toilet Floors</td>
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<td>Thin Set F131-02 ANSI A118.3 Epoxy ANSI A108.6 ANSI A118.3</td>
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<td>(Slab on grade)</td>
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<td>Ceramic Floor Tile (CFT)</td>
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<td>Shower Floors (Slab on Grade)</td>
<td>Glazed &amp; Unglazed Ceramic Mosaic Tile (CMT)</td>
<td>Mud Set (slope to drain) F112-02 ANSI A108.1</td>
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</tr>
<tr>
<td>Shower Walls &amp; Other Select Areas</td>
<td>Glazed Ceramic Wall Tile (CWT)</td>
<td>Thin Set W202, W244 or W245 ANSI A118.7</td>
</tr>
</tbody>
</table>

“F” and “W” prefixed numbers refer to system designs designated by Handbook for Ceramic Tile Installation by the Tile Council of America.

O. ERECTION TOLERANCES

1. The “mud-set” Portland cement setting method that is sloped to floor drains is used only in kitchen and locker room shower areas that could be fully immersed in water. Even though other areas have floor drains, floors are not required to be warped since total immersion would only be an occasional accident. As kitchens and locker room shower areas occur only in ground floor locations, a waterproof membrane is not thought to be beneficial or cost effective.

2. Latex additives have been selected for use in all thin-set (dry-set) and normal grouting applications for floors and walls due to their improved adhesion and greater resistance to impact and cracking achieved from the flexibility of the latex. Latex additives also improve hydration of the cement by retarding evaporation.

3. An epoxy grout is selected for use in kitchens and gang restrooms only, due to their resistance to stain and dirt, and ease of cleanability. Standard latex-Portland cement grouts are used at all other locations. Epoxy adhesives are not used.

4. Include expansion joints, control joints, construction joints caused by concrete shrinkage cracks and joints between dissimilar materials.
   a. In general, if the larger dimension of a floor is less than 12 ft, movement or control joints will not be required. In floors of large expanse, spacing of joints completely through the setting bed may be as close as 12 ft or as far apart as 24 ft. Joints should be provided in both directions, and there should be a perimeter joint where the floor abuts walls. In addition, joints should be provided between the floor and any other restraining surfaces such as curbs, columns and pipes.
   b. Where there is a movement joint in the concrete subfloor, there should be a corresponding joint in the bedding mortar and tile at least the same width. Joints should not be less than ¼ in wide. They must also be filled with a suitable back-up strip and sealant, and carefully installed to ensure that the sealant bonds firmly to the sides of the tiles.
   c.
P. FIELD QUALITY CONTROL

1. Installation Environmental Criteria:
   a. Do not install specified items until building is enclosed, wet work completed and HVAC system is operating and maintaining temperature and humidity at occupancy level during remainder of construction period.
   b. Remove grout residue from tile as soon as possible.
   c. Clean haze from tile according to tile and grout manufacturer’s written instructions.
   d. Prohibit foot traffic from tiled floors for at least seven days after grouting is completed.
   e. Protect installed tile work with Kraft paper or other heavy covering during remaining construction period.
   f.

Q. COORDINATION / EXHIBITS

1. Drawing Items: In addition to general requirements for coordinating drawings with specifications, drawings should indicate the following:
   a. Details where all tiling occurs.
   b. Schedules where tiling is indicated.

2. Specification Items:
   a. Division 09 Design Criteria “Gypsum Board Assemblies” for furnishing tile backer board.
09511 - Suspended Acoustical Ceilings

All ceilings shall be Armstrong fine fissured RH90 or performance equal approved by District Project Manager. All tile shall be 2’ x 2’ square.

No tiles to be placed prior to HVAC completion and operational. All buildings shall be humidity controlled prior to installation.

09569 - Resilient Flooring

No products specified shall contain asbestos. All floors per School Board directive shall be VCT tile, except kitchens and bathrooms. Utilization of carpet shall have prior School Board approval.

09680 - Carpet

Carpet Specifications

Collins & Aikman and Shaw Industries per State Contract. Equivalent vendors may be considered if on the FSPMA certified list.

09900 - Painting

General

The following recommendations will assist in obtaining the quality desired:

Require undercoats to have slightly different tints and to be inspected and approved by the Architect/Engineer prior to application of the next coat.

Specify the total thickness of paint by “dry mil” or “wet mil” thickness (according to recommendation by the paint manufacturer), and verify the thickness on the job by use of special low-cost gauges. The Architect/Engineer in specifying the quality of paint required shall be in compliance with SREF Specifications. This information contains acceptable vendor products as well as paint specifications for specific types of paint and their application and may be included in the Project Manual.

Substrate preparation requirements shall be clearly described. Door frames in masonry wall shall be back-painted (primed) prior to installation. Care should be taken to prevent Indoor Air Quality problems.
Ferrous Metal

Paint on steel iron items should be specified on the basis of mill thickness rather than number of coats. For items exposed to the weather a total of six mills is considered necessary; for Work exposed inside a building, four or five mills is desirable (dry film measurement). This includes structural steel and miscellaneous iron and steel items.

Coatings on galvanized surfaces are unacceptable unless circumstances prevail. In such cases complete documentation as to procedures shall be submitted for approval.

Exterior Waterproofing

The use of clear silicone waterproofing or approved alternative is desired on the exterior of all brick buildings including the stone. A 3% silicone is considered adequate; more than 4 1/2% is of no benefit. For limestone a 5% silicone is desirable. Products which have been used and found acceptable are: Florida Laboratories Chemclear 30 and Sonneborn-Hydrocide S-X.

Suggested Specification

A clear silicone solution containing a minimum of 3 - 5% silicone resin solids in a hydrocarbon solvent conforming to formulation and performance standard of Federal Specifications SS-W-00110 (G.S.A.). Container label shall certify that it meets above requirements. Where an interior paint is used on masonry or concrete surfaces, no silicone waterproofing is desired.

PAINT SPECIFICATIONS UTILITY LINE/SITE EQUIPMENT COLOR CODE STANDARDS

The following information is provided to address the paint manufacturer, color code, paint selection, and paint type to be applied to the various site utility fixtures and equipment. The preparation of the items to receive the paint shall comply to the paint manufacturer’s recommendations and/or Division 8 Section 08900 of the standard specifications section for finishes.

SPECIFICATIONS FOR PAINTING CONTRACTORS

A. Contractor should furnish Material Safety Data Sheet on all paints and coating that he is going to use on this job.
B. Regular Sheet Rock

Primer - one coat of quick-drying interior latex primer-sealer such as Pittsburgh Speedhide 6-2 or equivalent.

Finish - apply two coats of latex eggshell enamel such as Pittsburgh Speedhide 6-411 series or equivalent.

C. New Interior Wood

Primer - one coat interior enamel undercoat water base such as Pittsburgh Speedhide 6-755 or equivalent.

Finish - apply two coats of latex eggshell enamel 6-411 or acrylic latex semi-gloss enamel Pittsburgh 6-510 series or equivalent.

D. New Interior Wood Doors that are to be Painted

Primer - one coat of interior enamel undercoat water base such as Pittsburgh Speedhide 6-755 or equivalent.

Finish - apply two coats of interior/exterior water base gloss enamel Pittsburgh 53-610 series or equivalent.

New exterior wood doors use same material as interior doors

E. New Exterior Wood

Primer - apply one coat of exterior latex wood primer such as Speedhide 6-609 Pittsburgh or equivalent.

Finish - apply two coats of Pittsburgh Sun-Proof 721 line flat latex house paint.

F. New Exterior Wood Trim

Primer - exterior latex wood primer P.P.G. 6-609 or equivalent.

Finish - apply two coats of Pittsburgh Sun Proof 78-line semi-gloss acrylic latex house & trim paint.

G. Factory finish metal wall panels or vinyl covered sheetrock that are to be painted with latex paint.

1. Primer - Zinsser Bulls Eye 1-2-3 white pigmented water-based primer sealer.
2. Finish - two coats latex eggshell enamel
   Pittsburgh Speedhide 6-411 series or equivalent.

H. Properly primed metal doors

Finish - apply two coats of water base gloss enamel 53-610 series or equivalent.

Note: Any equivalent paint or coating must be approved by Facilities Planning and Construction.

SPECIFICATION GUIDE FOR PAINTING OF DISTRICT FACILITIES

A. When every possible waterborne type of paints and coating should be used on district facilities.

B. Quality Assurance

Product Manufacturer: Company specializing in manufacturing quality paint and coating with at least 20 years experience.

C. All vendors’ paints and coating should be top-of-their-line products.

D. Recommended Vendors

1. Paint Center of Central Florida (Pittsburgh)
2. M. A. Bruder and Sons Inc.
3. DeVoe and Raynolds Co.
4. Watkins Paint and Wallpaper Co. (Benjamin More)
5. Sherwin-Williams Co.
6. Glidden Coating & Resins
7. Porter Paints

1) Exterior waterproofing of masonry and concrete should be done with a water-based waterproofing sealer like OKON W-1 and OKON W-2 or equivalent.

2) Recommended exterior paint systems

These products listed are DeVoe and Raynolds Co. or equivalent systems.

3) Recommended interior paint systems

These products listed are DeVoe and Raynolds Co. or equivalent systems.
DIVISION 10 - SPECIALTIES

10100 - Markerboards and Tackboards

The Architect/Engineer should schedule the sizes and locations of Markerboards and tackboards in accordance with SREF installation specifications.

Markerboards shall be dry marker type in accordance with SREF guidelines.

10165 - Toilet Compartments

Toilet partitions and urinal screens (wall mounted) shall be surfaced units equal to products as manufactured by Santana Products Company, Scranton, PA (Color to be Paisley only). All exposed fastening devices shall be tamper proof. Ceiling above the toilet partitions shall be dropped to (7) feet (6) inches AFF to enable a sturdier installation to result. (Note: single stalls and other situations where an unsturdy installation could result may be floor mounted/overhead braced following discussion and approval by the Owner.)

Hinges

Toilet stall hinges shall comply with latest Florida Accessibility Requirements.

10440 - Identifying Devices

The Architect/Engineer shall assign room numbers to all spaces during the review of the Design Development Phase in accordance with F.I.S.H. Requirements. These numbers will be on the construction bid documents and can be used under doors, hardware, etc. This broad scope section can include building directories, door signs, address signs, and similar directional material, and generally is used when more that one of those items will be required. A narrow scope section dealing with the particular item is common when only one item (such as “building directory”) is required.
Signs

All signage shall be in accordance with SREF requirements.

The Architect/Engineer shall also include directional signs for direction of the public through corridors to destination together with identification of specific functions of rooms such as, MEN, WOMEN, CUSTODIAL CLOSET, MECHANICAL ROOM, DEPARTMENTAL NAMES, HIGH VOLTAGE, etc. Observe requirements of the Florida Accessibility Codes and F.I.S.H.. Particular attention should be given placement of exit signs to ensure compliance with applicable codes and occupancy limit at designation on signs at specific areas. Design placement, and other details will be in accordance with the Fire Marshall’s requirements.

10420 - Plaques

The material shall be cast bronze with narrow border raised polished letters, leatherette background and theft-proof fastenings.

Plaque will contain the following:

Name of the building and date constructed and names of the Architect and Contractor. Board Member identifications are those members who approve the monitory funding dollars for said school.

District policy prohibits naming associates or consultants to the Architect/Engineer and subcontractors.

10522 - Fire Extinguishers, Cabinets and Accessories

UL approved fire extinguishers shall be provided as per NFPA “10” and SREF for all buildings. Fire extinguisher placement shall be reviewed as part of Life Safety Requirements. All cabinets shall be recessed.

10800 - Toilet and Bath Accessories

The following accessories are typical and specific items shall be verified with the District Project Manager. Careful placement of accessories are required to protect sight lines.

Feminine Napkin Disposal

Partition mounted Bobrick B-354 (or American #47) Provide at each female water closet.
Feminine Napkin - Tampon Vendor

Combination dispenser, 10 1/3” x 30 1/4” x 5 1/2”, white enamel, wall mounted. Provide at each female toilet room.

Mirror

Stainless steel framed without shelf, Bobrick Series B-290 (or American series 500) minimum 16” x 24”. Mirror for handicapped usage shall have the bottom mounted at 40” above the floor or shall be a fixed tiled units (Bobrick B-293 or American #573). Provide above for each student lavatory.

Soap Dispenser

Owner supplied.

Toilet Tissue Dispenser

Owner supplied/flush mounted.

Towel Dispenser

Owner supplied/flush mounted.

Waste Receptacle

Owner supplied.

Coat Hooks

Provide at staff restrooms only!

Grab Bars

Note: All items shall be securely installed in compliance to SREF and ADA Codes. Use solid wood blocking at drywall locations.
A.PERFORMANCE REQUIREMENTS

1. Purpose: Mounting heights are required to comply with Civil Rights legislation, provide ergonomic compatibility, achieve universal design and ADA accessibility for adults and children of various ages. Although a particular age group or population with a particular disability may not necessarily be the primary user of a facility, the accompanying charts should be utilized to serve the primary and ancillary users. The Access Board has issued additional guidance to DOJ and DOT for building elements designed for children ages 12 and younger and are included as part of this Criteria.

2. References:

B. QUALITY ASSURANCE

1. Verify installations are complete and at the correct heights prior to Substantial Complete
2. Install items in accordance with manufacturer’s instructions and anchorage requirements, and at the elevations stated above finished floor (AFF) contained in the following listing.

<table>
<thead>
<tr>
<th>Counter Tops and Fixed Tables</th>
<th>Wall Cabinets</th>
<th>Marker/Tack Boards</th>
<th>Pencil Sharpener</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Standing AFF</td>
<td>Standing AFF</td>
<td>Tray Hgt. AFF</td>
</tr>
<tr>
<td>Adults</td>
<td>35”</td>
<td>54”</td>
<td>36”</td>
</tr>
<tr>
<td>Kindergarten</td>
<td>26”</td>
<td>44”</td>
<td>22”</td>
</tr>
<tr>
<td>Primary</td>
<td>26”</td>
<td>44”</td>
<td>25”</td>
</tr>
<tr>
<td>Intermediate</td>
<td>30”</td>
<td>44”</td>
<td>29”</td>
</tr>
<tr>
<td>Middle School</td>
<td>30”</td>
<td>60”</td>
<td>36”</td>
</tr>
<tr>
<td>High School</td>
<td>34”</td>
<td>54”</td>
<td>36”</td>
</tr>
</tbody>
</table>

Tack Strip
Top of tack strip (if separate from marker board) shall be located at 6’-0” AFF.

Book Shelves
Adjustable, not to exceed 48” high, vertical KV standards 36” o.c.
### Signage

In educational facilities from Kindergarten through Intermediate grades including auxiliary spaces used by these students, mount bottom of signage at 42” AFF, unless noted otherwise (UNO). Mount bottom of all other signage at 60” AFF. Place closest vertical edge 4” from the outside of latch side door jamb edge. Dedication plaques shall be mounted 64” AFF to top of plaque. (See DC 10 14 00 - Signage).

### TV Monitor Brackets

Mount bracket so that the clear space below the TV including VCR is 80” AFF.

### Coat Hooks

- **Kindergarten, Primary & Intermediate** – In Cubbies
- **Middle & High Schools** – In Lockers

### Toilet Room Accessories, Other Fixtures

<table>
<thead>
<tr>
<th></th>
<th>Grab Bars</th>
<th>Soap Dispensers</th>
<th>Drinking Fountains &amp; Water Coolers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Center Line, AFF</td>
<td>Diameter</td>
<td>Center Line, AFF to Operator or Spout</td>
</tr>
<tr>
<td>Adults</td>
<td>33”</td>
<td>1 ½”</td>
<td>45”</td>
</tr>
<tr>
<td>Kindergarten</td>
<td>25” (UNO)</td>
<td>1 ½”</td>
<td>37”</td>
</tr>
<tr>
<td>Primary</td>
<td>25” (UNO)</td>
<td>1 ½”</td>
<td>37”</td>
</tr>
<tr>
<td>Intermediate</td>
<td>25” (UNO)</td>
<td>1 ½”</td>
<td>42”</td>
</tr>
<tr>
<td>Middle School</td>
<td>33”</td>
<td>1 ½”</td>
<td>42”</td>
</tr>
<tr>
<td>High School</td>
<td>33”</td>
<td>1 ½”</td>
<td>45”</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Mirrors</th>
<th>Toilet Paper Holders</th>
<th>Feminine Napkin Trash Receptacle</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mtg. Hgt. AFF (to Bottom Edge of Mirror)</td>
<td>Size</td>
<td>Center Line of Roll AFF</td>
</tr>
<tr>
<td>Adults</td>
<td>40”</td>
<td>18” x 36”</td>
<td>19”</td>
</tr>
<tr>
<td>Kindergarten</td>
<td>34”</td>
<td>16” x 24”</td>
<td>17”</td>
</tr>
<tr>
<td>Primary</td>
<td>34”</td>
<td>16” x 24”</td>
<td>17”</td>
</tr>
<tr>
<td>Intermediate</td>
<td>34”</td>
<td>18” x 36”</td>
<td>17”</td>
</tr>
<tr>
<td>Middle School</td>
<td>40”</td>
<td>18” x 36”</td>
<td>19”</td>
</tr>
<tr>
<td>High School</td>
<td>40”</td>
<td>18” x 36”</td>
<td>19”</td>
</tr>
<tr>
<td>All (K-12)</td>
<td>16”</td>
<td>20” x 60”, 24” x 60” where indicated.</td>
<td>19”</td>
</tr>
</tbody>
</table>
### Recessed or Surface Mounted Paper Towel Dispensers / Trash Receptacles

<table>
<thead>
<tr>
<th></th>
<th>Mount. Hgt. to Centerline of Dispenser</th>
<th>Mount. Hgt. to Centerline. of Dispenser</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adults</td>
<td>40”</td>
<td>40”</td>
</tr>
<tr>
<td>Kindergarten</td>
<td>40”</td>
<td>34”</td>
</tr>
<tr>
<td>Primary</td>
<td>40”</td>
<td>34”</td>
</tr>
<tr>
<td>Intermediate</td>
<td>40”</td>
<td>42”</td>
</tr>
<tr>
<td>Middle School</td>
<td>40”</td>
<td>40”</td>
</tr>
<tr>
<td>High School</td>
<td>40”</td>
<td>40”</td>
</tr>
</tbody>
</table>

### Electric Hand Dryers

Mount bottom of hand dryers from 38” AFF to bottom of mounting box.

### Toilet Room Fixtures

<table>
<thead>
<tr>
<th></th>
<th>Lavatories</th>
<th>Water Closets</th>
<th>Urinals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rim AFF</td>
<td>Rim AFF</td>
<td>Controls AFF</td>
</tr>
<tr>
<td>Adults</td>
<td>33”</td>
<td>17”</td>
<td>44”</td>
</tr>
<tr>
<td>Kindergarten</td>
<td>25”</td>
<td>15”</td>
<td>36”</td>
</tr>
<tr>
<td>Primary</td>
<td>25”</td>
<td>15”</td>
<td>36”</td>
</tr>
<tr>
<td>Intermediate</td>
<td>30”</td>
<td>15”</td>
<td>36”</td>
</tr>
<tr>
<td>Middle School</td>
<td>30”</td>
<td>17”</td>
<td>44”</td>
</tr>
<tr>
<td>High School</td>
<td>33”</td>
<td>17”</td>
<td>44”</td>
</tr>
</tbody>
</table>

### Shower Heads

All shower heads shall be mounted at 78” AFF except as required by ADA shower stalls.

### Electrical Switches and Outlets

<table>
<thead>
<tr>
<th></th>
<th>AFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wall Switches, Dimmers</td>
<td>48” top of box</td>
</tr>
<tr>
<td>Standard Wall Receptacles</td>
<td>16” bottom of box</td>
</tr>
<tr>
<td>Receptacles Above Counter Tops</td>
<td>*</td>
</tr>
<tr>
<td>Exterior Wall Receptacles</td>
<td>24” bottom of box</td>
</tr>
<tr>
<td>Exit Lights</td>
<td>Above top of door frame openings or suspended from ceilings, noted on drawings per code requirements.</td>
</tr>
<tr>
<td>Standard Telephone Outlets</td>
<td>16” bottom of box</td>
</tr>
<tr>
<td>Wall Mounted Telephone</td>
<td>48” top of box</td>
</tr>
<tr>
<td>Wall Mounted Telephone –</td>
<td>40” top of box</td>
</tr>
<tr>
<td>Feature</td>
<td>Location</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Handicap</td>
<td></td>
</tr>
<tr>
<td>Telephone Above Counter Tops</td>
<td>*</td>
</tr>
<tr>
<td>TV Outlet (Ceiling/Wall)</td>
<td>80” bottom of box</td>
</tr>
<tr>
<td>TV Outlet (Table Top)</td>
<td>16” bottom of box</td>
</tr>
<tr>
<td>Standard Wall Data Outlets</td>
<td>16” bottom of box</td>
</tr>
<tr>
<td>Data Outlets Above Counter Tops</td>
<td>*</td>
</tr>
<tr>
<td>Fire Alarm Pull Station</td>
<td>48” top of box</td>
</tr>
<tr>
<td>Fire Alarm Audio/Visual Device</td>
<td>80” bottom of box</td>
</tr>
<tr>
<td>Electrical Shunt trip</td>
<td>80” bottom of box</td>
</tr>
</tbody>
</table>

* Coordinate exact location of outlet with design of casework, counter top and backsplash. The intent is to have outlets centered in 4” backsplashes (preferably horizontally). If no backsplash, center vertical box about 4” above the counter top in a stud wall; in a CMU wall, locate top or bottom of box at a block joint, whatever makes sense.
The American National Standards Institute (ANSI) Z9.2-1971 is adopted as the new standard for “fundamentals governing the design and operation of local exhaust systems”. This ANSI code refers back to NFPA 91 for the installation of “Blower and Exhaust Systems”.

Environmental Health and Safety requires that all fume hood exhaust systems meet these OSHA standards and that the installation and design meet NFPA 91 and 68 codes. The “Fire Protection Handbook” (13th NFPA edition, 1969 section 9, chapter IV) is also recognized by the State Fire Marshal’s Office as regulating the design and installation of Blower and Exhaust Systems.
1160 Loading Dock Equipment

This section again is one of the broad scope type, used for specifying a complete system of loading dock equipment. CSI’s Masterformat lists several narrow scope section numbers and titles for use when only individual items of equipment are required.

Dock levelers
Adjustable dock ramps
Portable ramps, bridges and platforms
Seals and shelters
Dock bumpers

Close attention to loading dock design can result in benefits during operation of the facility. Use improved loading dock seals rather than wood dock bumpers.

11860 - Waste Handling Equipment

Trash Disposal

The District recommends trash compactors, i.e. “BFI”.
DIVISION 12 - FURNISHINGS

General

The Owner will coordinate furnishings and equipment needs and bid/purchase through the Owner’s Purchasing Department.

Blinds

Provide heavy duty scissors track assembly with (1) inch aluminum slats, decorator valences and all mounting hardware to be consistent with District and/or State Contract.

12305 - PLASTIC LAMINATE FACED CASEWORK

PART 1 - GENERAL

SUMMARY

Provide labor, materials, and equipment necessary for the complete installation of educational casework shown on the Drawings, specified herein, or listed in the Casework Schedule.

Refer to Section 01030, Alternates, for a description of the alternate that affects the work of this Section.

This Work includes special and modified stock design pre-assembled units for installation as movable, fixed, or built-in, as noted on the Drawings, or listed in the schedule.

The catalog numbers of the manufacturer listed on the Casework Schedule are intended to include a complete and total item, as the catalog number is specified in the manufacturer's current catalog. Although the description in the schedule is brief, the item shall be provided complete with hardware, accessories, features, and components.

The use of dimensions and specific requirements set forth in Drawings and Specifications are not intended to preclude the use of other acceptable manufacturer's product or procedures which may be equivalent, but are given for purpose of establishing standard of design and quality for materials, construction, and workmanship.

Work Not Included: Resilient base, general millwork, blocking within walls, floors, or ceilings required for reinforcement and support, stainless steel sinks and fittings, and electrical outlets.
Installation of manufactured casework (does not include millwork items 06200) by the General Contractor is prohibited unless approved by the casework manufacturer and the Architect.


DEFINITIONS

Exposed Portions of Casework: Include surfaces visible when doors and drawers are closed. Bottoms of cases that are more than 4 feet above the floor shall be considered exposed. Visible members in open cases or behind glass doors or bottom of wall-hung cabinets also shall be considered as exposed portions.

Semi-Exposed Portions of Casework: Includes those members behind opaque doors, such as shelves, divisions, interior faces of ends, case back, drawer sides, backs and bottoms, and back face of doors. Tops of cases 6'-6" or more above floor shall be considered semi-exposed.

Concealed Portions of Casework: Include sleepers, web frames, dust panels, and other surfaces not usually visible after installation.

SUBMITTALS

Bidder shall submit to the Architect, within 21 days of bid receipt, a sample base cabinet and countertop constructed in accordance with these specifications by one of the specified casework manufacturers. Owner/Architect review of sample cabinet will occur prior to awarding contract. Bid may be rejected by Owner if sample cabinet is not included with the Bid Proposal. Bid may be rejected by Owner if sample cabinet is not constructed in accordance with these specifications.

The casework manufacturer shall furnish shop drawings giving details and sizes including methods of attachment and anything pertinent to the installation work, as soon as possible after the award of the Contract. He shall include full Specification requirements; include 3 color samples of finishes for the Architect's selection. Show locations for support in metal stud walls (09250).

The casework manufacturer and supplier shall keep aware of the progress of the Project and shall make sure that shop drawings are furnished in adequate time so that the casework covered thereby can be fabricated and delivered in accordance with the scheduled completion.

1. Submit guarantee as specified herein.

2. Submit complete and working shop drawings for all casework items.
JOB CONDITIONS

Do not deliver casework to project site until dry and heated storage space is provided. The casework specified under this Section is prefinished and precaution must be taken to protect it against damage during installation and until final acceptance. Contractor shall be responsible for quantities as shown on casework layouts on Drawings. The manufacturer/supplier shall be responsible for making field measurements to insure proper fit of casework items.

QUALITY CONTROL

Defective workmanship or damaged components shall be corrected, repaired, or replaced as requested by the Architect, without further cost to the Owner. Manufacturer Qualifications: At least 7 years experience in the manufacturer and installation of the type of cabinets specified. Installer Qualifications: At least 5 years experience in the installation of the type of cabinets specified.

GUARANTEE

The entire installation shall be guaranteed for a period of 3 years from the Date of Substantial Completion against defects in material and workmanship in accordance with the terms of the Contract. The guarantee shall cover repair or replacement, without cost to the Owner, of items that become defective within the 3-year period. Damage to the equipment caused by improper operation or misuse is not covered by this guarantee.

PART 2 - PRODUCTS

MANUFACTURER

Products of the following manufacturers are acceptable provided they comply with all technical specification requirements, materials, construction, and details in every respect. Standard production casework will not be allowed. Manufacturers shall conform to all requirements as specified herein.

1. LSI Corporation of America, Minneapolis, Minnesota
2. Stevens Cabinet Co., Teutopolis, Illinois
3. Trimline, Dickinson, North Dakota
4. Case Systems, Normal Wood Products, Midland, Michigan
5. Westmark Commercial Casework, Tacoma, Washington
Catalog numbers shown on the Educational Casework Schedule on Drawings refer to items manufactured by Trimline (TMI), Dicksonson.

WORKMANSHP

Verify machine parts for accurate fit and assemble with appropriate fastenings and adhesives to result in true, square, level, and plumb units.
Verify dimensions of other trades to be built into casework. Provide removable or false backs for access or concealment of heating or plumbing items. Scribe tops and back splashes to walls and other adjoining vertical surfaces. There shall be a minimum scribe with cabinets at end walls unless shown otherwise.

MATERIALS

Plastic Laminate

Plastic laminate shall be high pressure laminate conforming to NEMA LD3-1991. Thickness: .028 inch, GP28 grade, with a density of 90 pounds per cubic foot.

Required kinds shall be chosen from current Wilsonart "Design Group 1" series of all solid color and wood grain and patterned laminate materials with low luster textured finish, as produced by the Ralph Wilson Plastics Company of Temple, Texas, or Pionite, Formica or Nevamar or Architect approved equivalent palette with similar number of available choices. Colors/patterns shall be selected by the Architect from among the full complement of choices for each component. Palettes of limited available choices for casework colors are not acceptable.

Exposed horizontal surfaces: Shall be nominal .050 inch thick minimum with textured finish and conforming to NEMA standards for GP50 horizontal grade.

Exposed, interior and exterior vertical surfaces: Shall be .028 inch thick minimum with low luster textured finish and conforming to NEMA standards for GP28 vertical grade.

Backing sheet for concealed surfaces: Shall be .030 or .020 inches thick, conforming to NEMA standards for GP28 vertical grade or CL20 cabinet liner.

Backing sheet for semi-exposed surfaces: Shall be .030 or .020 inches thick, conforming to NEMA standards for GP28 vertical grade. Use to balance face laminate.
**Color of laminate**

Exposed Interior: To match exterior.

1. Exposed interiors include open cabinets and cabinets with glass doors.

Exposed exterior, as selected by Architect.

Concealed exterior, manufacturer's standard or other color as may be selected by Architect.

**Melamine**

Melamine shall be saturated paper laminated to core. Weight of paper shall not be less than 80 grams.

Semi-exposed surfaces: Melamine shall conform to NEMA LD3-3.1-1991 for wear requirements for GP28 vertical grade.

Color of melamine: Manufacturers standard neutral color or other color as may be selected by Architect.

**Leading Edges**

Door and drawer fronts shall be edged with a 3mm thick high impact PVC extrusion, with satin finish.

Horizontal and vertical front cabinet members shall be flat edged with a 1mm thick high impact PVC extrusion, with a satin finish.

Colors of PVC leading edges:

1. Open Units: Shall match exterior plastic laminate color.

2. Horizontal and Vertical Front Cabinet Members: Shall match exposed plastic laminate color or as selected by Architect.


4. Drawer and Door Fronts: As selected from colors to match plastic laminate or as selected by Architect.
Particleboard

Cabinets and Countertops: Provide Premium Industrial Grade, conforming to the Commercial Standards CS-236-66 Type I, Density B, Class 2, Property Requirements, (CS IB2), also known as ANSI A208.1 -1979.

Density, lb. per cu. ft. ...........................................47

Modules or Rupture, lb. per sq. in. .............................2500

Modulus of Elasticity, lb. per sq. in. ...........................450000

Internal Bond, lb. per sq. in. ....................................100

Thickness Swell (24 hr immerse ) ..............................4%

Moisture Content % by weight .................................6.0

Screw Holding Face ...............................................330

Edge .................................................................250

Surface Strength lb. per sq. in. .................................275

Hardness lb. .......................................................900

Hardboard

Hardboard used in the cabinets whether exposed or semi-exposed shall be ANSI A135.4, Class I tempered, smooth, 2 sides equal to "Duron" by U.S. Gypsum Company.

Plywood, Hardwood

Solid lumber or plywood concealed members; solid wood to be hardwood, kiln dried, select Poplar, or mill option lumber and plywood shall be Baltic Birch 7-ply.

Provide Marine grade boat plywood, 4 feet either side of sinks (Wet Areas) back splash shall also be marine grade boat plywood. Provide plywood (non-marine grade) at remaining countertops and back splashes.

Refer to Alternate for 7-ply Baltic Birch Plywood for cabinets
**Locks**

Locks shall be of cylinder type cast with 5-disc tumbler mechanism. Each lock shall be provided with milled brass key and keying as specified in keyed different and master keyed or keyed alike. Locks shall be provided as shown on equipment drawings or described in cabinet description.

Each area or room shall be keyed alike.

Locks shall be master keyed using the casework manufacturer's keying system. (This is independent to the building master keying system.)

**HARDWARE AND MISCELLANEOUS**

Hinges: Institutional 5 knuckle with interlaying leaves capable of 270 degree swing. They shall be of nominal .090 inch minimum thickness steel and shall be hospital tipped with non-removable pins fastened with 4 screws each leaf into faces. No edge fastening allowed.

Finish: Powder coat baked-on enamel, finish.

Color: As selected by Architect.

Pulls: Shall be accurately positioned on drawer and door fronts and positively through fastened with machine screws.

Brushed, polished chrome: Similar to color selected by Architect.

**Drawer Slides**

Provide one of the following: Manufacturer's standard, epoxy coated metal, nylon rollers, 100 pounds dynamic load (or) European style, bottom mounted, captive profile, epoxy finished, nylon rollers, and 100 pounds dynamic loading with positive in-stop and out-stop.

Provide out-stop and out-keeper to maintain drawer in 80 percent open position.

File drawers and paper storage drawers: Same as above except full extension and load rating static position to be no less than 125 pounds, Accuride 3832.

Adjustable Shelf Supports: Molded nylon or nickel, 2 pin, anti-lift, minimum 200 pounds capacity support clip.

Catches: Shall be roller type. Manufacturer's standard roller catch equivalent to LSI "LH-345" catch assembly.

**PARTICLE BOARD CABINET CONSTRUCTION**
Cabinet Bases

Manufacturer's standard 4 inch high base construction of water repellent treated 3/4 inch plywood. Provide additional center support for cabinets over 24 inches wide.

Base, Wall, and Tall Cabinet Boxes

Sides, bottom, and top: Constructed of glued and spline doweled 3/4 inch particleboard, providing balanced construction, surfaced with cabinet liner CL20 for semi-exposed and vertical grade laminate for exposed locations.

Wall cabinet bottoms and tops: Constructed of glued and spline doweled one inch thick particleboard, providing balanced construction surfaced with vertical grade laminate for exposed locations and cabinet liner CL20 for semi-exposed locations.

Back panel: Constructed of minimum 3/8 inch particleboard or 1/4 inch pre-finished tempered hard board, surfaced with melamine for semi-exposed and vertical grade laminate for exposed locations, inset and glued into sides, bottom, and top.

Exposed backs: Constructed of 3/4 inch particleboard, surfaced with vertical grade laminate of balanced construction for semi-exposed locations, glued and spline doweled, and mechanically attached if required.

Intermediate support rail: Minimum 3/4 inch particleboard, surfaced with vertical grade laminate of balanced construction, glued and doweled into cabinet sides.

Hanger rails: Two located at top and bottom of cabinet back, 3 on tall cabinets, locate at top, bottom, and center of 3/4 inch particleboard.

Fixed and Adjustable Shelves and Dividers

One-inch particleboard shelves.

Exposed Locations: Vertical grade plastic laminate on both sides. Color to match cabinet exterior plastic laminate or as selected by Architect.

Semi-exposed locations: Vertical grade plastic laminate or melamine.

Front and back leading edges shall be edged with flat 1mm thick high impact PVC edging to match shelf color.
Number of adjustable shelves provided, unless indicated otherwise on the Drawings or on the Schedule

1. Low and tall cabinets

   1 up to 24 inches   4 up to 72 inches
   2 up to 36 inches   5 up to 84 inches
   3 up to 60 inches   6 up to 96 inches

2. Wall hung cabinets

   0 up to 24 inches   2 up to 36 inches
   1 up to 30 inches   3 up to 40 inches

Adjustable dividers: 1/4 inch minimum thickness, pre-finished tempered hardboard or particleboard, smooth both faces, retained by molded plastic support clip.

Fixed dividers: Constructed of 3/4 inch particleboard, surfaced with vertical grad laminate or melamine; providing balanced construction; glued and spline doweled. PVC edged to match laminate or adjacent PVC edging.

Cabinet Doors

Hinged Doors

3/4 inch particleboard and 1 inch particle board for tall cabinets.

High-pressure plastic vertical grade laminate exterior.

Doors 48 inches and less in length shall have 2 hinges per door; doors over 48 inches in length shall have 3 hinges per door.

Corners: Square with radiused edges, 3mm PVC edging, or using standard grade laminate.

Drawers

Manufacturers standard construction of minimum components listed below; or high-density fiber board; glued and doweled or dovetail jointed; surfaced with vertical grade laminate or melamine of balanced construction. Bottoms constructed of minimum 1/4 inch tempered hardboard, surfaced to match drawer sides, inset and glued to four sides.
Drawer Face

Constructed of minimum 3/4 inch particleboard, surfaced with high-pressure vertical grade laminate exterior, screw attached to the drawer box.

1. Corners: To match doors.

2. Edging: To match doors.

3. Plastic Laminate: To match doors.

File Drawers

File drawers shall be constructed in accordance with a) and b) above. File drawers shall have front-to-back and side-to-side hanger file capability with hanger channel for letter size files integral with file drawer sides. 3/16 inch by 1/2 inch removable steel channel to span side-to-side for legal size hanging files.

PLYWOOD CABINET CONSTRUCTION (Alternate)

Cabinet Bases

Manufacturer's standard 4 inch high base construction of water repellent treated, 3/4 inch plywood. Provide additional center support for cabinets over 24 inches wide.

Base, Wall, and Tall Cabinet Boxes

Sides, bottom, and top: Constructed of glued and spline doweled 3/4 inch plywood, providing balanced construction, surfaced with cabinet liner CL20 for semi-exposed and vertical grade laminate for exposed locations.

Wall cabinet bottoms and tops: Constructed of glued and spline doweled one inch thick plywood, providing balanced construction surfaced with vertical grade laminate for exposed locations and cabinet liner CL20 for semi-exposed locations.

Back panel: Constructed of minimum 3/8 inch plywood or 1/4 inch pre-finished tempered hard board, surfaced with melamine for semi-exposed and vertical grade laminate for exposed locations, inset and glued into sides, bottom, and top.

Exposed backs: Constructed of 3/4 inch plywood, surfaced with vertical grade laminate of balanced construction for semi-exposed locations, glued and spline doweled, and mechanically attached if required.
Intermediate support rail: Minimum 3/4 inch plywood, surfaced with vertical grade laminate of balanced construction, glued and doweled into cabinet sides.

Hanger rails: Two located at top and bottom of cabinet back, 3 on tall cabinets, locate at top, bottom, and center of 3/4 inch plywood.

Fixed and Adjustable Shelves and Dividers

One-inch plywood shelves.

Exposed Locations: Vertical grade plastic laminate on both sides. Color to match cabinet exterior plastic laminate or as selected by Architect.

Semi-exposed locations: Vertical grade plastic laminate or melamine.

Front and back leading edges shall be edged with flat 1mm thick high impact PVC edging to match shelf color.

Number of adjustable shelves provided, unless indicated otherwise on the Drawings or on the Schedule

1. Low and tall cabinets
   - 1 up to 24 inches
   - 2 up to 36 inches
   - 3 up to 60 inches
   - 4 up to 72 inches
   - 5 up to 84 inches
   - 6 up to 96 inches

2. Wall hung cabinets
   - 0 up to 24 inches
   - 1 up to 30 inches
   - 2 up to 36 inches
   - 3 up to 40 inches

Adjustable dividers: 1/4 inch minimum thickness, pre-finished tempered hardboard or plywood, smooth both faces, retained by molded plastic support clip.

Fixed dividers: Constructed of 3/4 inch plywood, surfaced with vertical grad laminate or melamine; providing balanced construction; glued and spline doweled. PVC edged to match laminate or adjacent PVC edging.
Cabinet Doors

Hinged Doors

3/4 inch plywood and 1 inch plywood for tall cabinets.

High-pressure plastic vertical grade laminate exterior.

Doors 48 inches and less in length shall have 2 hinges per door; doors over 48 inches in length shall have 3 hinges per door.

Comers: Square with radiused edges, 3mm PVC edging, or use standard grade laminate.

Drawers

Manufacturers standard construction of minimum components listed below; or high-density fiber board; glued and doweled or dovetail jointed; surfaced with vertical grade laminate or melamine of balanced construction. Bottoms constructed of minimum 1/4 inch tempered hardboard, surfaced to match drawer sides, inset and glued to four sides.

Drawer Face

Constructed of minimum 3/4 inch plywood, surfaced with high-pressure vertical grade laminate exterior and interior, screw attached to the drawer box.

1. Comers: To match doors.
2. Edging: To match doors.
3. Plastic Laminate: To match doors.

File Drawers

File drawers shall be constructed in accordance with a) and b) above. File drawers shall have front-to-back and side-to-side hanger file capability with hanger channel for letter size files integral with file drawer sides. 3/16 inch by 1/2 inch removable steel channel to span side-to-side for legal size hanging files.

PLASTIC LAMINATE COUNTERTOPS

Square Edge Configurations: 1 inch to 1-1/8 inch thick monolithic particleboard with 1-1/4 inch edge face including top and bottom laminates.

Top and matching front edge to be high-pressure plastic laminate factory bonded.
Provide balancing sheet on opposite face.

Provide countertops for base cabinets and counter sections.

Laminate tops and shall be continuous in practical lengths. When requiring splice joints, use a combination of splines or dowels for alignment and tite-joint fasteners as required to make a uniform and gap less joint. Splices in counter top materials shall not occur where openings for sinks or other holes are required.

1. Provide continuous top for counter type cabinets fixed in a line.
2. Back and end splashes shall not rest on to. Top shall butt to back and end splashes, joint shall be set in appropriate sealant.

Provide 4 inch high scribable, square set, color matching, and mechanically attached back splash with end splashes.

1. Back splashes are required at locations where countertops abut walls where indicated on Drawings.
2. Edges of back and end splashes shall be of square edge configuration.

Sealants: Fully bed and seal splashes to tops and to other splashes with Dow Corning 786 Mildew Resistant Silicone Sealant, clear.

Additional approved manufacturers of mildew resistant silicone are as follows:

1. General Electric
2. Rhone-Poulenc, Inc.

Provide Marine grade boat plywood, 4 feet either side of sinks (Wet Areas) back splash shall also be marine grade boat plywood. Remaining areas shall be plywood.

PLASTIC LAMINATE COUNTERTOPS (Alternate)

Square Edge Configurations: I inch to 1-1/8 inch thick monolithic plywood with 1-1/4 inch edge face including top and bottom laminates.

Top and matching front edge to be high-pressure plastic laminate factory bonded.

Provide balancing sheet on opposite face.
Provide countertops for base cabinets and counter sections.

Laminate tops and shall be continuous in practical lengths. When requiring splice joints, use a combination of splines or dowels for alignment and tite-joint fasteners as required to make a uniform and gap less joint. Splices in counter top materials shall not occur where openings for sinks or other holes are required.
1. Provide continuous top for counter type cabinets fixed in a line.

Provide 4 inch high scribable, square set, color matching, and mechanically attached back splash with end splashes.

1. Back splashes are required at locations where countertops abut walls where indicated on Drawings.
2. Edges of back and end splashes shall be of square edge configuration.
3. Back and end splashes shall not rest on to. Top shall butt to back and end splashes, joint shall be set in appropriate sealant.

Sealants: Fully bed and seal splashes to tops and to other splashes with Dow Corning 786 Mildew Resistant Silicone Sealant, clear.

Additional approved manufacturers of mildew resistant silicone are as follows:

1. General Electric
2. Rhone-Poulenc, Inc.

Provide Marine grade boat plywood, 4 feet either side of sinks (Wet Areas) back splash shall also be marine grade boat plywood.

PART 3 – EXECUTION

INSTALLATION

Shop drawings and installation instructions furnished by the manufacturer shall be strictly adhered to. Mechanics making the installation shall be experienced in this type of work and capable of the highest quality of workmanship. Installation of casework shall conform to The Architectural Woodwork Institute (A WI) Quality Standards, Installation of Woodwork, latest edition. Countertops shall be installed flush against wall. Provide clear sealant at the top and around the ends of countertops, end and back splashes where they meet wall surfaces.

Cut openings in countertops for sinks or other items required. Cut to size from template furnished by supplier of sinks or use the designated sinks on job.

Make use of filler sections and scribe panels to fit cabinet work into specific dimensions. Provide maintenance instructions to Architect prior to request for final payment.

Upper cabinets shall always be aligned with base cabinets unless otherwise approved by Architect.
ADJUSTMENT

Adjust door catches, drawer slides, and other moving parts after installation to provide proper operation.

End cabinets placed against comers where they tee into other cabinets or obstacles shall be provided with chain or bracket stops on the inside of the doors to prevent the door or door handles from hitting the obstruction.

CLEANING

Exposed surfaces, edges, and cabinet interior shall be cleaned, and construction and installation marks removed prior to acceptance by Owner.

Supplier of this equipment shall be responsible for the immediate removal and disposal of trash, crating, and construction debris.

All foreign matter and sawdust created by installation of cabinets shall be removed from the interior and exterior of cabinet.
DIVISION 13 - SPECIAL CONSTRUCTION

Miscellaneous

Vacuum Cleaning System: Consider Spencer system, if budget permits, possibly as an add alternate.

Clocks: Shall be plug-in type not on a master clock system.

Telephone Conduit: All telephone wiring is district property. Termination must be coordinated through the appropriate telecommunications firm.

Key-operated Switches: For continuity throughout the campus, specify only Pass & Seymour devices.
14200 - ELEVATORS

PART 1 - GENERAL

1.1 DEFINITION: Elevators shall be required as a means of vertical transportation for all new two story (or greater) schools and existing two story schools undergoing Comprehensive Needs projects to meet ADA compliance.

A. Intended Use:

1. The primary use of an elevator is for students, staff and visitors that are not able to use a stairway. A secondary use is for transport of items that are too bulky or oversized to be moved from story to story by stairway. The elevator is not intended to be a high use item and should not be used as a normal means of vertical transportation.

2. This elevator standard is designed and written for an indoor elevator only, where entry and exit occur within the facility. The reason for this is to protect elevator components from the Florida climate and moisture. The elevator equipment room shall also be located within the facility and in a climate-controlled environment to control heat load.

3. If an exterior elevator is used, as in the case of a reused prototype building, it shall be protected from the elements with the use of canopies and overhangs.

B. Basis of Product Selection

1. The elevator manufacturers listed in this standard have been selected on product dependability, availability, user-friendly service, experiences with past installations and design requirements established by codes and user requirements established by SDOC Facilities Operations.

1.2 QUALITY ASSURANCE

A. Installer Qualifications: Elevator manufacturer or experienced installer approved by elevator manufacturer, who has completed elevator installations similar in material and design to the Construction Project.

B. Regulatory Requirements: Manufacturer and Contractor shall comply with applicable provisions in ASME A17.1 “Safety Code for Elevators and Escalators”.

C. Florida Statutes: Chapter 399.

D. Florida Administrative Code: Chapter 61C-5.

E. Accessibility Requirements: Americans with Disabilities Act (ADA), Accessibility Guidelines (ADAAG) Section 4.10 Elevators.
F. Pre-Construction Surveys/Conferences

1. The elevator manufacturer or the elevator installer shall attend the pre-construction conference and clarify components, conditions, schedules, testing and certification with the prime contractor.

1.3 INSPECTION AND CERTIFICATION

A. The elevator must be inspected and approved by an independent qualified elevator inspector (Q.E.I.) before a Certificate of Occupancy is issued for the facility.

1.4 SUBMITTALS: GENERAL INSTRUCTIONS, PRODUCT DATA, CERTIFICATES

A. Manufacturer’s Product Data sheets shall be required for each item specified.

B. Shop Drawings

1. Show plans, elevations, sections and large-scale details indicating service at each landing, machine room layout and locations of equipment and signals.

C. Samples shall be specifically required for non-specified manufacturer’s products submitted as a Substitution.

D. Maintenance Manual

1. Supply to the owner an operation and maintenance instructions manual that includes a parts inventory listing and emergency operation instructions and wiring diagrams. All replacement parts, to include the electronic controller, shall be available to the owner for purchase and installation after the warranty period has expired. (See Div. 1 Section 01770 – Closeout Procedures for O&M submittal requirements.)

E. Record Wiring Diagram:

1. Supply the owner with a job specific record set of the wiring diagram used for the installation of the elevator to include related connection charts and diagrams.

1.5 WARRANTY

A. Project Warranty shall be as stated in Division 1 of the Project Manual.

B. Maintenance Service

1. Routine maintenance consisting of regular examinations, adjustments and lubrication of the elevator equipment shall be provided by the installation contractor for the entire 1 year warranty period.

C. Installer’s Warranty

1. The elevator contractor’s warranty covers defective material and workmanship. The guarantee period shall be as stated in Division 1 of the Project Manual.
PART 2 - PRODUCT

2.1 ACCEPTABLE MANUFACTURERS
A. ThyssenKrupp Elevators
B. KONE Elevators Escalators.
C. Otis Elevator Co.

2.2 COMPONENT PERFORMANCE CHARACTERISTICS:
A. System Description:
   1. Type: Twin direct acting hydraulic cylinder without well holes.
   2. Rated Capacity and Speed: 3000 pounds @ 100 fpm.
   3. Number of Stops: 2.
   4. Minimum car inside dimension: 6'-8” wide x 4’-9” deep x 7’-4” beneath the suspended ceiling.
   5. Platform Size: 7’-0” wide x 5’-6” deep.
   6. Main Power Supply: 480 volts, 3 phase
   7. Entrance Width and type: 3’-6”x7’-0” Single-Slide Door.
   8. Lighting Power Supply: 120 volts, 1 Phase,
   9. Hoistway Entrance Frame Finish: Satin Stainless Steel
   10. Hoistway Entrance Door Finish: Satin Stainless Steel
   11. Door Opening Time: 4.0 seconds.
   12. Controls: Provide manufacturers microprocessor operation system. The owner shall be able to purchase the microprocessor from the manufacturer or have the microprocessor and solid state components repaired by the manufacturer. Controls shall be illuminated and vandal proof. Controls shall be nonproprietary.
   13. Hall and Car Signal Fixtures: Illuminated vandal proof hall buttons shall be provided at each landing. Faceplates shall be satin finished stainless steel with vandal resistant fasteners. Provide a minimum of eight (8) keys for the car controls.
   15. Intercom Provisions: Elevator shall have an ADA vandal resistant phone in the elevator cab. Telephone lines, in conduit, shall be furnished from the elevator cab to the elevator equipment room.
   16. Cab Interior finishes:
      a. Front return, door and transom: Satin Stainless Steel 
      b. Cab Shell: Baked enamel painted steel.
      c. Removable wall panels: Wood core finish (no particle board)
      d. Reveals & Base: Satin Stainless Steel 
      e. Railing: Provide handrails on sidewalls and back wall of elevator 1/2”x1 - 1/2”.
      f. Suspended Ceiling: Minimum height of 7’-4” with a solid ceiling panel.
g. Interior Lighting: Indirect using 120V 1 phase fixtures. The interior lighting shall have a main lighting system connected to standard power and an auxiliary lighting system connected to the emergency generator.

h. Flooring: Flooring shall be a single piece material, Altro Safety Flooring, Designer 25 Series. (Note to A/E: Flooring furnished and installed by others.)

17. Motor: Elevator motor shall have “solid state” starting and an overload device.


2.3 ELEVATOR OPERATION

A. Pressing a car button or a hall/landing button will “call” the car and bring it to the designated landing. A call for either landing or within the car may be made while the car is in motion. The car shall proceed to the next recorded landing that has been programmed until the calls have been satisfied. The car shall come to rest at the last called landing.

B. Provide an emergency stop switch, an alarm button and a light switch in the elevator car control panel.

2.4 ELEVATOR DOOR

A. The door shall have a solid state, multi-beam, infrared light array door protection system.

2.5 HOISTWAY ENTRANCE:

A. Provide manufacturers standard horizontal sliding door and frame hoistway entrance complete with track systems, hardware, sills and accessories.

2.6 STANDBY POWER OPTION

A. The elevator shall be equipped for standby power operation, usually in the form of a standby generator. On operation of standby power the elevator will return to designated floor and parked with doors open.

2.7 MACHINE ROOM

A. The elevator equipment room shall be adjacent to the elevator and be climate controlled to not allow overheating of the equipment or fluids.

2.8 ALLOWABLE SUBSTITUTIONS

A. Products other than those named in Acceptable Manufacturers and Specific Products above may be substituted when in conformance with all of the individual requirements stated in Component Performance Characteristics and approved by SDOC.

2.9 BASIS OF DESIGN type specifications shall NOT be used in the preparation of this Section. The Architect shall clearly specify a minimum of three named manufacturers complete with type and specific product selected. Manufacturers utilizing proprietary controllers will not be allowed. Controllers must be easily serviceable by any elevator service vendor.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine all elevator areas for compliance with manufacturer’s requirements for installation tolerances. Verify dimensions and examine structure. Proceeding with the elevator installation acknowledges contractors acceptance of existing site and building conditions. Do not proceed with any installation if unsatisfactory work conditions exist.

B. Any dimensional discrepancies shall be recorded and given to the prime contractor for correction before installation commences.

3.2 INSTALLATION AND ENVIRONMENTAL CONDITIONS:

A. It is important that hydraulic fluids are not allowed to leak into the environment. Spill plates shall be under all pumps and equipment that store hydraulic fluids. Vibration isolation shall be used on vibrating equipment to lessen structure borne noise from entering the facility.

B. Specified items of elevator equipment shall not be delivered or installed until the building is enclosed.

C. Install cylinders plumb and accurately centered for the elevator car position and travel.

D. Provide welded connections or continuous steel members in the elevator hoistway.

E. Assure that all moving parts are lubricated as recommended by the manufacturer.

F. The elevator alignment in the shaft is very important. Coordinate the installation of the hoistway entrances and the guide-rails for an accurate alignment of the entrances with the cars. Install sills and frames after car has been installed in the shaft.

G. A leveling tolerance of ¼” should be used for travel of the car passed the landing. Set the sills flush with the finished floor of the elevator.

3.3 DEMONSTRATION

A. A manufacturer’s representative shall demonstrate to the owner the proper use, operations and maintenance and emergency procedures to follow if there is a failure of the elevator.

3.4 PROTECTION

A. Do not allow use of the elevator by anyone until it has been tested and certified as explained in ASME A17.1. Do not use the elevators for construction purposes.

END OF DIVISION 14
DIVISION 21 – FIRE SUPRESSION

21000 –Fire Protection Design Guidelines

All plumbing and fire protection systems shall be designed in accordance with the latest version of the Standard Plumbing Code (SMC), NFPA 13, Uniform Building Code (UBC) and SREF Requirements. In addition, the following guidelines are design guidelines for all SDOC projects. Request for deviations from the guides and requirements must be made in writing to School District of Osceola County.

Fire Protection (sprinkler) systems shall be designed by the project engineer of record with all work clearly shown on the construction drawings. The design of the system shall not be specified for the Contractor. Utilize recessed sprinkler heads with concealing cover where possible. Sprinklers shall be glass bulb type, with hex-shaped wrench boss integrally cast into the sprinkler body. Sprinklers with O-rings are not permitted. Victaulic Automatic Sprinklers.

1. Grooved joint fittings, couplings, and valves shall be provided by a single manufacturer, and be UL listed and FM approved for fire protection / sprinkler service. The grooving tools shall be of the same manufacturer as the grooved components.

   a. Couplings shall consist of two ductile iron housing segments, pressure responsive gasket, and zinc-electroplated steel bolts and nuts.

      1) Rigid type coupling shall include offsetting angle-pattern bolt pads, fully installed at visual pad-to-pad offset contact. (Couplings that require specific torque ratings for proper installation are not permitted.) Where applicable, couplings shall be installation-ready, for direct stab installation without field disassembly. Victaulic Style 009-EZ, FireLock Style 005, or 07.

   b. Flexible type couplings shall be used where vibration attenuation and stress relief are required, and for seismic applications. Victaulic Style 75 or 77.

   c. Fittings shall be manufactured of ductile iron per ASTM A536; wrought steel per ASTM A234; or factory-fabricated from carbon steel pipe conforming to ASTM A53.
d. The grooved coupling manufacturer's factory-trained representative shall provide on-site training for the contractor's field personnel in the use of grooving tools and installation of grooved joint product. The representative shall periodically visit the job site to review best-practices are being followed. (A distributor's representative is not considered qualified to conduct the training.)

Piping and ductwork located in or passing through an UL-listed wall, floor, or roof/ceiling assembly shall have the requirements of the UL listing included on the drawings. The UL-listing number shall be identified on the drawings.

END OF DIVISION 21100
DIVISION 22 – PLUMBING

22100 – Plumbing Design Guidelines

All plumbing shall be designed in accordance with the latest version of the Standard Plumbing Code (SMC), NFPA 13, Uniform Building Code (UBC) and SREF Requirements. In addition, the following guidelines are design guidelines for all SDOC projects. Request for deviations from the guides and requirements must be made in writing to School District of Osceola County.

Domestic boilers with separate storage tanks are preferred over the forced draft tank type water heaters.

For standardization and availability of equipment and parts, Bell and Gossett Pumps are preferred for pipe systems 2" and larger. Grunfos pumps are preferred for pipe systems less than 2".

All underground and under floor gas lines shall be welded and coated - no threaded joints underground or under floor. All propane installations shall follow 601 Florida Standards.

Plumbing Valves shall be ball type (2-1/2" and under) or butterfly (3" or greater). (Victaulic Series 608) Gate valves are prohibited. No foreign-made or PVC valves and no CPVC valves over ¾”. Do not specify self closing valves or valves with plastic stems.

For standardization purposes, Sloan, Regal, Zurn, Theia, or Royal flush valves shall be specified. No other fixtures are acceptable.

Fully recessed drinking fountains or other recessed & remote type fixtures are prohibited. NO floor mounted drinking fountains.

Oasis and Elkay drinking fountains are acceptable manufacturers.

No wall-hung toilets (for vandalism and cost reasons). Tile grout floor mounted water closet to floor. Caulking floor mounted fixtures to floor is prohibited.

No floor urinals.

All CPVC transition fittings (both MIP & FIP) shall be CPVC X Brass IPS.

No CPVC ball valves over ¾” in size.

No PVC male adaptors. Transitions are to be made with PVC schedule 80 nipples only.

All air-hammer arrestors shall be Zurn Shocktrols and installed with isolation valves.
All access panels shall be large enough and located as to make the entire apparatus accessible for servicing.

All water closets shall be flushometer or tank type. Pressure-assisted are prohibited due to cost of maintenance.

All flush valves shall be externally mounted, no concealed installations.

All C.I. lavatories shall be installed with concealed-arm, chair carriers.

All hose bibs shall be Woodsford loose key.

All wall hydrants shall be Woodsford, Watts or Zurn only.

All hose bibs and wall hydrants shall have isolation valves.

No point-of-use instant electric waters heaters.

All cleanouts must be brought to grade and provided with a concrete apron.

No kitchen sinks with stoppers and chains.

All kitchen sinks with scullery/level drains.

All kitchen sinks shall be supplied with T&S commercial fixtures.

All rest room lavs. shall be supplied with T&S commercial fixtures.

Upstream and downstream cleanouts required on all grease traps.

All lids for grease traps must be heavy-duty traffic lids.

All irrigation systems must use Schedule 40 PVC at a minimum of 12 inches deep. For beds, use poly pipe with flexible piping. Purple primer when gluing shall be used.

Shut-off valves should be liberally placed to isolate sections of the facility without disrupting the operation of other operations within the facility.

Cleanouts should be located maximum of 75'-0" on 4" and larger piping and 50'-0" for smaller piping. Wall hydrants and hose bibs should be located a maximum of

All trap primers shall be Wolseley ProFlo PF127 series, no substitutions are acceptable.

Floor drains are required in all showers, locker rooms, concession areas, toilet rooms, boiler rooms and air handler/mechanical rooms. Primer tap required on all floor drains except in kitchen areas. Approved deep seal trap can be used in lieu of trap primer in areas accepted by Owner.
No Type "M" or "K" copper piping. Only Type "L" copper piping is desired. If PVC or CPVC is to be used, use Factory U.L. fitting, no field fittings permitted. No PVC waterlines inside footer lines.

Grooved joint fittings, couplings, and valves shall be provided by a single manufacturer. The grooving tools shall be of the same manufacturer as the grooved components.

1. Couplings shall be manufactured to copper-tube dimensions and consist of two ductile iron housing segments cast with offsetting angle-pattern bolt pads, grade EHP gasket rated to +250 deg F, and zinc-electroplated steel bolts and nuts. Couplings shall be installation-ready for direct stab installation without field disassembly. Victaulic Style 607.

2. Fittings shall be manufactured of wrought copper per ASME B16.22 or cast bronze per ASME B16.18, manufactured to copper-tube dimensions. Flaring of tube or fitting ends to accommodate alternate sized couplings is not permitted. Victaulic Copper-Connection.

3. The grooved coupling manufacturer's factory-trained representative shall provide on-site training for the contractor's field personnel in the use of grooving tools and installation of grooved joint product. The representative shall periodically visit the job site to review best-practices are being followed. (A distributor's representative is not considered qualified to conduct the training.)

1-1/2" and smaller domestic water with Type 'L' hard copper tube may be installed using push-to-connect fittings and joints. Fittings shall be manufactured of wrought copper per ASME B16.22 or cast bronze per ASME B16.18, with 301 stainless steel internal components, and EPDM seals. Victaulic Permalynx.

No copper waste lines to photo lab sinks or sinks subject to acid use.

Acid Waste systems shall be fused seal plastic pipe. Glass waste pipe shall not be specified.

Hot water piping shall be insulated per the Florida Energy Efficiency Code. Horizontal rain leaders and the bottom of all roof drains shall be insulated with closed cell type insulation.

If the plumber provides condensate lines, lines shall be 1" minimum, sloped 11/4" per foot, and shall be designed to allow individual cleanout of each line. An air gap shall be provided in the condensate drain at the exterior of the building. Condensate drywells are not desired. Rout condensate to storm drainage system, if possible. Condensate drains should connect to air outside perimeter of the building envelope. Condensate drains that connect to dry wells or other soil may become direct conduits for soil gas and can be a major entry point for radon.
Piping and ductwork located in or passing through an UL-listed wall, floor, or roof/ceiling assembly shall have the requirements of the UL listing included on the drawings. The UL-listing number shall be identified on the drawings.

22700 - Renovations/Plumbing

For projects where it is necessary to disconnect, relocate, or otherwise involve existing equipment, the Architect and Engineer shall ensure that the Contractor first establish the condition of the equipment by completing an Equipment Log Sheet. Engineer shall include this Log Sheet in the Specifications.

Specifications shall clearly define the role of both the Contractor and the School Maintenance personnel during construction, start-up, and warranty period.

END OF DIVISION  22000
Division 23 HVAC Design Guidelines

All HVAC systems shall be designed in accordance with the latest version of the Standard Mechanical Code (SMC), Uniform Building Code (UBC), SREF Requirements, and the Florida Building Code Latest Edition Mechanical Section. In addition, the following guidelines are mechanical design guidelines and requirements for all School District of Osceola County projects. Requests for deviations from the guides and requirements must be made in writing to School District of Osceola County. Phase II and Phase III Documents will be reviewed and signed off by Design Review Committee (DRC) members and the appropriate maintenance representatives prior to construction. All HVAC projects will be commissioned per the Department of Energy Guidelines.

Mechanical Design Guidelines

The following Phase II submittal requirements are in addition to the requirements listed in the Florida Administrative Code 6A-2. These submittal items are for review by the School District of Osceola County and are intended to demonstrate compliance with SDOC requirements and for review of the system design as it pertains to indoor air quality concerns. The design, plans and submittal items will be reviewed by School District of Osceola County with a peer review by their continuing contract Mechanical Engineer.

1. Provide floor plans of the proposed HVAC systems along with equipment sizing and schedules.
   a. Grooved joint couplings and fittings shall be shown on drawings and product submittals, and shall be specifically called out by the manufacturer's style or series designation.

2. Indicate the quantities of outside ventilation air and how this outside air is to be introduced to the spaces, conditioned and dehumidified when the spaces are occupied and unoccupied.

3. Provide a proposed sequence of operation for the different applications of the air-conditioning systems within the project, i.e. classroom, gymnasium, dining, administration, etc. School District of Osceola County specifications, Sections 23950 "Energy Management and Controls System" and Section 23985 "Sequence of Operation" spec shall review Section B.

4. Complete a HVAC design parameter worksheet for each HVAC system type and each building type within the project.
5. Provide a simple psychometric analysis of air conditioner cooling performance of the system selected by the FLEET analysis during full and partial loads (75%, 50%, 25%) for each typical air handling system to show that adequate dehumidification and cooling will be provided at full and partial loads.

**General**

**Mechanical Rooms**

All mechanical equipment shall be located inside the building wherever possible. The Design Consultant shall allow for adequate mechanical space during the programming phase. (Architectural graphics standards shall be used as a guideline.)

Mechanical rooms shall be designed in accordance with all applicable codes.

Mechanical rooms shall be designed to provide adequate maintenance clearances for all equipment (such as tube and coil pull spaces). Adequate means of access shall be provided for replacement of the largest piece of equipment without removing walls. Clearance shall be adequate to allow maintenance activity without disassembly of any fixed piping, supports, and so forth. Clearance shall be provided around boilers and pressure vessels in accordance with the Pennsylvania Boiler Code.

1. Unions and flanges for maintenance and servicing are not required in installations using grooved mechanical joint couplings and fittings. (The couplings shall serve as disconnect points.)

Mechanical rooms with heat-producing equipment shall be provided with an automatic ventilation system.

Mechanical rooms shall be provided with a minimum of one floor drain. Floor drains shall be piped to a sanitary system.

Mechanical rooms shall be provided with at least one hose bib with backflow preventer in the supply piping.

All equipment drains, blow down lines, and such shall be piped to a floor drain with an approved air gap fitting. (See Section 23510 Hydronic Piping.)

Mechanical rooms shall be located to provide access directly from the building exterior. Where this is not possible, mechanical rooms shall be accessed from public spaces.

Mechanical rooms shall not be located where vibration and/or noise will be objectionable.

Mechanical rooms shall be heated to maintain 55°F minimum.

HVAC Systems shall be selected based on life cycle cost analysis results and confirmed by the Department of Education. The Architect/Engineer shall inform the SDOC facilities staff of the probable first and maintenance costs of the various alternatives prior to life cycle cost submission.
• Provide mechanical equipment in separate mechanical rooms with access from outside. Air conditioning units, conduit and piping shall not be installed on roofs. Rooms shall be designed to allow minimum of (4) four feet clear walk space around equipment. Install manufacturer recommend clearances for air handling units, boilers, chillers, VAV boxes, pumps, valves, etc.

All mechanical rooms and equipment rooms shall contain emergency lighting.

Engineer shall provide a psychometric analysis of air conditioner cooling performance of the system selected by the life cycle cost analysis during full load and partial sensible loads (75%, 50%, 25%) for each typical air handling unit to show that adequate dehumidification and cooling will be provided at full and partial loads. This information shall be provided to SDOC and Contractor for review prior to proceeding with Phase II documents.

23100 Indoor Design Parameters

Cooling temperature set points shall be adjustable between 72° to 78° F. Relative humidity shall be at 60% or below per ASHRAE Standard 55-92 during full and part load conditions. Heating temperature set points shall be adjustable between 68° to 72° F.

Duct static pressure sensor shall be located in DDC panel. Tubing shall be ran for sensor 2/3” down the length of the duct.

Cooled and heated occupied spaces shall be provided with ventilation air at the rate established by the latest revision of ASHRAE Standard 62 by the "Ventilation Rate Procedure" where acceptable air quality is achieved by providing ventilation air of the specified quality and quantity to the space.

Outside air shall be controlled by CO² sensors in Gym, Cafeteria, and Media Center.

Maintain positive pressure within conditioned spaces (relative to unconditioned environments) during occupied periods. Maintain neutral or positive pressure in conditioned spaces during unoccupied periods. Pressure relief shall be by dampers, power exhaust fans are undesirable.

Provide positive air balance for all air-conditioned buildings.

Noise levels shall not exceed ASHRAE recommendations, and ARI Standard 885, procedure for estimating occupied space sound levels.

All classrooms shall be designed with individual zone controls and space thermostat. Thermostats shall be auto changeover with separate heating and cooling set points with limited set point adjustment accessible to District Staff. DDC software shall limit cooling range to 72° to 78° F cooling and 70° F heating. A minimum of one humidistat per AHU system shall be located in a typical room. Locate humidity sensors in critical spaces.
Plans and details shall include location of central workstation and all control panels and devices. In addition, plans shall indicate control zones with room numbers and zone names as coordinated with SDOC. For example, if three AHUs and one exhaust fan are to be turned on/off at the same time, indicate the zone by showing a dashed box around all areas served by these units. Specify that control diagrams shall be installed in respective mechanical rooms in a lockable glass and aluminum case.

Time schedule shall be used to control Outside Air and all exhaust. Time schedules shall be the same for Outside Air and all exhaust.

Service space and access requirements for all equipment shall be indicated on the drawings (using dashed line) to include equipment, components and filter removal. All clearance shall be per manufacturer spec design.

1. Unions and flanges for maintenance and servicing are not required in installations using grooved mechanical joint couplings and fittings. (The couplings shall serve as disconnect points.)

Kitchens and food preparation areas shall be air conditioned separate from primary system. DX systems are preferred due to hours of operation. Dry storage areas shall be cooled and dehumidified 24 hours per day, 7 days per week using separate DX systems. Consider use of packaged heat recovery units to preheat makeup water to hot water heaters.

The Architect shall insert in the Mechanical General Conditions of the Specifications for the project the following statement: "Final payment for this Contractor's work will not be approved until Owner's independent Test and Balance Company confirms conformity to plans and specifications and all DDC control sequences are verified by the design engineer."

- The construction documents shall specify that the Contractor is solely responsible for coordinating their work with the Owner's Test and Balance firm. All discrepancies drive changes, etc. reported by Engineer or Owner's Test and Balance Firm or Commissioning Authority shall be corrected by the Contractor within five-calendar day at no additional cost.

Refrigeration equipment shall utilize refrigerant R-134A, or 410A. Machines shall utilize R-134a, or 410A refrigerant. Mechanical room ventilation refrigerant detection and purge shall be designed per ANSI/ASHRAE Standard latest edition. Alarm signal shall be tied into EMCS System.
To facilitate weekend and holiday use, Administration Buildings shall have backup DX systems for entire area. If budget is restrictive, provide as an alternate bid.

- Prefer gas-heating boilers to electric heat. No steam systems. Natural gas preferred over LPG if available at site. Fuel oil is not desirable. For standardization purposes, specify Honeywell burner controls and Locinvar, Wright, Burham, or Teledyne Laars boilers, and LonMark interface to DDC. All boilers, even under 400,000 BTU, shall be equipped with hi limit manual reset and flow control switch, where flow is critical to installed boiler. Boilers shall have an emergency cut of switch located at door entrance (inside). Boilers must have proper temp and pressure gauges on tanks, discharge, and return lines. Boiler rooms shall have sufficient lighting.

Where possible, boiler shall be located separate from chiller rooms due to high noise level. All fresh air intakes shall not be installed near outside ground, to prevent dirt and dust from being drawn into boiler fans, burners and controls. A gas detector shall be located in boiler rooms. Boilers shall have more room for proper servicing from front and rear. No piping, etc. shall be located near access panels.

Boilers, like Lochinvar type, shall not be stacked 3 high due to service being difficult. Boilers shall have isolation valves on supply and discharge. All flow to floor drains shall be carefully sloped, installed in H&V and boiler rooms so that water will not stand. New boilers and controls shall be the same make as the majority of boilers, with that type of installation.

Owner Test and Balance will be provided under a separate Owner Contract and Specification using National Standards Total System Balance by Associate Air Balance Council. Test and Balance shall be A.A.B.C. members and maintain all A.A.B.C. certifications.

All control wiring shall be installed in conduit. For accessible ceiling spaces, plenum rated cable may be used, if strapped to building structure using data rings.

23200 – Systems

Do not use horizontal fan coil or unit ventilators where possible. If unit ventilators are required due to structural reasons, do not introduce ventilation air into unit. Provide ventilation air through preconditioned outside air systems.

23300a – Direct Expansion Cooling Systems

Utilize multiple compressors with unloading capability where possible.
For multi-stage equipment utilize dual (or more) circuit split face coil with the first stage of cooling on the bottom of the coil. Do not use row split or intertwined coils.

Consider hot gas reheat where conditions require reheat for humidity control.

Where possible, utilize a separate zoned 100% outside air unit to provide conditioned, dehumidified air to the classrooms in lieu of providing raw outside air to each air handling unit. This unit will be controlled to provide air to the space at near space conditions or to supplement cooling/heating of the space. The outside air A/C unit shall be controlled by the energy management system, shall include motorized outside air dampers, and shall have minimum 30% efficiency filters. During non-occupied times, outside air unit shall close the outside air damper. Provide end switches on the outside air to ensure that dampers are open.

23300b – Chilled Water Systems

Cooling coils shall be piped counter flow to airflow.

Provide central system chilled water temperature control to provide adequate low temperature water for dehumidification. Chilled water temperature reset shall not be used unless space humidity is being monitored throughout the facility. Design shall deliver cold chilled water at part-load. Do not bypass water through an inactive chiller.

Utilize multiple chillers or multi-stage chillers after 200 tons. Provide a minimum of 25% redundancy for chiller system (i.e. if the block cooling load is 200 tons, the chiller plant shall be capable of providing at least 100 tons if any one chiller, pump, cooling tower, or refrigeration circuit is down). Air-cooled equipment is preferred if life cycle cost is comparable with other alternatives.

Piping systems serving more than one building shall be primary-secondary with backup pumping capacity for secondary pump(s). The piping layout shall be coordinated with school master plan to facilitate future growth.

Provide service isolation shutoff valves, a separate balancing valve, Venturi flow meter (or circuit setter), strainer, drain, and automatic air vents at each coil.

Provide strainer downstream of the isolation valve at each coil with drain valve and nipple fitting. Strainers shall include a fully stainless steel basket.
1. Grooved end strainers are acceptable in grooved piping systems. Victaulic Style 732

Specify pipe-flushing velocities to remove sand and debris prior to system start-up, mains 10 f.p.s., branch piping 23 f.p.s.

For renovation, replace split-row or intertwined multi-circuited coils with split face coils with bottom coil activated first.

Isolation valves shall be ball (2-1/2" and under) or butterfly (3" or greater). Gate valves are not acceptable. Butterfly valves shall include a stainless steel stem which is offset from the disc centerline to provide full 360-degree circumferential seating, and the seat shall be pressure responsive. Provide isolation valves at each building and main building areas. Victaulic Series 726 and MasterSeal.

Grooved joint fittings, couplings, and valves shall be provided by a single manufacturer. The grooving tools shall be of the same manufacturer as the grooved components.

1. Couplings shall consist of two ductile iron housing segments, pressure responsive gasket, and zinc-electroplated steel bolts and nuts.
   a. Rigid type coupling shall include offsetting angle-pattern bolt pads, fully installed at visual pad-to-pad offset contact. (Couplings that require specific torque ratings for proper installation are not permitted.) Where applicable, couplings shall be installation-ready, for direct stab installation without field disassembly, and rated to +250 deg F. Victaulic Style 107 or 07.
   b. Flexible type couplings shall be used where vibration attenuation and stress relief are required, and in lieu of flexible connectors at pumps and vibrating equipment. Victaulic Style 77.
   c. Flange Adapter: Flat face, ductile iron housings with elastomer pressure responsive gasket, for direct connection to ANSI Class 125 or 230 flanged components. Victaulic Style 741.

2. Fittings shall be manufactured of ductile iron per ASTM A536; wrought steel per ASTM A234; or factory-fabricated from carbon steel pipe conforming to ASTM A53.

3. The grooved coupling manufacturer's factory-trained representative shall provide on-site training for the contractor's field personnel in the use of grooving tools and installation of grooved joint product. The representative shall periodically visit the job site to review best-practices are being followed. (A distributor's representative is not considered qualified to conduct the training.)

Central systems shall be capable of providing cooling and heating to maintain acceptable temperature and humidity levels in all buildings. Four-pipe systems are preferred. No two or three pipe distribution systems are permitted.
For re-circulating systems with outside air ducted to return duct, provide motorized low-leakage dampers for the outside air intake and return air. These dampers shall be spring return and operate independent and be controlled by the energy management system and shall close when the air handling unit is shut down or when the space is not occupied. Outside air dampers shall be on a separate schedule from the equipment on/off schedule. Consider specifying a low occupancy mode of operation in control sequences. Motion detectors are not acceptable; instead CO² sensors shall be used to control Outside Air, on main rooms, per ASRAE Outside Air Standard. Provide manual dampers in the outside air and the return air ducts to balance the outside air to the unit.

If a variable air volume system is utilized, the system must be designed to ensure the correct flow of ventilation air is distributed to occupied spaces at all supply airflow conditions during occupied periods.

Condensate drains shall be 1" minimum, sloped 1/4" per four feet, and shall be designed to allow individual cleanout of each line. Condensate drain trap detail and piping shall be shown on the drawings. An air gap shall be provided in the condensate drain at the exterior of the building. Condensate drywells are not desired. If possible, route condensate to storm drainage system. Condensate drains should connect to air outside perimeter of the building envelope. Condensate drains that connect to dry wells or other soil may become direct conduits for soil gas and can be a major entry point for radon.

Refrigerant piping shall be shown on the drawings. All piping below slab shall be run in a piping chase or conduit of sufficient size to allow replacement of the piping in the future. Each end of the chase shall be sealed air and watertight. Refrigerant piping above grade shall be accessible or enclosed in a suitable chase. Specify Contractor to submit refrigerant piping shop drawings. DX equipment manufacture shall certify sizes, per Carrier System Design Manual.

Ductwork shall be externally wrapped sheet metal construction with all joints sealed per SMACNA Standards. Observation of construction should include visual inspection of duct workmanship. All concealed, insulated ductwork shall be wrapped in lieu of lined, except where required for sound control. Any lined duct shall have microbial/moisture preventative coating.

Sound and vibration control of mechanical equipment shall be part of the mechanical design. Noise levels shall be carefully considered in the selection of all mechanical equipment and design of ductwork systems. No cork or neoprene absorption pads. Spring isolation on all equipment is preferred.

Water treatment service shall be included for all HVAC hydronic systems for the warranty period. The water treatment system will be periodically checked by the company currently under contract for the other facilities within the district.
Piping and ductwork located in or passing through an UL-listed wall, floor, or roof/ceiling assembly shall have the requirements of the UL listing included on the drawings. The UL-listing number shall be identified on the drawings.

New schools and major additions shall include the installation and or expansion of a DDC Energy Management and Control System. Basis of design shall be according to LonTalk protocol EIA standard 709.1: Circon, TAC or Distech, based on past performance, see LonMark spec. Check with SDOC if an existing system is on campus.

Do not use common headers or returns on the condenser side of the chilled water system. Each chiller shall be piped to its own tower. Each supply riser pipe to each tower shall have a check valve. Each tower, chiller and condenser pump shall be cross-connected with manual valves to provide redundancy.

Carbon Dioxide shall be used as fire extinguishers for range hoods. The Ansul system is preferred.

Provide lockable covers for security over thermostats and sensors in gym and common areas.

Rooftop mechanical units will not be accepted for new design work unless approved by SDOC project manager. If DX systems are considered, use split systems. There is to be no AHUs above ceilings or attics per energy code and the Maintenance Department.

Combustion heating systems should be provided with combustion air and dilution air from outside the occupied space in accordance with the Standard Gas and Mechanical Code.

The following spaces should be designed for 24-hour air conditioning and dehumidification (The use of industrial dehumidifiers is preferred for after hours dehumidification):

A. Computer Labs  
B. Science Labs  
C. Record Storage Rooms  
D. Band Instrument Storage Room  
E. Data Rooms  
F. Media Centers  
G. Textbook Storage Rooms

SDOC prefers chilled water systems where life cycle costs show it to be comparable with other systems. If DX, split DX systems are preferred over packaged DX units. Rooftop units are not desired.
23400 - Equipment

For standardization purposes, central station AHU design shall be based on Carrier, Trane, York and McQuay as the only acceptable manufacturers. Air handling units and fan coil units shall be double wall construction, if available. The primary condensate drain pan shall be stainless steel and sloped to drain completely on one or both sides. Heating coils shall be placed in the reheat position. Install access panels for inspection and cleaning every 10 feet in sheet metal duct to access coils, screens, heaters, flow stations, etc. The use of germicidal lamp technology should be considered.

Air handling and ductwork systems shall be protected from construction dust during the construction period. Specifications shall include provisions for system inspection and cleaning if deemed necessary at no additional cost to Owner. Provide a minimum of 30% efficiency filter for all air handling units and fan coil units. Pleated throwaway type is preferred. Specify standard manufactured size. At least one set of filters shall be installed in all equipment during construction and replaced with a new set prior to Contractor test and balance and again prior to Owner test and balance. All outside-air shall be filtered with minimum 30% dust spot extended surface efficiency filters. All filters shall be readily accessible. Contractor shall replace all filters monthly after startup of systems until Final Completion.

Outside Air intake louvers shall have 1/2" x 1/2" minimum mesh screen.

The Architect and Engineer shall select and specify insulation systems that not only satisfy the minimum energy standards, as defined by the State Energy Efficiency Code, but also prevent condensation during periods of start-up of the system. Fiberglass pipe insulation may not be used as cold pipe insulation. Horizontal rain leaders and the bottom of all roof drains shall be insulated. Control valves, piping specialties and condensate drain lines shall be insulated.

Cooling towers shall be set at a sufficient height to ensure net positive suction pressure at pumps. Cooling towers shall be located a sufficient distance away from outside air intakes to prevent contamination of the intake air.

Centrifugal pumps are preferred. Grooved end triple-service valve assemblies consisting of a grooved end butterfly valve (Victaulic MasterSeal) with memory stop feature and flow-measuring check valve (Victaulic Series 779) shall be used at pumps. Triple duty valves are not desirable.

Install water meters on all loops. Meters shall be analog.

A two (2) year warranty, maintenance and service contract shall be included in the specifications for the complete HVAC system. The specification shall include detailed requirements of agreement.
Provide for Owner to receive manufacturer's brochures and operating instructions from Contractor, and for Mechanical Subcontractor to instruct School Maintenance technicians in operating procedures.

If electronic flow meters are used, specify Venturi type with electronic analog differential pressure sensor for measuring flow.

Smoke detectors shall be photoelectric type. Ionization type smoke detectors shall not be used.

As a minimum, humidistat’s shall be located in:

A. Book Storage  
B. Library  
C. Print Rooms  
D. Media Rooms  
E. Computer Labs  
F. Science Labs  
G. Typical classrooms  
H. At least one per building on campus

* Do not install humidistat’s in return air ducts for after hours dehum-mode.

- Classroom thermostat set point shall be occupant adjustable (with software limits). VAV boxes shall be marked by room on all T-STATs, ceilings, and Energy Management Systems. No 277 volt single-phase motors.

- All Variable Frequency Drives shall be provided by either the controls or mechanical contractor. ABB, Graham, or Baldor are acceptable manufacturers. Motors to the drives shall be the same manufacturer as the drives, with Class G insulation. Motors shall meet or exceed all MG1 requirements.

Locate returns accessible away from dust creating surfaces (chalkboards, etc.).

Supply and return air devices shall be aluminum.

All return air grilles shall be filtered with 1" throwaway filters with hinged access. Contractor shall provide initial set (used during construction), balance set (used for Contractor Test and Balance) and final set (used for Owner Testing). After Owner Testing period, Owner shall replace filters during warranty period.

Ceiling mounted and above ceiling air handling units are not desirable.
Specifications shall include a statement that if any unit AHU (10 tons or greater) vibrates and is causing noise problems, the fan shall be dynamically balanced in the field to factory specifications at no additional cost to Owner.

Plans shall indicate analog pressure gauges, thermometers, and Pete's plugs on the supply and return of all chillers, boilers, and pumps.

For fuel tanks, provide a fuel tank level indicator located in the Mechanical Room and provide an alarm to BAS on fuel level.

Cooling tower design shall be based upon Marley, Baltimore Air Coil, or Evapco. Basin shall be stainless steel. Fins shall be non-corrosive material. Specify guardrails and service access ladders. Cooling tower motors shall be located outside air stream.

Underground chilled and hot water piping on larger systems shall be underground, steel welded, pre-insulated piping. All underground piping shall be steel welded, domestic pipe. Foam glass insulation is allowable for smaller systems. Install insulation on pump housing that is removable for service.

23500 – Renovations/Equipment

Specifications shall indicate that the Contractor shall be fully responsible for refrigerant recovering, recycling, etc. for existing equipment per current EPA and ASHRAE requirements and all recovery forms shall be handed over to SDOC.

For projects where it is necessary to disconnect, relocate, or otherwise involve existing equipment, the Architect and Engineer shall ensure that the Contractor first establish the condition of the equipment by completing an Equipment Log Sheet. Engineer shall include this Log Sheet in the Specifications.

The Specifications shall clearly define the role of both the Contractor and the School Maintenance personnel during construction, start-up, and warranty period.

Coordinate any new controls with existing controls on campus. Intent is to have only one DDC control system manufacturer per campus. Coordinate requirements with the Maintenance Department prior to design.

END OF DIVISION 23
Division 25 5
Facility Automation System

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CHECKOUT, START-UP AND TESTING

ACCEPTANCE

SCHEDULE OF RESPONSIBILITIES

Notes to Schedule of Responsibilities:
SECTION 25100 - HVAC CONTROLS

Define General Scope of Work here

2) GENERAL

   a) Definitions

(1) **Alarm:** Notification of an abnormal condition.

(2) **Algorithm:** A logical procedure for solving a recurrent mathematical problem.

(3) **Analog:** A continuously varying signal value (temperature current, velocity, etc.)

(4) **Application Generic Controller (AGC):** A networked device or node that contains a complete, configurable application that is generic in nature and suited for various control tasks. The device manufacturer produces this application. The manufacturer exposes a high number of network variables and configuration properties on the device to allow the specific use of the device to be configured with network tools.

(5) **Application Specific Controller (ASC):** A networked device or node that contains a complete, configurable application that is specific to a particular task. This application is normally produced by the device manufacturer and contains a number of configuration parameters that may be adjusted by network tools.

(6) **Binary:** A two-state system where an "on" condition is represented by a high signal level and an "off" condition is represented by a low signal level.

(7) **Bridge:** A device that routes messages or isolates message traffic to a particular segment sub-net or domain of the same physical communication media.

(8) **Building Automation System (BAS):** The complete facility control system comprised of all mechanical system automation, and automatic temperature control, etc., as defined in the contract documents. The BAS is built upon a single network infrastructure based upon LonWorks Network Services. This infrastructure may include field wiring, LON wiring, routers, bridges, raceways, and gateways as required connecting non-interoperable subsystems and devices.

(9) **Channel:** A physical media serving a number of nodes. All nodes on any given channel ‘hear’ messages produced by other nodes on the channel. The network configuration and node application program determines whether or not a device responds to the messages.
(10) **Control Unit:** A LonWorks control product that handles multiple inputs and outputs and more than one control loop. May utilize a supplemental general-purpose microprocessor in addition to the Neuron chip to perform additional functions or software applications.

(11) **Control Wiring:** Includes conduit, wire and wiring devices to install complete control systems including motor control circuits, interlocks, thermostats, EP and PE switches and like devices. Includes all wiring from Intelligent Devices and Controllers to all sensors and points defined in the input/output summary shown on the drawings or specified herein and required to execute the sequence of operation.

(12) **Custom Application Controller (CAC):** Programmable control product that incorporates solid-state components based upon the ANSI/CEA 709.1 protocol to perform control loops or functions. The application in the controller is custom software produced by the Control System Contractor specifically for the project. These applications shall conform to the LonWorks functional profiles and interoperability standards. Complete documentation including object diagrams, Device Resource Files (DRF), and External Interface Files (XIF) must be submitted EOR (Engineer of Record) when such devices/controllers are used.

(13) **Deadband:** A temperature range over which no heating or cooling energy is supplied, such as 72-78 degrees F, i.e. as opposed to single point changeover or overlap.

(14) **Device Resource File:** External Interface files and Lon plug-ins that are required to display manufacturer’s defined network variables or configuration parameters correctly.

(15) **Distributed Control:** A system whereby all control processing is decentralized and independent of a central computer.

(16) **Diagnostic Program:** A machine-executable program with instructions used to detect and isolate system and component malfunctions.

(17) **Domain:** A domain is logical collection of nodes on one or more channels. Communications can only take place among nodes configured in a common domain; therefore, a domain forms a virtual network. Multiple domains can occupy the same channels, so domains may be used.

(18) **Gateway:** A device that contains an I/O software driver to translate data from other protocols to the conforming LonWorks standard.

(19) **Graphical User Interface (GUI):** A graphical subset of operator interfaces.
(20) **HVAC Control Systems:** The complete LonWorks Control System comprising User Interface, routers, gateways, repeaters, Control Units (CU), software, portable operators terminals, network communications wiring and raceways, and required field hardware, etc.

(21) **Intelligent Devices:** A LonWorks product that is configured to provide control over a single control loop or to monitor a single or multiple control variable(s); incorporates solid-state components based upon the LonTalk protocol to perform dedicated functions (ex: actuators, sensors, and switches).

(22) **LonWorks:** General purpose direct digital control technology platform originally developed by Echelon Corporation and now controlled by ANSI and LonMark. The technology employs routers, gateways, bridges, and multimedia transceivers to permit topology and media independent control solutions comprised of multiple interoperable devices.

(23) **LonMark International (LMI)/LonMark Americas (LMA):** An international member based, non-profit organization with committees of numerous independent product developers, systems integrators, engineers, and end users dedicated to determine and maintain the interoperability guidelines for the LonWorks industry. LMI tests and certifies devices for interoperable compliance.

(24) **Man-Machine Interface (MMI):** A graphical, object-oriented method by which an operator is capable of communicating with the system. The Man-Machine interface allows the operator to manage, control, monitor, and configure the system.

(25) **Network:** A system of distributed control devices that are linked together on a communication bus. A network allows sharing of point information between all control devices. Additionally, a network may provide central monitoring and control of the entire system from an MMI/GUI.

(26) **Node:** An intelligent device attached to the network. Usually falls into one of the following categories - sensor, actuator, ASC, AGC, CAC.

(27) **Operator Interface:** A device combination of hardware and software, (PC, laptop or display terminal) which provides client access to the control system, primarily used for network management, configuration, and diagnostics.

(28) **Operating System (OS):** Software which controls the execution of computer programs.

(29) **Peripheral:** External devices used to communicate to and from a computer. Peripherals include CRT, printer, hard drives, disk drives, modems, etc.

(30) **Point:** Group of data, which corresponds to a hardware input, output, or calculated value.
(31) **Portable Operator's Terminal (POT):** Laptop/tablet device that allows local and remote access to the local control network.

(32) **Router:** A device that routes or forwards messages destined for a node on another subnet or domain of the control network. The device controls message traffic based on node address and priority. Routers may also serve as communication interfaces between different channel media. (i.e., powerline, twisted pair, Ethernet\TCP\IP, and RF)

(33) **Segment:** A set of channels connected by bridges or repeaters. A node sees every packet from every other node on its segment.

(34) **Sensor:** Device capable of measuring the condition or value of a variable.

(35) **Software:** Programs and routines used to extend the capabilities of computers hardware.

(36) **Subnet:** A subnet is a logical collection of up to 127 nodes within a domain. Up to 255 subnets can be defined within a single domain. All nodes in a subnet must be on the same segment. Subnets cannot cross-intelligent routers.

(37) **XIF Files:** The external interface files created in Neuron C defining the LonMark product’s network variables, message tags, and hardware related parameters.

**b) Abbreviations**

(1) AGC    Application Generic Controller
(2) ASC    Application Specific Controller
(3) BAS    Building Automation System
(4) BMS    Building Management System
(5) CAC    Custom Application Controller
(6) COS    Change of State
(7) CPU    Central Processing Unit
(8) DDC    Direct Digital Controller
(9) DPR    Damper
(10) DPU   Digital Point Unit
(11) DRF   Device Resource File
(12) DWGS  Drawings
(13) EMCS  Energy Monitoring Control System
(14) EP    Electric-pneumatic
(15) FAS   Facility Automation System
(16) FPB   Fan Powered VAV Box
(17) FPM   Feet per minute
(18) FACP  Fire Alarm Control Panel
c) Description

This section defines the Basic Materials and Methods provided by the Controls Contractor and used in the installation of LonWorks Control products to provide the functions necessary for control of the mechanical systems on this project. Please be advised that the requirements of this specification will be strictly enforced. Systems that do not meet the requirements of the specification as outlined below (section 1.1 in particular) will not be accepted.
(1) Provide a Facility Management and Control System incorporating LonWorks, Direct Digital Control (DDC), equipment monitoring, and control consisting of microprocessor based plant control processors interfacing directly with sensors, actuators, and environmental delivery systems (ie. HVAC units); electric controls and mechanical devices for all items indicated on drawings described herein including dampers, valves, panels, sensing devices; a primary communications network to allow data exchange between microprocessor based devices.

(2) The system will consist of a flat, open architecture that utilizes the ANSI/CEA 709.1 (LonTalk™) Protocol as the common communication protocol between all controlled and controlling devices. Where necessary or desired, LonTalk packets may be encapsulated into TCP/IP messages to take advantage of existing infrastructure or to increase network bandwidth. Hierarchal systems consisting of master or global controllers that poll and/or control less intelligent unitary controllers on a secondary bus will not be considered.

(3) The entire system network shall be a Local Operating Network (LON). All nodes shall communicate with each other utilizing ANSI/CEA 709. There will be no consideration given to any network which does not use LonWorks as the primary communications network. Controllers shall be capable of sharing standard network variable data with other LON-based devices.

(4) Controllers shall implement the full ANSI/CEA 709.1 “LonTalk” protocol. Controllers must meet all of the requirements of this standard and must adhere to all of the protocol definition set forth by ANSI. All controllers shall be able to co-exist and interoperate on the LonWorks network without interfering or limiting other controller’s functionality. Controllers shall be able to be installed by any standard LonWorks Network Services (LNS) based network management tool.

(5) The system installed shall seamlessly connect devices other than HVAC throughout the building regardless of subsystem type, i.e. HVAC, lighting, and security devices should easily coexist on the same network channel without the need for gateways. Use of ANSI/CEA-852 layer 3 transparent routers is the only acceptable method spanning multiple channels and is the recommended method for system scalability. These components shall share common software for network communications, configuration, time scheduling, alarm handling, history logging, and custom programming. Any routers required by the system shall be supplied and commissioned as part of this specification.

(6) Gateways shall not be used unless specifically authorized in writing. Use of a gateway requires submittal of the documentation as required by the owner or owner’s representative. It is the intent of this specification that gateways be limited to integrating legacy systems where applicable. Acceptance of gateways is at the sole discretion of the owner.
(7) System Monitoring shall be provided through the installation of Graphical User Interface (GUI) software applications that support a direct driver to the LonWorks database or through web browser based devices. The GUI shall provide complete access to any point in the system at any time. A complete and fully commissioned LNS database must be delivered for use with the GUI as a specific deliverable as defined on the project schedule. This database must include ALL node definitions, ALL channel and subnet definitions, all router and repeater definitions, and all bindings etc.

(8) The control system shall be designed such that mechanical equipment will be able to operate under stand-alone control. Functional methodology such as scheduling, trending, and alarming shall be outlined fully in your submittal documentation. Methodology must follow pertinent and applicable LonMark guidelines. Controllers that require a master computer or controller to perform basic functions are not acceptable. In the event of a network communication failure, or the loss of any other controller on the LON network, the control system shall continue to independently operate under control of the resident program stored in nonvolatile memory as detailed herein.

(9) The documentation contained in this section and other contract documents pertaining to HVAC Controls is schematic in nature. The contractor shall provide all required hardware and software necessary to implement the functions shown or as implied in the contract documents.

(10) System configuration and monitoring will be performed via a PC-type computer. Under no circumstances shall the PC be used as a control device for the network. It can be used for storage of data, network management, and as a GUI. If the PC is taken off line, the control system shall continue to operate fully.

(11) All LonWorks devices (controllers, sensors, actuators, etc) shall be integrated into one common network infrastructure utilizing a common network management tool and creating a single LNS network database...

(12) All system controllers shall utilize a peer-to-peer communications scheme to communicate with each other and with the PC-type monitoring computer(s). All controllers shall utilize Standard Network Variable Types (SNVTs) as defined by LonMark International. Controllers shall implement LonMark device profiles as appropriate. All devices shall be provided with an LNS plug-in configuration utility. If an LNS plug-in is not available for a device, all device resource files, XIF files, and points list shall be provided.
(13) Controllers shall contain non-volatile memory for storage of control programs, configuration, and setpoints. All such data shall be retained in the event of a power failure. At least one controller shall have an on-board (battery or “super cap”-backed) real-time clock to ensure correct time-of-day operation following a power failure. Controllers that are not backed-up in the event of a power failure and that require time-based operation (VAV’s, heat pumps, etc.) shall be peers on the network and be able to obtain time synchronization from a power fail protected controller and/or controllers upon network power restore.

(14) Historical data logging, alarm monitoring and management, and scheduling shall be accessible and managed via the GUI. The system may utilize specific controllers on the LON to perform these functions or it may be performed by a host computer, or a combination of both.

(15) Controllers shall use a software mechanism for network addressing and identification. It shall not be required to set physical network address switches on each controller.

(16) System shall utilize LonMark defined standard network and command messaging for all system data.

(17) In general, only LonMark certified devices will be accepted on this control network. Each device must be LonMark certified version [3.2] or higher. In those instances in which LonMark devices are not available, provide LonWorks devices with application source code, device resource files, and external interface definitions 2 weeks prior to bid date. Any controller that does not meet this spec must be stated and submitted with specific reason why it is not LonMark certified. LonMark compatible, LonMark compliant, LonMark “ish” controllers are not acceptable. Exceptions may be granted for programmable controllers utilizing a custom programming software tools. These programmable controllers must meet all LonMark requirements for interoperability and shall utilize standard variable and configuration properties (SNVTs, SCPTs) as defined by LonMark. Any custom software required for controller programming shall be included as a leave-behind tool with enough license capability built into the bid to support the installation.

(18) If a dedicated configuration tool is provided it is preferable that it be launched from within the applicable Network Management Software. If not, any software required for controller configuration shall be included as a leave-behind tool with enough license capability to support the installation.

(19) The network infrastructure shall conform to the LonMark published guidelines for network wiring and system architecture. Wire type, distance, termination, and use of routers shall strictly conform to the LonMark wiring standards. The number of nodes per channel shall be no more than 80% of the defined segment (logical or physical) limit in order to provide future system enhancement with minimal infrastructure modifications. See reference to the Junction Box and Wiring Guidelines.
(20) Upon job completion provide all drawings, product information, complete and functional LNS databases, resource files, configuration files, etc on standard recordable media (CD, DVD).

(21) The contractor shall provide the appropriate quantity of legal copies of all software tools, configuration tools, management tools, and utilities used during system commissioning and installation. All tools shall be generally available in the market. No closed and/or unavailable tools will be permitted. Contractor shall convey all software tools and their legal licenses at project close out.

(22) Specification Compliance Checklist:

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<thead>
<tr>
<th></th>
<th>Check</th>
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<tbody>
<tr>
<td><strong>Architecture:</strong> Flat Peer to Peer Lon w/ Layer 3 routing only</td>
<td></td>
</tr>
<tr>
<td><strong>Communication Protocol:</strong> LonTalk (ANSI/CEA 709.1)</td>
<td></td>
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<tr>
<td><strong>Transceiver:</strong> ANSI/CEA 709.1a FTT-10 Free Topology Transceiver</td>
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<tr>
<td><strong>Processor:</strong> Implements full ANSI/CEA 709.1 protocol</td>
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<tr>
<td><strong>Network Operating System/Database Standard:</strong> LonWorks Network Services(LNS)</td>
<td></td>
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<tr>
<td><strong>Message Tags:</strong> LonMark Defined Standard Network Variable Types (SNVT) &amp; Standard Configuration Property Types (SCPT)</td>
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</tr>
<tr>
<td><strong>Use of Gateways:</strong> Pre-approved Only. For converting proprietary to LON Only</td>
<td></td>
</tr>
<tr>
<td><strong>Network Management/Commissioning Tool:</strong> LNS Based</td>
<td></td>
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<tr>
<td><strong>Contractor Certification:</strong> Training certification requirements</td>
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</tr>
<tr>
<td><strong>Product Certification:</strong> LonMark Certified [3.2] or better</td>
<td></td>
</tr>
<tr>
<td><strong>Media Type:</strong> Project specific – FTT, Powerline, Fiber</td>
<td></td>
</tr>
<tr>
<td><strong>Twisted Pair Wiring Topology:</strong> Free Topology, Polarity Insensitive</td>
<td></td>
</tr>
<tr>
<td><strong>Other Considerations:</strong> Must provide external interface file (XIF files) and device resource files for each device</td>
<td></td>
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</table>

**d) Summary of work**

(1) Provide LonWorks based products that communicate on multiple channels to meet the functional specifications as indicated on the Drawings and the dedicated product functional specifications and profiles specified in other Sections.

(2) Provide FTT-10A LonTalk routers and repeaters as required to combine different communication channels onto a central field bus or as required to segment groups of Intelligent Devices and/or Control Units.
(3) Provide Intelligent Control Devices, Programmable Controllers, and Application Specific Controllers as herein specified, as needed to perform functions indicated in the input/output summaries and sequences of operation, and/or indicated on the HVAC drawings.

(4) Provide wire, raceway systems, 24 VDC and/or 24 VAC power supplies and final connections to nodes provided by this contract. Must comply with Division 16 requirements.

(5) The contractor shall provide all controls and sequence of operations as required by these specifications and by the drawings. Provide all required devices, sensors, hardware, software, wiring, controllers, etc. Provide all required devices, sensors, hardware, software, wiring, controllers, etc. including any required and not specifically addressed in this specification but required for system functionality. It shall be the responsibility of the contractor to provide a complete and functional system.

(6) The system shall allow for future integration of other systems (Card Access, Lighting, Intrusion Monitoring etc.) on the network proposed in this document, and also share a common infrastructure for network communications, time scheduling, alarm handling, history logging, monitoring and system control.

**e) Other services**

(1) The work scope shall also include the furnishing of services of various engineering disciplines both in the field and in home office in order to complete the work in a satisfactory and professional manner. The Control System Contractor is responsible for providing these engineering services.

(2) Provide technical direction of the installation as specified herein.

(3) Provide field calibration, testing and commissioning of equipment as specified herein.

(4) Incorporate Uninterruptible Power Supply surge transient protection in the installation of the system to protect electrical components in all LonWorks controllers, remote controllers, and operator's workstations.

(5) Provide submittals, software, data entry facilities Portable Operator’s Terminal (POT), programming, startup, test and validation, training of the Custodian and Maintenance Representative on maintenance and operation, as built documentation and system warranty.

(6) Provide special tools, testing equipment as required for operation, installation, and maintenance of the equipment specified herein.
(7) Provide data communication wiring and connections between LonWorks controllers and RC controllers and DDC controllers.

(8) Provide documentation and complete Operating and Maintenance Manuals.

(9) Provide start-up and system commissioning.

(10) Provide accurate and current LNS Database of the control network to Architect/Engineer of Record. Any changes made on the network shall be incorporated into the LNS database and an updated database shall be provided ensuring the Architect/Engineer of Record always has the correct and current database for the control system.

(11) Provide documentation on all point naming conventions to the Architect/Engineer of Record for incorporation into the GUI.

(12) Provide a CD backup of the LNS database upon ANY changes or updates to the database.

(13) The network infrastructure shall conform to the published guidelines for wire type, length, number of nodes per channel, termination, and other relevant wiring and infrastructure criteria as published (reference: Junction Box and Wiring Guidelines for Twisted Pair LonWorks Networks).

(14) Any host PC GUI interface shall use openly available software packages that are nonexclusive. No closed software will be accepted. Software must be generally available on the market from multiple sources.

(15) Contractor shall provide references of prior successful experience.

(16) Contractor must demonstrate ability and intent to design, architect, and install a open, logically flat, LonWorks system.

(17) No exclusive or non-open integration tools, devices, or host software shall be used as part of this open system.

(18) If Internet or IP connectivity is specified, all devices connecting to the LAN shall use the TCP/IP protocol stack. Any LAN to LonWorks routers shall use the ANSI/CEA-852 standard layer 3 transparent routing protocol. Specific IP interconnectivity shall follow IT standards for security, firewalls, address, etc. published in separate documents (if appropriate).

(19) The control system shall be installed using the best available products from the currently available suppliers that meet the system specification. Controllers from multiple manufactures are acceptable.
(20) The system integrator shall provide a protocol analyzer log summary for each channel for a minimum of 24 hours showing system performance. The statistical summary shall show that all bandwidth utilization and error limits are within acceptable ranges and that there are no network traffic problems, node communication problems, or system sizing problems.

f) References

(1) References and industry standards listed in this Section are applicable to the Work. Unless more restrictive criteria or differing requirements are explicitly stated in the Specifications, or mandated by governing codes or regulations, the recommendations, suggestions, and requirements described in the referenced standards shall be deemed mandatory and applicable to the Work.
(2) Perform the work in accordance with the requirements of Section 25501 Basic HVAC Requirements, Division 1 (if applicable) and Division 25 and Division 16 sections, and with the provisions of all applicable codes and laws.
(3) The installation and equipment is to conform to all applicable building and electrical code articles and reference standards cited therein.

g) Products furnished but not installed under this section

(1) Control Valves
(2) Sensor Wells
(3) Air Flow Stations

3) Quality Assurance

a) General

The FAS shall be furnished, engineered, and installed by Licensed Trade Technicians. The contractor shall have on staff trained LonWorks Network Integrators. Training shall include a minimum of 40 hours of LonWorks Network Design and LonWorks Network Management tool training. Contractor must have at least two fully trained staff members at all times. Contractor shall provide training class certifications of staff members. Contractor shall have a direct line of technical support from suppliers. The contractor shall employ technicians who have completed factory-authorized training. The contractor shall employ technicians to provide instruction, routine maintenance, and emergency service within 24 hours upon receipt of request.
b) Contractor Qualifications

(1) The Contractor must be regularly engaged in the service and installation of LonWorks based systems as specified herein, and must have been so for a minimum of three (3) years.

(2) The Contractor must be an authorized representative in good standing of the manufacturer of the proposed hardware and software components.

(3) The Contractor shall have an office that is staffed with designers trained in integrating interoperable systems and technicians fully capable of providing LonWorks instruction and routine emergency maintenance service on all system components.

(4) The Contractor shall have in house capabilities to provide control strategies for whole building control. This includes HVAC, lighting, access, and security applications etc.

(5) The Contractor shall have a service facility, staffed with qualified service personnel, capable of providing instructions and routine emergency maintenance service for networked control systems.

(6) The Contractor shall submit a list of no less than three (3) similar projects, which have LonWorks based FAS as specified herein installed by the Contractor. These projects must be on-line and functional such that they can be observed the system in full operation.

(7) The Contractor must be a certified LonWorks Integrator and shall submit resumes with the proposal indicating passing certificates as proof of approved training. Such proof must include summary of coursework and indicate both written and laboratory requirements of training. Certificates of training completion shall be for currently active employees.

c) Hardware and Software Component Manufacturer Qualifications

(1) The manufacturer(s) of the hardware and software components must be primarily engaged in the manufacture of LonWorks based systems as specified herein, and must have been so for a minimum of three (3) years.

(2) The manufacturer(s) of the hardware and software components as well as its subsidiaries must be a member in good standing of LonMark International and/or LonMark Americas.

(3) The manufacturer(s) of the hardware and software components shall have an authorized representative capable of providing service and support as referenced in section B above, and must have done so for a minimum of three (3) years.
(4) The manufacturer(s) of the hardware and software components shall have a technical support group accessible via a phone/fax/email that is staffed with qualified personnel, capable of providing instruction and technical support service for networked control systems.

(5) The manufacturer(s) of the hardware and software components must have no less than three (3) similar projects, which have LonWorks based Facility Automation Systems as specified herein installed by the authorized representative referenced above. These projects must be on-line and functional such that the Owners/Users representative can observe the system in full operation.

4) Acceptable manufacturers of the hardware and software

(1) See list of LonMark Manufactures at www.lonmark.org

5) Reference Standards

   a) General

(1) Control system components shall be new and in conformance with the following applicable standards for products specified:

(2) Systems must be made up of LonMark certified devices and LNS Based tools.

(3) All controllers must be based on ANSI/CEA 709.1 LonTalk Protocol

(4) All routing must be via ANSI/CEA 852 LonWorks to IP Routing

   b) Submittals

   Submit the following according to conditions of Contract and Division 25 Specification sections. In addition, provide the following:

(1) Product data on all components used to meet the requirements of the specifications such as enclosures, network transceivers, Resource files, LNS Plug-ins, XIF documentation, configuration parameter options, mounting details, power supplies, etc.
(2) Software documentation regarding the proposed PC operating system, third party utilities and application programs, and the proposed application program for the Control Units.

(3) Logical and physical diagrams for each channel indicating each node (control devices and ID’s), node address (domain, subnet and group), channel type and router specifications.

(4) Submit functional temperature control diagrams for each mechanical system served by the HVAC Control System.

(5) Indicate and Tag each input/output served by each Control Unit or Intelligent Device.

(6) Submit 8 sets of submittals for review within 3 weeks of contract award.

**c) Shop Drawings**

(1) The controls contractor shall submit AutoCAD or Visio generated schematic drawings for the entire control system for review and approval before work shall begin. Included in the submittal drawings shall be a one-page diagram depicting the complete system architecture complete with a communications riser. Drawings shall include point-to-point wiring diagrams and must show all temperature controls, start-stop arrangement for each piece of equipment, equipment interlocks, wiring terminal numbers and any special connection information required for properly controlling the mechanical equipment.

(2) The submittal shall include a bill of material reference list including component manufacturer and party number as well as equipment sequences of operation.

(3) The submittals shall include manufacturer's catalog data describing each item of control equipment or component provided and installed for the project.

**d) Close-Out Documents**

(1) Submit final copies of the shop drawings outlined in paragraph C above. These final submittals shall reflect all field modifications and change orders required to complete the installation. Submit the following quantities of record submittal drawings immediately following receipt of notification of substantial completion. Auto CAD drawing or VISIO files of all shop drawings on CD ROM disks or USB flash memory sticks.

(2) Three (3) complete sets of documents located in a three-ring notebook and organized by subject with divider tabs. Soft copies of ALL files must also be provided with each set on CD.
e) Operation and Maintenance manuals

(1) Submit three (3) sets of operation and maintenance manual. Include the following documentation:

a. Network Management Software User Manual specific to each tool package provided.
b. Maintenance Instructions: Document all maintenance and repair/ replacement procedures. Provide ordering number for each system component, and source of supply. Provide a list of recommended spare parts needed to minimize downtime.
c. Documentation of network variables, network node configurations, priority interrupts, node bindings, addressing structure, etc.

f) Instruction of owner operating personnel

(1) All training shall be by the Controls Contractor and shall utilize specified manuals, as-built documentation, the on-line help utility and any other appropriate training materials.

(2) Operator training shall include:

d. Four (4) initial eight (8)-hour sessions for a group of four (4) people

(3) The initial operator-training program shall be to establish a basic understanding of basic functions, commands, routines, etc. and shall assume attendees have a sound working knowledge of the Windows operating system and PC use. The training shall encompass as a minimum:

e. Troubleshooting of input devices, i.e., bad sensors
f. Sequence of operation review
g. Sign on - sign off
h. Selection of all displays and reports
i. Commanding of points (keyboard and mouse mode)
j. Modifying label text
k. Use of all dialogue boxes and menus
l. System initialization
m. LonWorks Network Management Software (if applicable)

g) Acceptance procedure (Commissioning)

(1) The TCC shall provide to the architect 30 days prior to acceptance testing the commissioning procedures to be used for acceptance of the FAS.
(2) Upon completion of the installation, the controls contractor shall start-up the system and perform all necessary calibration and testing to ensure proper operation of the project control systems.

(3) Schedule a hardware demonstration and system acceptance test. The acceptance testing is defined as demonstrating the sequence of operation as indicated in the drawings. The Controls Contractor shall perform all tests prior to scheduling the acceptance test and hardware demonstration to insure the overall system is ready prior to inspection and observations.

(4) When the system performance is deemed satisfactory in whole or in part by these observers, the system parts will be accepted for beneficial use and be deemed substantially complete as defined.

(5) The Controls Contractor shall prove that they controls network is functioning correction and within acceptable bandwidth criteria and shall test the system with an approved protocol analysis tool. Provide a log and statistics summary showing that each channel is within acceptable parameters. Each channel shall he shown to have at least 25% spare capacity for future expansion.

**h) Warranty**

(1) The FAS shall be free from defects in workmanship and material under normal use and service. If within eighteen (18) months from the date of substantial completion, the installed equipment is found to be defective in operation, workmanship or materials, the building systems contractor shall replace, repair or adjust the defect at no cost. Service shall be provided within 24 hours upon notice from Owner’s designated Representative.

(2) The warranty shall extend to material that is supplied and installed by the Controls Contractor. Material supplied but not installed by the Controls Contractor shall be covered per the above to the extent of the product only. Installation labor shall be the responsibility of the trade contractor performing the installation.

(3) All corrective software modifications made during warranty service periods shall be updated on all user documentation and on user and manufacturer archived software disks.

**i) Product delivery, storage and handling**

(1) Do not install electronic hardware in the project until non-condensing environmental conditions have been established. Products installed in violation of this request maybe requested to be replaced at no additional cost to the project.
(2) Coordinate storage requirements for factory mounted terminal control units on air terminal devices, air handling units or other packaged control equipment. Do not store control units on site in non-conditioned areas for more than two weeks.

(3) Factory-Mounted Components: Where control devices specified in this section are indicated to be factory mounted on equipment, arrange for shipping control devices to unit manufacturer.

6) LON Products

a) Remote access

(1) The owner shall provide an appropriate connection to the Internet to enable remote system access Owner agrees to pay monthly access charges for connection and ISP.

b) Web servers (if required)

1) Functionality

(1) The Web Servers shall provide the interface between the LAN or WAN and the field control devices, and provide global supervisory control functions over the control devices connected to the Web Servers. It shall be capable of executing application control programs to provide:

n. Hosting of the graphical HTML pages
o. Calendar functions
p. Scheduling (if no other means available)
q. Data Logging (if no other means available)
r. Alarm monitoring and routing (if no other means available)
s. Time synchronization (if no other means available)
t. Soap/XML interface
u. Static or Dynamic IP addressing
v. SNVT access via web pages and via XML interface
w. SMTP Server for alarm email notification
x. Messages and message management

2) Software licensee

(1) The Software License for the Web Server(s) must be open and enable any Systems Integrator to engineer, change or modify the application once the project is complete. Restrictive engineering access to the Web server will not be acceptable.

3) Event alarm notification and actions
(1) The Web Server shall provide alarm recognition, storage, routing, management, and analysis to supplement distributed capabilities of equipment or application specific controllers.

(2) The Web Server shall be able to route any alarm condition to any defined user location whether connected to a local network or remote via dial-up, telephone connection, or wide-area network.

(3) Alarm generation shall be selectable for annunciation type and acknowledgement requirements.

(4) Control equipment and network failures shall be treated as alarms and annunciated.

(5) Alarms shall be annunciated via email notification to specific, configurable email address.

(6) Alarms shall be visually identified via the HTML graphics pages. Overrides and setpoint changes shall be configured via the HTML interface.

(7) Alarms shall be annunciated in any of the following manners as defined by the user:
   y. Screen message text
   z. Pagers via paging services that initiate a page on receipt of email message
   aa. Graphic with flashing alarm object(s)

(8) Alarms shall be logged for a period of no less than 1 week

(9) Alarm logs shall be able to be transferred from the web server to a host

(10) The following shall be recorded by the Web Server for each alarm (at a minimum):
    bb. Time and date
    cc. Location (building, floor, zone, office number, etc.)
    dd. Equipment (air handler #, access way, etc.)
4) Data logging and storage

(1) The web server shall have the ability to collect data for any object and store this data for future use. Data logging shall be performed either by a dedicated logger on the control network, via a combined web server/data logger, or by a central host PC attached to the network. Which ever way data logging is to be performed it must:

   ee. Store data logs for at least 1 week before being overwritten

   ff. Automatically update the host storage PC that the logs are approaching their full level

   gg. Data logs shall be able to be transferred from the web server to a host

   hh. Be easily able to append a new log to a previously saved log

5) Security and user administration

(1) Communications between the Web Server and Web Browser are to adopt proven ‘Secure User Authentication’ employing 128-bit industry standard MD5 digital signatures. All transactions to/from the Web Server are to adopt the MD5 security procedures as a minimum to ensure the data on the system is protected from unauthorized access.

(2) Individual web graphics pages shall have their own password protection. Groups of pages may have the same password for the same level of user. Provide at least 3 levels of user access.

6) Web browser clients

(1) The system shall be capable of supporting a minimum of 20 simultaneous client connections using a standard Web browser such as Internet Explorer™, Firefox™, or Netscape Navigator™. Systems requiring additional software (to enable a standard Web browser) to be resident on the client machine, or manufacture-specific browsers shall not be acceptable.

(2) The Web browser software shall run on any operating system and system configuration that is supported by the Web browser. Systems that require specific machine requirements in terms of processor speed, memory, etc., in order to allow the Web browser to function with the FMCS, shall not be acceptable.

(3) The Web browser shall provide a view of the system, in terms of graphics, schedules, calendars, logs, etc. Systems that require different views or that require different means of interacting with objects such as schedules, or logs, shall not be permitted.

(4) The Web browser client shall support as a minimum, the following functions:

   ii. User log-on identification and password shall be required. If an unauthorized user attempts access, a blank web page shall be
displayed. Security using Java authentication and encryption techniques to prevent unauthorized access shall be implemented.

jj. HTML programming shall not be required to display system graphics or data on a Web page. HTML editing of the Web page shall be allowed if the user desires a specific look or format.

kk. Storage of the graphical screens shall be in the Web Server, without requiring any graphics to be stored on the client machine. Systems that require graphics storage on each client are not acceptable.

ll. Real-time values displayed on a Web page shall update automatically without requiring a manual “refresh” of the Web page.

(5) The system shall provide the capability to specify a user’s (as determined by the log-on user identification) home page. Provide the ability to limit a specific user to just their defined home page. From the home page, links to other views, or pages in the system shall be possible, if allowed by the system administrator.

(6) Graphic screens on the Web Browser client shall support hypertext links to other locations on the Internet or on Intranet sites, by specifying the Uniform Resource Locator (URL) for the desired link.

**c) Programmable control unit (PCU)**

1) **General requirements**

(1) System controllers shall share network variable data with other LON-based devices that utilize the same transceivers as referenced previously.

(2) Operating system software, custom operating sequence software and application programs shall be stored in programmable, non-volatile memory.

(3) The complete programmable controller including accessory devices such as relay, transducers, power supplies, etc., shall be wired and housed in an enclosure or as required by the location and local code requirements.

(4) Provide programmable controller boards with external interface jacks to provide an optional communication link.

(5) Equip programmable controller with diagnostic indicators for the following:

mm. Transmit.

nn. Receive.
2) Service (health) indication lamp(s) Input/Output requirements

(1) The programmable controller shall accommodate digital and analog input and output points as appropriate for the task it was intended to perform. For troubleshooting and load analysis, the value of each analog output shall be available in the database for trending and display.
(2) Each controller shall have 10% spare point capacity when installed.

3) Accessories

(1) Provide the following with each PCU:
   oo. Over current and transient power protection

4) Programmable controller software

(1) A programmable controller shall operate totally standalone and independent of a central computer or master controller for all specified control applications.

(2) Operating System software shall:
   pp. Reside in programmable power failure backed RAM,
   qq. Operate in real-time, provide prioritized task scheduling,
   rr. Control time programs,
   ss. Scan inputs and outputs.
   tt. Contain built in diagnostics.

(3) Input/Output Point Processing Software shall include:
   uu. Continuous update of input and output values and conditions
   vv. All connected points are to be updated at a minimum of one-second intervals.
   ww. Assignment of proper engineering units and status condition
   xx. Identifiers to all analog and digital input and outputs

(4) A "fixed mode" option shall be supported to allow inputs and outputs from DDC control programs to set to a fixed state or value. When in the "fixed mode" inputs and output shall be assigned a high residual command priority to prevent override by application programs.

(5) Run time shall be accumulated based on the status of a digital output point. It shall be possible to totalize either on time or off time up to 60,000 hours with one-minute resolution. Run time counts shall be resident in non-volatile memory and have PCU resident run time limits assignable through the operator's terminal.
(6) A transition counter shall be provided to accumulate the number of times a device has been cycled on or off. Counter is to be non-volatile and be capable of accumulating 60,000 switching cycles. Limits shall be assignable to counts to provide maintenance alarm printouts.

(7) Custom DDC programs are to be provided to meet the control strategies as called for in the sequence of operation sections of these specifications.

(8) Each PCU shall have resident in its memory and available to the programs a full library of DDC algorithms, intrinsic control operators, arithmetic, logic and relational operators for implementation of control sequences.

(9) The PCU shall include Proportional plus Integral (PI), and Proportional plus Integral plus Derivative (PID) control loops.

(10) DDC control programs shall include an assignment of initialization values to all outputs to assure that controlled devices assume a fail-safe position on initial system start-up.

**d) Terminal device control unit (TDCU)**

1) General Requirements

(1) Control Units shall be equipped with an appropriate Neuron microprocessor controller, programmable non-volatile memory for general data processing, power supply, input/output modules, termination blocks and network transceivers of adequate size and quantity to perform the function they were intended to.

(2) System controllers shall be capable of sharing network variable data with other LON-based devices.

(3) Operating system software, custom operating sequence software and application programs shall be stored in programmable, non-volatile memory.

(4) It shall be possible to make changes to the application program and/or configuration of any controller in real-time with no interruption of the operation of the controlled equipment. Systems that require that the controller be taken offline and/or require the shutdown of the controlled equipment are not acceptable.

(5) The TDCU shall synchronize time with a PCU on the network upon power up of the network.
2) TDCU Software

(1) General: A TDCU shall operate totally standalone and independent of a central computer for all specified control applications. Software shall include a complete Operating System (O.S.), communications handler, point processing, standard control algorithms, and specific control sequences.

(2) O.S. software shall reside in programmable flash memory, operate in real-time, provide prioritized task scheduling, control time programs, and scan inputs and outputs. O.S. shall also contain built in diagnostics.

(3) TDCU’s shall have application specific programs to minimize configuration and installation time. Application specific programs shall be able to be changed so the same hardware component can be utilized in the event the mechanical equipment is removed, and new mechanical equipment has been added.

(4) Input/Output Point Processing Software shall include:
   yy. Continuous update of input and output values and conditions
   zz. All connected points are to be updated at a minimum of one-second intervals
   aaa. Assignment of proper engineering units and status condition identifiers to all analog and digital input and outputs

(5) A "fixed mode" option shall be supported to allow inputs to, and outputs from DDC control programs to set to a fixed state or value. When in the "fixed mode" inputs and output shall be assigned a high residual command priority to prevent override by application programs.

**e) Network interfaces, LON routers, bridges repeaters and transceivers**

1) Internet servers, Routers, Bridges and Repeaters

(1) Equip each Internet server, router and bridge with a network transceiver on each network port (inbound and outbound) as dictated by the network type (Type 1 - FTT, Type 2 - TP, Type 3 - PL, Type 4 - LP, Type 5 - RF).

(2) The network router shall be designed to route messages from a segment, sub-net, or domain in full duplex communication mode.
(3) Routers and bridges shall utilize LonTalk protocol transport, network, and session layers to transparently route messages bound for a node address in another sub-net or domain exclusively.

(4) Routers, bridges and repeaters shall be fully configurable and permit a systems integrator to define message traffic, destination, and other network management functions utilize LonWorks Devices used for routing, bridging, or repeaters.

(5) The routers, bridges, and repeaters shall be capable of DIN rail or panel mounting and be equipped with status LED lights for Network traffic and power.

7) Electronic input/output devices

This section to be edited for preferential functionality and approved vendor list added. The following specification requirements are for reference only.

a) Temperature Sensors and Transmitters

1) General Sensor & Transmitter Requirements

(1) Provide sensors and transmitters required as outlined in the input/output summary and sequence of operation, and as required to achieve the accuracy as specified.

(2) Sensors can be of type RTD, Thermistor, and transmitter.

(3) The following accuracy’s are required and include errors associated with the sensor, lead wire and A to D conversion.

<table>
<thead>
<tr>
<th>Point Type</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>(4) Outside Air</td>
<td>0.5°F</td>
</tr>
<tr>
<td>(5) Chilled Water</td>
<td>0.5°F</td>
</tr>
<tr>
<td>(6) Room Temperature</td>
<td>1.00°F</td>
</tr>
<tr>
<td>(7) Hot Water/Steam</td>
<td>0.75°F</td>
</tr>
<tr>
<td>(8) Duct Temperature</td>
<td>0.5°F</td>
</tr>
<tr>
<td>(9) Sensors used in energy, water (BTU) or process calculations</td>
<td>0.1°F</td>
</tr>
</tbody>
</table>

Note: Sensors used in BTU or process calculations shall be accurate to ±0.10°F over the process temperature range. Submit a manufacturer's calibration report.
2) Thermowells

(1) When thermowells are required, the sensor and well shall be supplied as a complete assembly including wellhead and Greenfield fitting.

(2) Thermowells shall be pressure rated and constructed in accordance with the system working pressure.

(3) Thermowells and sensors shall be mounted in a threadolet or 1/2" NPT saddle and allow easy access to the sensor for repair or replacement.

(4) Thermowells shall be constructed of the following materials:

<table>
<thead>
<tr>
<th>Coolant</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>bbb. Chilled and Hot Water</td>
<td>brass</td>
</tr>
<tr>
<td>ccc. Steam</td>
<td>304/316 stainless steel</td>
</tr>
<tr>
<td>ddd. Brine (salt solutions)</td>
<td>marine grade stainless steel</td>
</tr>
</tbody>
</table>

3) Outside Air Sensors

(1) Outside air sensors shall be designed to withstand the environmental conditions to which they will be exposed. They shall also be provided with a solar shield.

(2) Sensors exposed to wind velocity pressures shall be shielded by a perforated plate surrounding the sensor element.

(3) Temperature transmitters shall be of NEMA 3R construction and rated for ambient temperatures.

4) Duct Type Sensors

(1) Duct mount sensors shall mount in a electrical box through a hole in the duct and be positioned so as to be easily accessible for repair or replacement. A neoprene grommet (Seal-tite fitting and mounting plate) shall be used on the sensor assembly to prevent air leaks.

(2) Duct sensors shall be insertion type and constructed as a complete assembly including lock nut and mounting plate. Duct sensors probe shall be constructed of 304/316 stainless steel.

(3) For outdoor air duct applications, use a weatherproof mounting box with weatherproof cover and gasket.

5) Averaging Duct Type Sensors
For ductwork greater any dimension than 48 inches and/or where air temperature stratification exists, utilize an averaging sensor with multiple sensing points. The averaging sensor shall be installed complete with end cap, compression fittings, gaskets, mounting flange and required accessories.

(2) Provide capillary supports at the sides of the duct to support the sensing string.

6) Intelligent LonWorks Room Sensors

(1) Room temperature sensors are to be provided with a cover to prevent accidental damage.

(2) Provide LonMark certified device for communication with the communication network.

b) Relative Humidity Sensors/Transmitter

(1) The humidity transmitter shall meet the following overall accuracy including lead loss.

(2) Room Type Sensor ±3% RH

(3) Transmitters shall be shipped factory pre-calibrated.

(4) Differential Pressure Transmitters and Accessories

c) General Air and Water Pressure Transmitter Requirements:

(1) Pressure transmitters shall be constructed to withstand 100% pressure over-range without damage and to hold calibrated accuracy when subject to a momentary 40% over-range input.

(2) Differential pressure transmitters used for flow measurement shall be sized to the flow-sensing device and shall be supplied with shutoff and bleed valves in the high and low sensing pick-up lines (3 valve manifolds).

(3) Provide a minimum of a NEMA 1 housing for the transmitter. Locate transmitters in accessible local control panels wherever possible.
1) Low Air Pressure Applications (0 to 0.5” WC)

(1) The pressure transmitter shall be capable of transmitting a linear electronic signal proportional to the differential of the room and reference static pressure input signals with the following minimum performance specifications.

   eee. Span: Not greater than two times the design space DP.
   fff. Accuracy: Plus or minus 0.5% of full scale
   ggg. Dead Band: Less than 0.3% of output.
   hhh. Repeatability: Within 0.2% of output.
   iii. Linearity: Plus or minus 0.2% of span.
   jjj. Response: Less than one second for full span input.
   kkk. Temperature Stability: Less than 0.01% output shift per degree F. change.

2) Flow, Pressure, and Electrical Measuring Apparatus

(a) Traverse Probe Air Flow Measuring Stations

(1) Traverse probes shall be of a dual manifolded, cylindrical, type constructed of 3003 extruded aluminum with an anodized finish to eliminate surface pitting and unnecessary air friction. The multiple total pressure manifold shall have sensors located along the stagnation plane of the approaching air flow and without the physical presence of forward projecting sensors into the air stream.

(2) The static pressure manifold shall incorporate dual offset static tips on opposing sides of the averaging manifold so as to be insensitive to flow-angle variations of as much as ±20° in the approaching air stream.

(3) The airflow traverse probe shall not induce a measurable pressure drop, nor shall the sound level within the duct be amplified by its singular or multiple presence in the air stream. Each airflow-measuring probe shall contain multiple total and static pressure sensors placed at equal distances along the probe length. The number of sensors on each probe and the quantity of probes utilized at each installation shall comply with the ASHRAE Standards for duct traversing.

(4) Traverse probes shall be accurate to ±25% of the measured airflow range down to 0.25” WC static pressure.

(5) Each flow measuring station shall be complete with its own dedicated microprocessor with a 4-line, 80 character, Alpha Numeric display and full function keypad. The panel shall be fully programmable and display calculated CFM directly on a LED monitor on the panel face.

(6) Each station shall log airflow rates in real time and download data to its control unit (CU) via a RS-232 interface.
3) Shielded Static Pressure Sensor

(1) Provide for each zone where required a shielded static pressure sensor suitable for ceiling or wall (See drawings) surface mounting, complete with multiple sensing ports, pressure impulse suppression chamber with minimum volume of 50 cubic inches, airflow shielding, and 3/8" compression takeoff fittings, all contained in a welded stainless steel casing, with polish finish on the exposed surfaces.

(2) These probes shall be capable of sensing the static pressure in the proximity of the sensor to within 1% of the actual pressure value while being subjected to a maximum airflow of 1000 FPM from a radial source.

(3) The shielded static sensing devices shall be used for both reference and space pressure sensing.

(4) Pressure sensors used for outside air pressure reference purposes shall be equipped with a conduit seal for pneumatic tubing and bushings for a weather tight installation.

4) Static Pressure Traverse Probe

(1) Provide multipoint traverse probes in the duct at each point where static pressure sensing is required.

(2) Each duct static traverse probe shall contain multiple static pressure sensors located along the exterior surface of the cylindrical probe. Pressure sensing points shall not protrude beyond the surface of the probe.

(3) The duct static traverse probe shall be of 304 stainless steel construction and (except for 3/4" dia. probes with lengths of 24" or less) be complete with threaded end support rod, sealing washer and nut, and mounting plate with gasket and static pressure signal fitting. The static traverse probe shall be capable of producing a steady, non-pulsating signal of standard static pressure without need for correction factors, with an instrument accuracy of ±1.

5) Venturi Flow meter

(1) Pressure drop on venturi type flow meters shall not exceed 0.25" WC. Each venturi low and high-pressure taps shall be equipped with nipples, valves and quick disconnects.

(2) Equip each venturi with a metal identification tag indicating the size, location, GPM and meter reading for the GPM specified.

(3) Provide (1) 6" dial differential pressure meter of the proper range to determine piping system flow rate. The meter shall be the property of the Owner.
d) Current Transformers

(1) The current transformers shall be designed to be installed or removed without dismantling the primary bus or cables. The transformer shall be of a split core design.

(2) The core and windings shall be completely encased in a UL approved thermoplastic rated 94VA. No metal parts shall be exposed other than the terminals.

(3) The current transformers shall meet the following specifications:
   1. Frequency Limits: 50 to 400 Hz.
   2. Insulation: 0.6 KV Class, 10 KV BIL.
   3. Accuracy: ± 1% at 5.0 to 25.0 VA accuracy class with U.P.F. burden.

(4) Provide a disconnect switch for each current transformer.

e) Current Sensing Switches

(1) Current sensing switch shall be self-powered with solid-state circuitry and a dry contact output. Current sensing switches shall consist of a solid state current sensing circuit, adjustable trip point, solid state switch, SPDT relay and an LED indicating the on or off status. A conductor of the load shall be passed through the window of the device. It shall accept over current up to twice its trip into range.

f) Electronic Valve & Damper Actuators

1) General Requirements

(1) Electronic actuators shall be electric, direct-coupled type capable of being mounted over the shaft of the damper. They shall be UL listed and the manufacturer shall provide a 2-year unconditional warranty from the date of commissioning. Power consumption shall not exceed 8 watts or 25 VA of transformer sizing capacity per high torque actuator nor 2 watts or 4 VA for VAV actuators.

(2) Electronic overload protection shall protect actuator motor from damage. If damper jams actuator shall not burnout. Internal end switch type actuators are not acceptable. Actuators may be mechanically and electrically paralleled on the same shaft to multiply the available torque. A reversing switch shall be provided to change action from direct to reverse in relation to control signal as operation requires.
2) Combination Smoke and Fire Damper Actuators

(1) Actuators shall be factory mounted and connected to the damper section and shall conform to UL 555S specifications.

(2) Actuators shall be rated for 350°F.

3) Control Valve Actuators (3 inch and smaller)

(1) Actuators shall have a gear release button on all non-spring return models to allow manual setting. The actuator shall have either an insulating air gap between it and the linkage or a non-conducting thermoplastic linkage. Care shall be taken to maintain the actuator's operating temperatures and humidity within its specifications. Pipes shall be fully insulated and heat shields shall be installed if necessary. Condensation may not form on actuators and shall be prevented by a combination of insulation, air gap, or other thermal break.

(2) The control circuit shall be fully modulating using 2 - 10 volt or 4 - 20 mA signals. Accuracy and repeatability shall be within 1/21 of control signal. A 2 - 10 v or 4 - 20 mA signal shall be produced by the actuator which is directly proportional to the shaft clamp position which can be used to control actuators which are paralleled off a master motor or to provide a feedback signal to the automation system indicating valve position.

(3) Valve body and actuators shall be shipped fully assembled and tested at the valve factory prior to shipment.

4) Control Valve Actuators (4 inch and larger).

(1) The valve actuator shall consist of a permanent split capacitor, reversible type electric motor that drives a compound epicycle gear. The electric actuator shall have visual mechanical position indication, readable from a distance of 25 feet, showing output shaft and valve position. Unit shall be mounting directly to the valves without brackets and adapters, or readily adapted to suit all other type quarter-turn valves.

(2) The actuator shall have an integral terminal strip, which, through conduit entries, will ensure simple wiring to power supplies. Cable entries shall have UL recommended gland stops within the NPT hole to prevent glands from being screwed in too far and damaging cable.

(3) The actuator shall be constructed to withstand high shock and vibrations without operations failure. The actuator cover shall have captive bolts to eliminate loss of bolts when removing the cover from the base. One copy of the wiring diagram shall be provided with the actuator.
(4) The actuator shall have a self-locking gear train, which is permanently lubricated, at the factory. The gearing shall be run on ball and needle bearings. Actuators with 600 in/lbs. or more output torque shall have two adjustable factory calibrated mechanical torque limit switches of the single-pole, double-throw type.

(5) The motor shall be fitted with thermal overload protection.

(6) The motor rotor shaft shall run in ball bearings at each end of motor.

(7) The actuator housing shall be hard anodized aluminum for full environmental protection.

(8) The environmental temperature range of the actuator shall be -30°C to +60°C (-20°F to +140°F).

(9) For intermittent on/off service, the actuator shall be rated at a 20% duty cycle (i.e., 12 minutes extended duty in every hour, or alternatively; one complete cycle every 2 minutes). For more frequent cycling and modulating service, an actuator shall be rated for continuous duty. The actuator rated for continuous duty shall be capable of operating 100% of the time at an ambient temperature of 40°C.

(10) The actuator shall have an integral self-locking gear train. Motor brakes shall not be required to maintain desired valve position. Levers or latches shall not be required to engage or disengage the manual override. Mechanical travel stops, adjustable to 25° in each direction of 90° rotation shall be standard, as well as two adjustable travel limit switches with electrically isolated contacts. Additional adjustable switches shall be available as option.

(11) Single Phase Motor: The motor shall have Class B insulation capable of withstanding locked-rotor for 25 seconds without overheating. Wiring shall also be Class B insulation. An auto-reset thermal cutout protector shall be embedded in the motor windings to limit heat rise to 80°C in a 40°C ambient. All motors shall be capable of being replaced by simply disconnecting the wires and then removing mounting bolts. Disassembly of gears shall not be required to remove the motor.

(12) Materials of Construction: The electric actuator shall have a pressure die-cast, hard-anodized aluminum base and cover. The compound gear shall be made of die-cast, hard-anodized aluminum or steel. An alloy steel worm gear shall be provided for manual override and torque limiting. Bearings for gears shall be of the ball and needle type; bronze bearings shall be used on the shafting parts.
g) Control valves

1) General Control Valve Requirements

(1) All automatic control valves shall be linear, fully proportioning, with modulating ball, plug or V-port inner guides unless otherwise specified. The valves shall be quiet in operation and fail safe in either normally open or normally closed position in the event of control air failure or loss of electronic output signal.

(2) All valves shall be capable of operating in sequence when required by the sequence of operation. All control valves shall be sized by the control manufacturer, and shall be guaranteed to meet the heating and cooling loads as specified. All control valves shall be suitable for the pressure conditions, and shall close against the differential pressures involved. Valve body pressure rating and connection type (screwed or flanged) shall conform to ANSI pressure classifications appropriate for the system working pressures.

(b) Hot and Cold Water Control Valves

(1) Hot and cold water globe type control valves shall be single-seated type, with equal percentage flow characteristics. The valve discs shall be composition type and shall be sized using ISA methods.

(2) Pressure drop through the valves shall not exceed 5 psi unless otherwise indicated.

(3) Ball valves shall be equipped with 316 stainless steel trim, Teflon seals and adjustable packing gland nuts. Provide a handle for manual operation during start-up and maintenance.

h) Switches

1) Current Sensing Switches

(1) Current sensing switch shall be self-powered with solid-state circuitry and a dry contact output. Current sensing switches shall consist of a solid state current sensing circuit, adjustable trip point, solid state switch, SPDT relay and an LED indicating the on or off status. A conductor of the load shall be passed through the window of the device. It shall accept over current up to twice its trip into range.
*i) Electrical control power and low voltage wiring*

(1) Provide interlock wiring between supply and exhaust fans, electrical wiring for relays (including power feed) for temperature and pressure indication.

(2) Provide power wiring, conduit and connections for low temperature thermostats, high temperature thermostats, alarms, flow switches, actuating devices for temperature, humidity, pressure and flow indication, point resets and user disconnect switches for electric heating, appliances controlled by this Section.

(3) Provide all other wiring required for the complete operation of the specified systems.

(4) Install all wiring raceway systems complying with the requirements of the National Electrical Code.

*j) Network Communication Requirements*

(1) Wired network communication shall follow the published guidelines for twisted pair LonWorks network.

(2) In all communication conduits, provide one spare twisted pair to be installed, tagged and labeled at each end.

(3) Communication conduits shall not be installed closer than six feet from high power transformers or run parallel within six feet of electrical high power cables. Care shall be taken to route the cable as far from interference generating devices as possible. Where communication wire must cross high power wire (deemed as 110VAC or greater) it must do so at right angles.

(4) All shields shall be grounded (earth ground) at one point only to eliminate ground loops. All shield grounding shall be done at the controller location with the shield at the sensor/device end of the applicable wire being left long and “safed” off in an appropriate manner.

(5) There shall be no power wiring, in excess of 30 VAC rms, run in conduit with communications wiring. In cases where signal wiring is run in conduit with communication wiring, all communication wiring and signal wiring shall be run using separate twisted pairs (24awg) in accordance with the manufacturer’s wiring practices.

*k) Input/Output Control Wiring*

(1) RTD wiring shall be two-wire or four-wire twisted, shielded, minimum number 18 gauge.
(2) Other analog inputs shall be a minimum of number 18 gauge, twisted, (shielding optional).

(3) Binary control function wiring shall be a minimum of number 18 gauge.

(4) Analog output control functions shall be a minimum of number 18 gauge, twisted, shielded.

(5) Binary input wiring shall be a minimum of number 18 gauge.

2) Splices

(1) Splices in shielded cables shall consist of terminations and the use of shielded cable couplers, which maintain the integrity of the shielding. Terminations shall be in accessible locations. Cables shall be harnessed with cable ties as specified herein.

I) Conduit and Fittings

(1) Conduit for Control Wiring, Control Cable and Transmission Cable: Electrical metallic tubing (EMT) with compression fittings, cold rolled steel, zinc coated or zinc-coated rigid steel with threaded connections.

(2) Outlet Boxes (Dry Location): Sheradized or galvanized drawn steel suited to each application, in general, four inches square or octagon with suitable raised cover.

(3) Outlet Boxes (Exposed to Weather): Threaded hub cast aluminum or iron boxes with gasket device plate.

(4) Pull and Junction Boxes: Size according to number, size, and position of entering raceway as required by National Electrical Codes. Enclosure type shall be suited to location.

m) Relays

(1) Relays other than those associated with digital output cards shall be general purpose, enclosed plug-in type with 8-pin octal plug and protected by a heat and shock resistant duct cover. Number of contacts and operational function shall be as required.

2) Solid State Relays (SSR)
(1) **Input/output isolation shall be greater than** 10E9 ohms with a breakdown voltage of 2500V root mean square or greater at 60 Hz. The contact life shall be 10 x 10 E6 operations or greater. The ambient temperature range of SSRs shall be -20 to +140F. Input impedance shall not be less than 500 ohms. Relays shall be rated for the application. Operating and release time shall be for 100 milliseconds or less. Transient suppression shall be provided as an integral part of the relay.

3) **Contactors**

(1) Contactors shall be of the single coil, electrically operated, and mechanically held type. Positive locking shall be obtained without the use of hooks, latches, or semi permanent magnets. Contractor shall be double-break-silver-to-silver type protected by arcing contacts. The number of contacts and rating shall be selected for the application. Operating and release times shall be 100 milliseconds or less. Contactors shall be equipped with coil transient suppression devices.

8) **FAS Hardware identification**

a) **Automatic Control Valve Tags**

(1) For valves, etc., use metal tags with a 2-inch minimum diameter, fabricated of brass, stainless steel or aluminum. Attach tags with chain of same materials. For lubrication instructions, use linen or heavy duty shipping tag.

(2) Tag valves with identifying number and system. Number valves by floor level, column location and system served.

(3) Prepare lists of all tagged valves showing location, floor level, and tag number, use. Prepare separate lists for each system. Include copies in each maintenance manual.

b) **Wire Tags**

(1) All multi-conductor cables in all pull boxes and terminal strip cabinets shall be tagged.

(2) Provide wire Tags as per Division 16.

c) **Conduit Tags**

(1) Provide tagging or labeling of conduit so that it is always readily observable which conduit was installed or used in implementation of this Work.
**d) Miscellaneous Equipment Identification**

(1) Screwed-on, engraved black lamicoid sheet with white lettering on all control panels and remote processing panels. Lettering sizes subject to approval.

(2) Inscription, subject to review and acceptance, indicating equipment, system numbers, functions and switches. For panel interior wiring, input/output modules, local control panel device identification.

**9) User interface software**

**a) Basic Conventional Operators Workstation software**

(1) The Operators Workstation shall be equipped with Microsoft ® Windows [most current operating system] as the user terminal operating software.

(2) The Operators Workstation software is installed to provide basic operator interface (i.e., non-facility management/color graphics) shall use pull down menu navigation as the basis of program execution, operating feature penetration, and local or remote site access.

(3) Manual Database Save and Restore. A system operator with the proper password clearance shall be able to archive the database and store on electronic, magnetic, or optical media.

(4) Security. Each operator shall be required to log on to the system with a user name and password in order to view, edit, add, or delete data. System security shall be selectable for each operator. The system supervisor shall have the ability to set passwords and security levels for all other operators.

**b) Custom Application Programming Features**

(1) The language shall be English language oriented and be based on the syntax of programming languages such as BASIC. It shall allow for free form or fill-in-the-blank programming. Alternatively, the programming language can be graphically-based using function blocks as long as blocks are available that directly provide the functions listed below, and that custom or compound function blocks can be created.
(2) A full screen character editor/programming environment shall be provided. The editor shall be cursor/mouse-driven and allow the user to insert, add, modify, and delete code from the custom programming. It shall also incorporate word processing features such as cut-paste and find/replace.

(3) The programming language shall allow independently executing program tasks to be developed.

(4) The editor/programming environment shall have a debugging/simulation capability that allows the user to step through the program and to observe any intermediate values and/or results. The debugger shall also provide error messages for syntax and execution errors.

(5) The programming language shall support conditional statements (IF/THEN/ELSE/ELSE-IF) using compound Boolean (AND, OR and NOT) and/or relations (EQUAL, LESS THAN, GREATER THAN, NOT EQUAL) comparisons.

(6) The programming language shall support floating-point arithmetic using the following operators: +, -, /, x, square root, and xy. The following mathematical functions shall also be provided: absolute value and minimum/maximum value from a list of values.

(7) The programming language shall have pre-defined variables that represent clock time, day of the week, and date. Variables that provide interval timing shall also be available. The language shall allow for computations using these values.

(8) The programming language shall have the ability to pre-define variables representing the status and results of the System Software, and shall be able to enable, disable, and change the values of objects in the system.

(9) On-Line Help. Provide a context sensitive, on-line help system to assist the operator in operation and editing of the system. On-line help shall be available for all applications and shall provide the relevant data for that particular screen.

c) Optional Telephone Interface Software

(1) The system user shall have the option to incorporate telephone access to the system. The telephone interface system shall override system schedules for devices from any LON manufacturer.

(2) If required a standard analog telephone line will be provided. The telephony interface shall use a standard modem interface and not require any custom phone switch equipment.
10) **User Interface/Operator Work Station (OWS) Hardware**

(1) The operator workstation shall be a PC running a currently supported version of the Windows operating system (currently XP).

(2) The PC shall be of a current, fully configured model with the following minimum hardware requirements:
   a. 100GB Hard drive
   b. 1GB Ram
   c. 1.4 GHz processor
   d. Ethernet interface – 100BaseT
   e. V.96 internal modem
   f. CD Rom/DVD Rom burner
   g. 17” flat screen monitor – 1024x768 minimum resolution
   h. Mouse/pointing device and keyboard
   i. Speakers

(3) Standard software included shall be:
   a. Anti-virus software
   b. Microsoft Office
   c. Internet browser
   d. Backup to CD/DVD software
   e. LNS Based Network Management Tool

11) **Execution**

   **a) EXAMINATION**

(1) Verify that systems are ready to receive work.

(2) Beginning of installation means installer accepts existing conditions.

(3) The project plans shall be thoroughly examined for control device and equipment locations, and any discrepancies, conflicts, or omissions shall be reported to the Architect/Engineer for resolution before rough-in work is started.

(4) The contractor shall inspect the site to verify that equipment is installable as show, and any discrepancies, conflicts, or omissions shall be reported to the Architect/Engineer for resolution before rough-in work is started.
(5) The Controls Contractor shall examine the drawings and specifications for other parts of the work, and if head room or space conditions appear inadequate or if any discrepancies occur between the plans and his work and the plans for the work of others, he shall report such discrepancies to the Architect/Engineer and shall obtain written instructions for any changes necessary to accommodate his work with the work of others.

**b) General installation requirements**

(1) Install all control components in accordance with manufacturer's instructions and recommendations.

(2) If the controls contractor is responsible for providing the damper then provide mixing dampers of parallel blade construction arranged to mix streams. Provide separate minimum outside air damper section adjacent to variable outside air damper.

(3) Mount control panels adjacent to associated equipment on vibration-free walls or freestanding angle iron supports. One cabinet may accommodate more than one system in same equipment room. Provide nameplates for instruments and controls inside cabinet and nameplates on cabinet face.

(4) After completion of installation, test and adjust control equipment. Submit data showing setpoints and final adjustments of controls.

(5) Install equipment, piping, wiring/conduit parallel to building lines (i.e., horizontal, vertical, and parallel to walls) wherever possible.

(6) Provide sufficient slack and flexible connections to allow for vibration of piping and equipment.

(7) Verify integrity of all wiring to ensure continuity and freedom from shorts and grounds.

(8) All equipment, installation, and wiring shall comply with acceptable industry specifications and standards for performance, reliability, and compatibility and be executed in strict adherence to local codes and standard practices.

**c) Electrical system installation**

(1) Comply with all Division 16 Installation Requirements.
(2) Install low voltage power and LON and LAN communication trunks in conduit in the following locations regardless of local building code allowances otherwise.

- Mechanical rooms
- Electrical rooms
- Vertical risers (exception: fire rated continuous closet like a telephone closet)
- Open Areas where the wiring will be exposed to view or tampering

(3) Conceal conduit within finished shafts, ceilings and walls as required. Install exposed conduit parallel with or at right angles to the building walls and ceilings.

(4) Where Class 2 wires are in concealed and accessible locations including ceiling return air plenums, approved cables not in raceway may be used provided that:

- Circuits meet NEC Class 2 (current-limited) requirements.
  (Low-voltage power circuits shall be sub-fused when required to meet Class 2 current-limit.)
- All cables shall be UL listed for application, i.e., cables used in ceiling plenums shall be UL listed specifically for that purpose.

(5) Do not install Class 2 wiring in conduit containing Class 1 wiring. Boxes and panels containing high voltage may not be used for low voltage wiring except for the purpose of interfacing the two (e.g., relays and transformers).

(6) Where Class 2 wiring is run exposed, wiring to be run parallel along a surface or perpendicular to it, and NEATLY tied at 3m (10 ft.) intervals minimum.

(7) All wire-to-device connections shall be made at a terminal blocks or terminal strip. All wire-to-wire connections shall be at a terminal block, or with a crimped connector. All wiring within enclosures shall be neatly bundled and anchored to permit access and prevent restriction to devices and terminals.

(8) Plug or cap all unused conduit openings and stub-ups. Do not use caulking compound.

(9) Route all conduit to clear beams, plates, footings and structure members. Do not route conduit through column footings or grade beams.

(10) Set conduits as follows:

- Expanding silicone fire stop material sealed watertight where conduit is run between floors and through walls of fireproof shaft
- Oakum and lead, sealed watertight penetration through outside foundation walls
(11) Cap open ends of conduits until conductors are installed.

(12) Where conduit is attached to vibrating or rotating equipment, flexible metal conduit with a minimum length of 18 inches and maximum length of 36 inches shall be installed and anchored in such a manner that vibration and equipment noise will not be transmitted to the rigid conduit.

(13) Where exposed to the elements or in damp or wet locations, waterproof flexible conduit shall be installed. Installation shall be as specified for flexible metal conduit.

(14) Provide floor, wall, and ceiling plates for all conduits passing through walls, floors or ceilings. Use prime coated cast iron, split-ring type plates, except with polished chrome-plated finish in exposed finished spaces.

**12) Sequence of operations**

Refer to drawings for normal operating mode sequences of operations.

**a) General**

(1) Provide automatic control for system operation as described herein, although word “automatic” or “automatically”, is not used.

(2) Provide control devices, control software and control wiring as required for automatic operation of each sequence specified.

(3) Manual operation is limited only where specifically described; however, provide manual override for each automatic operation.

(4) Where manual start-up is called for, also provide scheduled automatic start-stop capabilities.

(5) Functions called for in sequence of operations are minimum requirements and not to limit additional capabilities the DDC system can be provided with.

(6) Provide the following functions which are not specifically mentioned in each sequence of operation for each item of equipment:

- www. Start-Stop, manual, and scheduled
- xxx. On-Off status of each piece of equipment
- yyy. Run-time
- zzz. All setpoints shall be adjustable
- aaaa. Sequenced starting of all motors
b) Temperature sensors

(1) Temperature sensor assemblies shall be readily accessible and adaptable to each type of application in such manner as to allow for quick, easy replacement and servicing without special tools or skills.

(2) Strap-on mountings shall not be permitted.

(3) Outdoor installations shall be of weatherproof construction or in appropriate NEMA enclosures. These installations shall be protected from solar radiation and wind effects. Protective shield shall be stainless steel.

(4) Sensors shall be with enclosure where located in finished space.

(5) Sensors in ducts shall be mounted in locations to sense the correct temperature of the air only and shall not be located in dead air spaces or positions obstructed by ducts, equipment, and so forth. Locations where installed shall be within the vibration and velocity limit of the sensing element. Ducts shall be securely sealed where elements or connections penetrate ducts to avoid measuring false conditions.

(6) All sensors measuring temperatures in pipes larger than 2 inches in diameter or in pressure vessels shall be supplied with wells properly fabricated for the service. Wells shall be non-corrosive to the medium being measured and shall have sufficient physical strength to withstand pressures and velocities to which they are subjected. Wells shall be installed in the piping at elbows where piping is smaller than the length of the well to affect proper flow across the entire area of the well.

13) Cleaning

(1) The Controls Contractor shall clean up all debris resulting from his or her activities daily. The contractor shall remove all cartons, containers, crates, etc. under his (or his sub-contractors) control as soon as their contents have been removed. Waste shall be collected and placed in a location designated by the Construction Manager or General Contractor.

(2) At the completion of work in any area, the Controls Contractor shall clean all of his/her work, equipment, etc., making it free from dirt and debris, etc.

(3) At the completion of work, all equipment furnished under this Section shall be checked for paint damage, and any factory-finished paint that has been damaged shall be repaired to match the adjacent areas. Any metal cabinet or enclosure that has been deformed shall be replaced with new material and repainted to match the adjacent areas.
14) Protection

(1) The Controls Contractor shall protect all work and material from damage by his/her work or workers or sub-contractors, and shall be liable for all damage thus caused.

(2) The Controls Contractor shall be responsible for his/her work and equipment until finally inspected, tested, and accepted. The Controls Contractor shall protect his/her work against theft or damage, and shall carefully store material and equipment received on-site that is not immediately installed. The Controls Contractor shall close all open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects.

15) Checkout, start-up and testing

(1) The FAS shall be properly commissioned prior to acceptance. The Controls Contractor shall coordinate with others (including mechanical, electrical and test and balance) to properly start up and verify the operation of the system. Provide as-built documentation as detailed in Part 1 of this Section.

16) Acceptance

(1) The FAS will not be accepted as meeting the requirements of Completion until all tests described in this specification have been performed to the satisfaction of the Engineer and the Owner (or designated representative). Any tests that cannot be performed due to circumstances beyond the control of the Contractor may be exempt from the Completion requirements if stated as such in writing by the Owner or the Owner's representative. Such tests shall then be performed as part of the warranty.

17) SCHEDULE OF RESPONSIBILITIES

(1) The following schedule identifies the responsible Division for the installation of the facility automation system. This schedule should be used as a general guide. The General Contractor is the central authority governing the total responsibility of all trade contractors. Therefore, deviations and clarifications of this schedule are permitted provided the General Contractor assumes responsibility to coordinate the trade contractors different than as indicated herein. If deviations or clarifications to this schedule are implemented, submit a record copy to the Architect.
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</tbody>
</table>
2) Notes to Schedule of Responsibilities:

(1) 1. Magnetic motor starters (special duty type) shall be set in place under electrical division except when part of factory wired equipment, in which case set in place under mechanical division.

(2) 2. Where a remote motor disconnect is required in addition to the one provided integral to an Variable Frequency Drive (VFD), the Controls Contractor shall provide the necessary control interlock between the disconnects.

(3) 3. The Controls Contractor shall inform the Mechanical Contractor and the Electrical Contractor of the additional capacity required of control power transformers.

(4) 4. The Mechanical Contractor shall refer to the electrical specifications and plans for all power and control wiring and shall advise the Architect of any discrepancies prior to bidding. The Controls Contractor shall be responsible for all control wiring as outlined, whether called for by the mechanical or electrical drawings and specifications.
DIVISION 26 – ELECTRICAL

SECTION 26010 BASIC ELECTRICAL REQUIREMENTS

GENERAL

Basic Requirements: The Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

General Provisions: Provide all labor, materials, equipment, and incidentals required to make ready for use complete electrical systems as specified herein and shown on the drawings.

Provide and Install: The word "provide" where used on the Drawings or in the Specifications shall mean "furnish, install, mount, connect, test, complete, and make ready for operation". The word "install" where used on the Drawings or in the Specifications shall mean "mount, connect, test, complete, and make ready for operation". Perform work required by, and in accordance with, the Contract Documents.

Installation: Provide and place in satisfactory condition, ready for proper operation, raceways, wires, cables, and other material needed for all complete electrical systems required by the Contract Documents. Additional raceways and wiring shall be provided to complete the installation of the specific equipment provided. Include auxiliaries and accessories for complete and properly operating systems. Provide electrical systems and accessories to comply with the NEC, state and local codes and ordinances. It is the intent of these Specifications that the electrical systems be suitable in every way for the use intended. Material and work which is incidental to the work of this Contract shall be provided at no additional cost to the Contract.

Field Connections: Provide field connections to remote equipment and control panels provided under other Divisions of these Specifications. Provide raceway, wire, and interconnections between equipment, transmitters, local indicators, and receivers. Provide 120V and low voltage surge protection equipment in accordance with Section 26709 at equipment as required. Install field connections to "packaged" equipment provided under other Divisions of these Specifications.
**SCOPE OF WORK**

General: Provide labor, materials, permits, inspections and re-inspection fees, tools, equipment, transportation, insurance, temporary protection, temporary power and lighting, supervision and incidental items essential for proper installation and operation of the Electrical systems indicated in the Contract Documents. Provide materials not specifically mentioned or indicated but which are usually provided or are essential for proper installation and operation of the Electrical systems indicated in the contract documents.

Notices: Give notices, file Plans, pay fees, and obtain permits and approvals from authorities having jurisdiction. Include all fees in the Bid Price.

**INTERPRETATION OF DRAWINGS**

General: The Drawings are diagrammatic and are not intended to show exact locations of Raceway runs, outlet boxes, junction boxes, pull boxes, etc. The locations of equipment, appliances, fixtures, Raceways, outlets, boxes and similar devices shown on the Drawings are approximate only. Exact locations shall be determined and coordinated in the field. The right is reserved to change, without additional cost, the location of any outlet within the same room or general area before it is permanently installed. Obtain all information relevant to the placing of electrical work and in case of interference with other work, proceed as directed by the Architect.

Discrepancies: Notify the Architect of any discrepancies found during construction of the project. The Architect will provide written instructions as to how to proceed with that portion of work. If a conflict exists between the Contract Documents and an applicable code or standard, the most stringent requirement shall apply.

Wiring: Each three-phase circuit shall be run in a separate Raceway unless otherwise shown on the Drawings. Unless otherwise accepted by the Architect, Raceway shall not be installed exposed. Where circuits are shown as "home-runs" all necessary fittings, supports, and boxes shall be provided for a complete raceway installation.

Layout: Circuit layouts are not intended to show the number of fittings, or other installation details. Connections to equipment shall be made as required, and in accordance with the accepted shop and manufacturer's setting drawings.

Coordination: Coordinate final equipment locations with drawings or other disciplines. Layout before installation so that all trades may install equipment in available space. Provide coordination as required for installation in a neat and workmanlike manner.
EQUIPMENT SIZE AND HANDLING

Coordination: Investigate each space in the structure through which equipment must pass to reach its final location. If necessary, ship the equipment in sections of specific sizes to permit the passing through the necessary areas within the structure.

Handling: Equipment shall be kept upright at all times. When equipment has to be tilted for ease of passage through restricted areas during transportation, the manufacturer shall be required to brace the equipment suitably, to insure that the tilting does not impair the functional integrity of the equipment.

RECORD DRAWINGS

Production: The Contractor shall provide two (2) sets of black or blue line on white drawings to maintain and submit record "As-Built Documents". Label each sheet of the Record Document set with “Project Record Documents” with company name of the installing contractor in stamped or printed letters. One set shall be maintained at the site and at all times be accurate, clear, and complete. These drawings shall be available at all times to the Architect's field representatives.

Recording: Record information concurrent with construction progress. Make entries within 24 hours upon receipt of information. The "As-Built" drawings shall accurately reflect installed electrical work specified or shown on the Contract Documents.

Completion: At the completion of the Work, transfer changes with a colored pencil onto the second set and submit to the Architect. The "As-Built" drawings shall be made available to the Architect to make the substantial completion punch list.

Final: Upon Contractor’s completion of the Engineer’s final punch list, transfer all “As-Built” conditions and all requirements by the Engineer to a reproducible set of drawings and CAD files. Submit drawings and CAD disks for review and acceptance. The Contractor shall provide updated disks which include final As-Built conditions.

ABBREVIATIONS

Abbreviations: The following abbreviations or initials may be used:

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>A/C</td>
<td>Air Conditioning</td>
</tr>
<tr>
<td>AC</td>
<td>Alternating Current</td>
</tr>
<tr>
<td>ABV CLG</td>
<td>Above Ceiling</td>
</tr>
<tr>
<td>ADA</td>
<td>Americans with Disabilities Act</td>
</tr>
<tr>
<td>AF</td>
<td>Ampere Frame</td>
</tr>
<tr>
<td>AFF</td>
<td>Above Finished Floor</td>
</tr>
<tr>
<td>AFG</td>
<td>Above Finished Grade</td>
</tr>
<tr>
<td>AHU</td>
<td>Air Handler Unit</td>
</tr>
<tr>
<td>AIC</td>
<td>Amps Interrupting Capacity</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>AL</td>
<td>Aluminum</td>
</tr>
<tr>
<td>AMP</td>
<td>Ampere</td>
</tr>
<tr>
<td>ANSI</td>
<td>American National Standards Institute</td>
</tr>
<tr>
<td>ASA</td>
<td>American Standards Association</td>
</tr>
<tr>
<td>AT</td>
<td>Ampere Trip</td>
</tr>
<tr>
<td>ATS</td>
<td>Automatic Transfer Switch</td>
</tr>
<tr>
<td>AUX</td>
<td>Auxiliary</td>
</tr>
<tr>
<td>AWG</td>
<td>American Wire Gauge</td>
</tr>
<tr>
<td>BC</td>
<td>Bare Copper</td>
</tr>
<tr>
<td>BIL</td>
<td>Basic Impulse Level</td>
</tr>
<tr>
<td>BMS</td>
<td>Building Management System</td>
</tr>
<tr>
<td>BRKR or BKR</td>
<td>Breaker</td>
</tr>
<tr>
<td>CAB</td>
<td>Cabinet</td>
</tr>
<tr>
<td>C</td>
<td>Conduit or Raceway</td>
</tr>
<tr>
<td>CB</td>
<td>Circuit Breaker</td>
</tr>
<tr>
<td>CBM</td>
<td>Certified Ballast Manufacturers</td>
</tr>
<tr>
<td>CCTV</td>
<td>Closed Circuit Television</td>
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<tr>
<td>CKT</td>
<td>Circuit</td>
</tr>
<tr>
<td>CLEC</td>
<td>Clock Equipment Cabinet</td>
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<tr>
<td>CLG</td>
<td>Ceiling</td>
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<tr>
<td>CO</td>
<td>Conduit or Raceway Only</td>
</tr>
<tr>
<td>COAX</td>
<td>Coaxial Cable</td>
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<tr>
<td>COND</td>
<td>Conductor</td>
</tr>
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<td>CONN</td>
<td>Connection</td>
</tr>
<tr>
<td>CPU</td>
<td>Central Processing Unit</td>
</tr>
<tr>
<td>CRT</td>
<td>Cathode Ray Terminal (Video display terminal)</td>
</tr>
<tr>
<td>CT</td>
<td>Current Transformer</td>
</tr>
<tr>
<td>CU</td>
<td>Copper</td>
</tr>
<tr>
<td>CW</td>
<td>Cold Water</td>
</tr>
<tr>
<td>DC</td>
<td>Direct Current</td>
</tr>
<tr>
<td>DDC</td>
<td>Direct Digital Control</td>
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<tr>
<td>DEG</td>
<td>Degree</td>
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<tr>
<td>DISC</td>
<td>Disconnect</td>
</tr>
<tr>
<td>DO</td>
<td>Draw Out</td>
</tr>
<tr>
<td>DN</td>
<td>Down</td>
</tr>
<tr>
<td>DPST</td>
<td>Double Pole Single Throw</td>
</tr>
<tr>
<td>EMT</td>
<td>Electrical Metallic Tubing</td>
</tr>
<tr>
<td>EO</td>
<td>Electrically Operated</td>
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<tr>
<td>EOL</td>
<td>End of Line Resistor</td>
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<tr>
<td>EWC</td>
<td>Electric Water Cooler</td>
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<tr>
<td>FAAP</td>
<td>Fire Alarm Annunciator Panel</td>
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<tr>
<td>FACP</td>
<td>Fire Alarm Control Panel</td>
</tr>
<tr>
<td>FCU</td>
<td>Fan Coil Unit</td>
</tr>
<tr>
<td>FLA</td>
<td>Full Load Amperes</td>
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<tr>
<td>FM</td>
<td>Factory Mutual</td>
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<tr>
<td>GF</td>
<td>Ground Fault</td>
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</table>
GFCI  Ground Fault Circuits Interrupter
GND   Ground
HOA   Hand-Off-Automatic
HORIZ Horizontal
HP    Horsepower
IC    Intercom
ICU   Intensive Care Unit
IEEE  Institute of Electrical and Electronic Engineers
IES   Illuminating Engineering Society
IMC   Intermediate Metallic Raceway
IN    Inches
IT    Instantaneous Trip
IPCEA Insulated Power Cable Engineers Association
JB    Junction Box
KCMIL Thousand Circular Mills
KV    Kilovolt
KVA   Kilo-Volt-Amps
KW    Kilowatts
LBS   Pounds
LED   Light Emitting Diode
LT    Light
LTD   Long Time Delay
LTT   Long Time Trip
LTG   Lighting
MAX   Maximum
MCB   Main Circuit Breaker
MCC   Motor Control Center
MCP   Motor Circuit Protector
MIC   Microphone
MIN   Minimum
MLO   Main Lugs Only
MTD   Mounted
MTG   Mounting
MUX   Multiplex (Transponder) Panel
MVA   Mega Volt Amps
N     Neutral
NC    Normally Closed
NEC   National Electrical Code
NECA  National Electrical Contractors Association
NEMA  National Electrical Manufacturers Association
NFPA  National Fire Protection Association
NIC   Not in Contract
NF    Non Fused
NL    Non Linear
NO    Number or Normally Open
#     Number
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>0</td>
<td>Phase</td>
</tr>
<tr>
<td>OL</td>
<td>Overload</td>
</tr>
<tr>
<td>OSHA</td>
<td>Occupational Safety and Health Administration</td>
</tr>
<tr>
<td>P</td>
<td>Pole</td>
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<tr>
<td>PB</td>
<td>Pullbox</td>
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<tr>
<td>PIV</td>
<td>Post Indicator Valve</td>
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<td>PNL</td>
<td>Panel</td>
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<tr>
<td>PR</td>
<td>Pair</td>
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<td>PWR</td>
<td>Power</td>
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<td>PF</td>
<td>Power Factor</td>
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<td>PRI</td>
<td>Primary</td>
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<tr>
<td>PT</td>
<td>Potential Transformer</td>
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<tr>
<td>PVC</td>
<td>Polyvinylchloride</td>
</tr>
<tr>
<td>REF</td>
<td>Refrigerator</td>
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<tr>
<td>RGC or GRC</td>
<td>Rigid Galvanized Raceway</td>
</tr>
<tr>
<td>RMS</td>
<td>Root-Mean-Square</td>
</tr>
<tr>
<td>RPM</td>
<td>Revolutions Per Minute</td>
</tr>
<tr>
<td>RECPT</td>
<td>Receptacle</td>
</tr>
<tr>
<td>SCA</td>
<td>Short Circuit Amps</td>
</tr>
<tr>
<td>SD</td>
<td>Smoke Detector</td>
</tr>
<tr>
<td>SEC</td>
<td>Secondary</td>
</tr>
<tr>
<td>S/N</td>
<td>Solid Neutral</td>
</tr>
<tr>
<td>SPKR</td>
<td>Speaker</td>
</tr>
<tr>
<td>SPST</td>
<td>Single Pole Single Throw</td>
</tr>
<tr>
<td>SST</td>
<td>Solid State Trip</td>
</tr>
<tr>
<td>ST</td>
<td>Short Time Trip</td>
</tr>
<tr>
<td>STD</td>
<td>Short Time Delay</td>
</tr>
<tr>
<td>SW</td>
<td>Switch</td>
</tr>
<tr>
<td>SWGR</td>
<td>Switchgear</td>
</tr>
<tr>
<td>SWBD</td>
<td>Switchboard</td>
</tr>
<tr>
<td>TEL</td>
<td>Telephone</td>
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<tr>
<td>TTB</td>
<td>Telephone Terminal Board</td>
</tr>
<tr>
<td>TTC</td>
<td>Telephone Terminal Cabinet</td>
</tr>
<tr>
<td>TVEC</td>
<td>Television Equipment Cabinet</td>
</tr>
<tr>
<td>TYP</td>
<td>Typical</td>
</tr>
<tr>
<td>UL</td>
<td>Underwriters Laboratories</td>
</tr>
<tr>
<td>UON</td>
<td>Unless Otherwise Noted</td>
</tr>
<tr>
<td>V</td>
<td>Volt</td>
</tr>
<tr>
<td>VFD</td>
<td>Variable Frequency Drive</td>
</tr>
<tr>
<td>VSD</td>
<td>Variable Speed Drive</td>
</tr>
<tr>
<td>W</td>
<td>Wire</td>
</tr>
<tr>
<td>WP</td>
<td>Weatherproof</td>
</tr>
<tr>
<td>XFMR</td>
<td>Transformer</td>
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</tbody>
</table>
CODES, FEES, AND STANDARDS

Application: The codes, standards and practices listed herein generally apply to the entire project and specification sections. Other codes, standards or practices that are more specific will be referenced within a particular specification.

Requirements: All materials and types of construction covered in the specifications will be required to meet or exceed applicable standards of manufacturer, testing, performance, and installation according to the requirements of UL, ANSI, NEMA, IEEE, and NEC referenced documents where indicated and the manufacturer's recommended practices. Requirements indicated on the contract documents that exceed but are not contrary to governing codes shall be followed.

Compliance and Certification: The installation shall comply with the governing state and local codes or ordinances. The completed electrical installation shall be inspected and certified by applicable agencies that it is in compliance with codes.

Applicability: The codes and standards and practices listed herein dates are furnished as the minimum latest requirements.

State of Florida.
Osceola County.

Utility Company: Comply with latest utility company regulations.

State Statutes: Florida Statutes

4A3, The State Fire Prevention Code
4A47, The Uniform Fire Safety Standards for Elevators.
State Requirements for Educational Facilities. (SREF)


Standards: American Society of Mechanical Engineers

ASME-A17.1 Elevator Code, plus Interpretations to Date.

Florida Americans with Disabilities Accessibility Implementation Act as described in Florida Accessibility Code for Building Construction, Department of Community Affairs.

Labels: Materials and equipment shall be new and free of defects, and shall be U.L. listed, bear the U.L. label or be labeled or listed with an approved, nationally recognized Electrical Testing Agency. Where no labeling or listing service is available or desired for certain types of equipment, test data shall be submitted to validate that equipment meets or exceeds available standards.
NFPA: National Fire Protection Association (NFPA) Standards

NFPA-20  Installation Of Centrifugal Fire Pumps.
NFPA-70  National Electrical Code.
NFPA-72  Installation, Maintenance And Use Of Fire Alarm Systems.
NFPA-90A  Installation of Air Conditioning And Ventilation Systems.
NFPA-96  Installation of Equipment For The Removal Of Smoke And Grease Laden Vapors From Commercial Cooking.

SUPERVISION OF THE WORK

Supervision: Provide one field superintendent who has had a minimum of four (4) years previous successful experience on projects of comparable sizes, type and complexity. The Superintendent shall be present at all times when work is being performed. At least one member of the Electrical Contracting Firm shall hold a State Master Certificate of Competency.

COORDINATION

General: Compare drawings and specifications with those of other trades and report any discrepancies between them to the Architect. Obtain from the Architect written instructions to make the necessary changes in any of the affected work. Work shall be installed in cooperation with other Trades installing interrelated work. Before installation, Trades shall make proper provisions to avoid interferences in a manner approved by the Architect.

Provide all required coordination and supervision where work connects to or is affected by work of others, and comply with all requirements affecting this Division. Work required under other divisions, specifications or drawings to be performed by this Division shall be coordinated with the Contractor and such work performed at no additional cost to Owner including but not limited to electrical work required for:

- Door hardware
- Roll-up doors
- Roll-up grilles
- Signage
- Fire shutters
- Elevators
- Sliding or automatic doors
- Mechanical Division of the Specifications
- Landscape Architect drawings
- Lifts
Laundry equipment
Kitchen equipment
Millwork design drawings and shop drawings

Obtain set of Contract Documents from Owner’s Authorized Representative or Contractor for all areas of work noted above and include all electrical work in bid whether included in Division 26 Contract Documents or not.

Secure approved shop drawings from all required disciplines and verify final electrical characteristics before roughing power feeds to any equipment. When electrical data on approved shop drawings differs from that shown or called for in Construction Documents, make adjustments to the wiring, disconnects, and branch circuit protection to match that required for the equipment installed.

Damage from interference caused by inadequate coordination shall be corrected at no additional cost to the Owner.

Adjustments: Locations of raceway and equipment shall be adjusted to accommodate the work with interferences anticipated and encountered. Determine the exact routing and location of systems prior to fabrication or installation.

Priorities: Lines which pitch shall have the right of way over those which do not pitch. For example, plumbing drains shall normally have the right of way. Lines whose elevations cannot be changed shall have the right of way over lines whose elevations can be changed.

Modifications: Offsets and changes of direction in raceway systems shall be made to maintain proper headroom and pitch of sloping lines whether or not indicated on the drawings. Provide elbows, boxes, etc., as required to allow offsets and changes to suit job conditions.

Replacement: Work shall be installed in a way to permit removal (without damage to other parts) of other system components provided under this Contract requiring periodic replacement or maintenance. Raceway shall be arranged in a manner to clear the openings of swinging overhead access doors as well as ceiling tiles.

Layout: The Contract Drawings are diagrammatic only intending to show general runs and locations of raceway and equipment, and not necessarily showing required offsets, details and accessories and equipment to be connected. Work shall be accurately laid out with other Trades to avoid conflicts and to obtain a neat and workmanlike installation, which will afford maximum accessibility for operation, maintenance and headroom.
Contract Conflicts: Where discrepancies exist in the Scope of Work as to what Trade provides items such as starters, disconnects, flow switches, etc. such conflicts shall be coordinated between the divisions involved. It is the intent of the Contract Documents that all work shall be provided complete as one bid price.

Drawing Conflicts: Where drawing details, plans or specification requirements are in conflict and where sizes of the same item run are shown to be different within the contract documents, the most stringent requirement shall be included in the Contract. Systems and equipment called for in the specification or as shown on the drawings shall be provided as if it was required by both the drawings and specifications. Prior to ordering or installation of any portion of work, which appears to be in conflict, such work shall be brought to Architect's attention for direction as to what is to be provided.

It is the responsibility of this Contractor to coordinate the exact required location of floor outlets, floor ducts, floor stub-ups, etc. with Owner’s Authorized Representative and Designer (and receive their approval) prior to rough-in. Locations indicated in Contract Documents are only approximate locations.

The Contract Documents describe specific sizes of switches, breakers, fuses, Raceways, conductors, motor starters and other items of wiring equipment. These sizes are based on specific items of power consuming equipment (heaters, lights, motors for fans, compressors, pumps, etc.). Coordinate the requirements of each load with each load’s respective circuitry shown and with each load’s requirements as noted on its nameplate data and manufacturer’s published electrical criteria. Adjust circuit breaker, fuse, Raceway, and conductor sizes to meet the actual requirements of the equipment being provided and installed and change from single point to multiple points of connection (or vice versa) to meet equipment requirements. Changes shall be made at no additional cost to the Owner.

Working Clearances: Minimum working clearances about electrical equipment shall be as referenced in the applicable edition NEC Article 110, and shall include equipment installed in ceiling spaces.
**COORDINATION STUDY**

Specified Manufacturers: All panelboard and circuit breakers shall be of the manufacturer and type specified herein, and as indicated on the drawings or the Coordination Study. Any discrepancies or conflicts in specified equipment shall be brought to the attention of the engineer during bid, for formal clarification.

Substitutions: Alternate manufacturers listed will be considered under the following conditions:

- Written approval of the Owner to consider alternate manufacturer.
- Ability of alternate manufacturer to meet the requirements of the Construction Documents.
- Alternate equipment selection shall provide selective overcurrent device coordination, including coordination with existing equipment.
- Submission of coordination plots, showing proper selective coordination of proposed equipment for reference and review. Provide coordination plots for all distribution branches indicated on Construction Documents.

**PRODUCTS**

**MATERIALS**

Specified Method: Where several brand names, make or manufacturers are listed as acceptable each shall be regarded as equally acceptable, based on the design selection but each must meet all specification requirements. Where a manufacturer's model number is listed, this model shall set the standard of quality and performance required. Where no brand name is specified, the source and quality shall be subject to Engineer's review and acceptance. Where manufacturers are listed, one of the listed manufacturers shall be submitted for acceptance. No substitutions are permitted.

Certification: When a product is specified to be in accordance with a trade association or government standard requested by the Engineer, Contractor shall provide a certificate that the product complies with the referenced standard. Upon request of Engineer, Contractor shall submit supporting test data to substantiate compliance.

Basis of Bid: Each bidder represents that his bid is based upon the manufacturer's, materials, and equipment described in the Contract Documents.

Space Requirements: Equipment or optional equipment shall conform to established space requirements within the project. Equipment which does not meet space requirements, shall be replaced at no additional expense to the Contract. Modifications of related systems shall be made at no additional expense to the Contract. Submit modifications to the Architect/Engineer for acceptance.
SHOP DRAWINGS

General: Shop drawings shall be submitted for every item listed within the Submittals section each individual specification section. One copy shall be submitted to the engineer prior to ordering equipment. Refer to Basis of approval paragraph.

Responsibility: It is the Contractors responsibility to provide material in accordance with the plans and specifications. Material not provided in accordance with the plans and specifications shall be removed and replaced at the Contractors expense.

Official Record: The shop drawing submittal shall become the official record of the materials to be installed. If materials are installed which do not correspond to the record submittal they shall be removed from the project without any additional cost or delays in construction completion.

Information: The shop drawing record submittal shall include the following information to the extent applicable to the particular item;

- Manufacturer's name and product designation or catalog number.
- Standards or specifications of ANSI, ASTM, ICEA, IEEE, ISA, NEMA, NFPA, OSHA, UL, or other organizations, including the type, size, or other designation.
- Dimensioned plan, sections, and elevations showing means for mounting, Raceway connections, and grounding, and showing layout of components.
- Materials and finish specifications, including paints.
- List of components including manufacturer's names and catalog numbers.
- Internal wiring diagram indicating connections to components and the terminals for external connections.
- Manufacturer's instructions and recommendations for installation, operation, and maintenance.
- Manufacturer's recommended list of spare parts.

Provide 1/2" = 1'-0” enlarged electrical room layout drawings for all electrical rooms. All equipment shall be indicated at actual size of equipment being provided. All dimensions and required working clearances shall be shown.

Preparation: Prior to submittal, shop drawings shall be checked for accuracy and contract requirements. Shop drawings shall bear the date checked and shall be accompanied by a statement that the shop drawings have been examined for conformity to Specifications and Drawings. This statement shall also list discrepancies with the Specifications and Drawings. Shop drawings not so checked and noted shall be returned to Contractor unreviewed.

Basis of Review: Approval is only for general conformance with the design concept of the project and general compliance with the information given in the contract documents. Contractor is responsible for quantities, dimensions, fabrication processes, and construction techniques.
Responsibility: The responsibility that dimensions are confirmed and correlated with proper coordination of other trades shall be included as part of the Contract Documents. The responsibility and the necessity of providing materials and workmanship required by the Specifications and Drawings which may not be indicated on the shop drawings shall be included as part of the Contract Documents. The Contractor is responsible for any delays in job progress occurring directly or indirectly from late submissions or re-submissions of shop drawings, product data, or samples.

Ordering Equipment: No material shall be ordered or shop work started until the Engineer's has officially received the shop drawings record submittal and has formally released the Contractor for submittal requirements.

Brochure Requirements: Submit Technical Information Brochures at the start of construction or no later than 30 days after Award of the Contract. Each brochure shall consist of an adequately sized, hardcover, 3-ring binder for 8-1/2" X 11" sheets. Provide correct designation on outside cover and on end of brochure. When one binder is not enough to adequately catalog all data, an additional binder shall be submitted.

Brochure Contents: First sheet in the brochure shall be a photocopy of the Electrical Index pages in these specifications. Second sheet shall be a list of Project Addresses for this project. Third sheet shall list Project Information. Provide reinforced separation sheets tabbed with the appropriate specification reference number and typed index for each section in the Electrical Schedule. Technical Information consisting of marked catalog sheets or shop drawings shall be inserted in the brochure in proper order on all items specified and shown on drawings. At the end of the brochure, provide and insert a copy of the specifications for this Division and all addenda applicable to this Division.

Contractor's Review: Review the brochures before submitting to the Engineer. No request for payment shall be considered until the brochure has been reviewed, stamped and submitted for review.

Cost: Submit cost breakdown on work in the Technical Information Brochures. The cost of material and labor for each item shall be indicated. The cost of fittings and incidentals are not required.

Title Drawings: Title drawings to include identification of project and names of Architect-Engineer, Engineer, Contractors, and/or supplier, data, number sequentially and indicate in general;

    Fabrication and Erection dimensions.
    Arrangements and sectional views.
    Necessary details, including complete information for making connections with other work.
    Kinds of materials and finishes.
    Descriptive names of equipment.
Modifications and options to standard equipment required by the contract. Leave blank area, size approximately 4 by 2-1/2 inches, near title block (for Engineer's stamp imprint). In order to facilitate review of shop drawings, they shall be noted, indicating by cross-reference the contract drawings, notes, and specification paragraph numbers where items occur in the contract documents. See specific sections of specifications for further requirements.

Technical Data: Submit technical data verifying that the item submitted complies with the requirements of the specifications. Technical data shall include manufacturer's name and model number, dimensions, weights, electrical characteristics, and clearances required. Indicate optional equipment and changes from the standard item as called for in the specifications. Provide drawings, or diagrams, dimensioned and in correct scale, covering equipment, showing arrangement of components and overall coordination.

Same Manufacturer: In general, relays, contactors, starters, motor control centers, switchboards, panelboards, dry type transformers, disconnect switches, circuit breakers, manual motor starter switches, etc., shall be supplied and manufactured by the same manufacturer. This requirement shall apply to same type of electrical components specified in other Divisions.

EQUIPMENT, MATERIALS, AND SUPPORTS

General: Each item of equipment or material shall be manufactured by a company regularly engaged in the manufacture of the type and size of equipment, shall be suitable for the environment in which it is to be installed, shall be approved for its purpose, environment, and application, and shall bear the UL label.

Installation Requirements: Each item of equipment or material shall be installed in accordance with instructions and recommendations of the manufacturer, however, the methods shall not be less stringent than specified herein.

Required Accessories: Provide all devices and materials, such as expansion bolts, foundation bolts, screws, channels, angles, and other attaching means, required to fasten enclosures, raceways, and other electrical equipment and materials to be mounted on structures which are existing or new.

Protection: Electrical equipment shall at all times during construction be adequately protected against mechanical injury or damage by the elements. Equipment shall be stored in dry permanent shelters. If apparatus has been damaged, such damage shall be repaired at no additional cost or time extension to the Contract. If apparatus has been subject to possible injury, it shall be thoroughly cleaned, dried out and put through tests as directed by the Manufacturer and Engineer, or shall be replaced, if directed by the Engineer, at no additional cost to the Contract.
IDENTIFICATION OF EQUIPMENT

General: Electrical items shall be identified as specified in the Contract Documents. Such identification shall be in addition to the manufacturer's nameplates and shall serve to identify the item's function and the equipment or system, which it serves or controls. Refer to Identification Section of the specifications for additional information.

CONCRETE PADS

General: Provide reinforced concrete pads for floor mounted electrical equipment. Unless otherwise noted, pads shall be nominal four (4) inches high and shall exceed dimensions of equipment being set on them, including future sections, by six (6) inches on all sides, except when equipment is flush against a wall, then the side or sides against the wall shall be flush with the equipment. Chamfer top edges 1/2". Trowel surfaces smooth. Reinforce pads with #5 reinforcing bars at 24" centers each way, unless specifically detailed on drawings.

SURFACE MOUNTED EQUIPMENT

General: Surface mounted fixtures, outlets, cabinets, panels, etc. shall have a factory-applied finish or shall be painted as accepted by Engineer. Raceways and fittings, where allowed to be installed surface mounted, shall be painted to match the finish on which it was installed. Paint shall be in accordance with other applicable sections of these specifications.

CUTTING AND PATCHING

Core Drilling: The Contractor shall be responsible for core drilling as required for work under this section, but in no case shall the Contractor cut into or weld onto any structural element of the project without the written approval of the Architect.

Cutting and Patching: Cutting, rough patching and finish patching shall be provided as specified in the contract documents. Cutting and patching shall be performed in a neat and workmanlike manner. Upon completion, the patched area shall match adjacent surfaces.

Openings and Sleeves: Locate openings required for work performed under this section. Provide sleeves, guards or other accepted methods to allow passage of items installed under this section.

Roof Penetration: Provide roofer with pitch pans, fittings, etc., required for electrical items which penetrate the roof. Roof penetrations are to be waterproofed in such a manner that roofing guarantees are fully in force. Roof penetrations shall be coordinated with other Trades to ensure that roof warranty is not invalidated.
**SLEEVES AND FORMS FOR OPENINGS**

Sleeves: Provide sleeves for Raceways penetrating floors, walls, partitions, etc. Locate necessary slots for electrical work and form before concrete is poured. Watertight sleeves shall be line seal type WS. Fire rated partition sleeves shall be mild steel. Sleeves shall be Schedule 40 PVC or galvanized rigid steel unless specifically noted otherwise. Size shall be one standard diameter larger than pipe being installed or of a larger diameter to below 1/4” minimum clearance.

Forms: Provide boxed out forms for Raceway penetrations only where allowed by the Architect. Fill opening after Raceway installation, with equivalent material.

**OPERATING AND MAINTENANCE INSTRUCTIONS**

General: Thoroughly instruct the Owner’s Representative, to the complete satisfaction of the Architect and Engineer, in the proper operation of all systems and equipment provided. The Contractor shall make all arrangements, via the Architect, as to whom the instructions are to be given in the operation of the systems and the period of time in which they are to be given. The Architect shall be completely satisfied that the Owner’s Representative has been thoroughly and completely instructed in the proper operation of all systems and equipment before final payment is made. If the Architect determines that complete and thorough instructions have not been given by the Contractor to the Owner's Representative, then the Contractor shall be directed by the Architect to provide whatever instructions are necessary until the intent of this paragraph of the Specification has been complied with.

Submittals: Submit to the Architect for approval five (5) typed sets, bound neatly in loose-leaf binders, of instructions for the installation, operation, care and maintenance of equipment and systems, including instructions for the ordering and stocking of spare parts for equipment installed under this contract. The lists shall include part number and suggested suppliers. Each set shall also include an itemized list of component parts that should be kept on hand and where such parts can be purchased.

Information Requirements: Information shall indicate possible problems with equipment and suggested corrective action. The manuals shall be indexed for each type of equipment. Each section shall be clearly divided from the other sections. A sub index for each section shall also be provided.

Instructions: The instructions shall contain information deemed necessary by the Architect and include but not limited to the following:

- **Introduction:**
  - Summary description of the Electrical Systems.
  - Purpose of systems.
**System:**
Detailed description of all systems.
Illustrations, schematics, block diagrams, catalog cuts and other exhibits.

**Operations:**
Complete detailed, step by step, sequential description of all phases of operation for all portions of the systems, including start up, shutdown and balancing.
Include posted instruction charts.

**Maintenance:**
Parts list and part numbers.
Maintenance and replacement charts and the Manufacturer's recommendations for preventive maintenance.
Trouble shooting charts for systems and components.
Instructions for testing each type of part.
Recommended list of on-hand spare parts.
Complete calibration instructions for all parts and entire systems.
General and miscellaneous maintenance notes.

**Manufacturer's Literature:**
Complete listing for all parts.
Names, addresses and telephone numbers.
Care and operation.
All pertinent brochures, illustrations, drawings, cuts, bulletins, technical data, certified performance charts and other literature with the model actually furnished to be clearly and conspicuously identified.
Internal wiring diagrams and Engineering data sheets for all items and/or equipment furnished under each Contract.
Guarantee and warranty data.

**SERVICE AND METERING**

Company: The utility company serving this project will be referred to as the Utility Company herein.

Service: Make arrangements with the power company for obtaining a complete service. Pay charges and provide labor and material for the service. Service shall be obtained at 277/480 volts from the Utility Company. Provide underground cables and Raceways for incoming services from the utility's overhead service drop to distribution equipment. Provide Utility Company approved meter socket and empty Raceway (per utility co. specs.) from transformer secondary bushings to meter location.
A. Fees: Contact the Utility Company to determine if any fees, charges or costs will be due the Company, as required for temporary power, permanent power, installations, hook-ups, etc. This fee, charge or cost shall be included in the bid price.

B. Payment: Pay for required licenses, fees and inspections. Include costs in the proposed construction cost submission. These costs shall include but not be limited to applicable taxes, permits, necessary notices, certificates and costs required to obtain same.

C. Codes: Install a complete system in accordance with the latest edition of the National Electrical Code and the latest regulations of governing local, State, County and other applicable codes, including the Utility Company requirements.

A. Provide transformer pad per Utility Company requirements.

**TEMPORARY LIGHT AND POWER**

Capacity: Provide capacity from new temporary service. Make arrangements with the Owner for temporary service and pay all related expenses. Temporary light and power shall be provided constantly during the project dependent upon Owner's safety requirements.

Capacity: Make arrangements with the Owner for existing temporary service and pay all related expenses. Temporary light and power shall be provided constantly during the project dependent upon Owner's safety requirements.

Lighting: Temporary light shall be based on one 200 watt lamp covering each 1,000 square foot of floor area in the building. Each room 100 square foot and over shall have a minimum of one 100-watt lamp with guards. Provide power for motors up to 3/4 horsepower only. Provisions are to be made for electric welders, if required.

Outlets: Provide outlets located at convenient points so that extension cords of not over fifty (50) feet will reach work requiring artificial light or power.

Other Connections: Contractors of other trades shall furnish their own cords and sockets, as may be required for their work and shall also pay for cost of temporary wiring of construction offices and shanties used by them.

New Fixtures: Permanently installed lighting fixtures may be used for temporary lighting at the Contractor's option with the provision that cool white lamps for fluorescent, clear lamps for incandescent and marked temporary for other types shall be installed. At job completion, lamps shall be replaced with permanent lamps specified.
Wiring: Temporary electrical work shall be furnished and installed in conformity with the National Electrical Code and in accordance with the requirements of the local ordinances and shall be maintained in a workmanlike manner throughout their entire construction period and shall be removed after installation of the permanent electrical systems. Extension cords shall be GFCI protected or shall be fed from GFCI circuit breakers.

Payment: The Contractor will pay for the cost of energy consumed by all trades. Any temporary wiring of a special nature for light and power required other than mentioned above shall be paid for by the Contractor using same.

EXECUTION

WORKMANSHIP

General: The installation of materials and equipment shall be performed in a neat, workmanlike and timely manner by an adequate number of craftsmen knowledgeable of the requirements of the Contract Documents. They shall be skilled in the methods and craftsmanship needed to produce a quality level of workmanship. Personnel who install materials and equipment shall be qualified by training and experience to perform their assigned tasks.

Acceptable Workmanship: Acceptable workmanship is characterized by first-quality appearance and function, conforming to applicable standards of building system construction, and exhibiting a high degree of quality and proficiency which is judged by the Architect as equivalent or better than that ordinarily produced by qualified industry tradesmen.

Performance: Personnel shall not be used in the performance of the installation of material and equipment who, in the opinion of the Architect, are deemed to be careless or unqualified to perform the assigned tasks. Material and equipment installations not in compliance with the Contract Documents, or installed with substandard workmanship and not acceptable to the Architect, shall be removed and reinstalled by qualified craftsmen, at no change in the contract price.

PROTECTION AND CLEAN UP

Protection and Restoration: Suitably protect equipment provided under this Division during construction. Restore damaged surfaces and items to "like new" condition before a request for substantial completion inspection.
Handling: Materials shall be properly protected and Raceway openings shall be temporarily closed by the Contractor to prevent obstruction and damage. Post notice prohibiting the use of systems provided under this Contract, prior to completion of work and acceptance of systems by the Owner's representative. The Contractor shall take precautions to protect his materials from damage and theft.

Safeguards: The Contractor shall furnish, place and maintain proper safety guards for the prevention of accidents that might be caused by the workmanship, materials, equipment or systems provided under this contract.

Cleanup: Keep the job site free from debris and rubbish. Remove debris and rubbish from the site and leave premises in clean condition on a daily basis.

SYSTEMS GUARANTEE

General: Provide a one-year guarantee. This guarantee shall be by the Contractor to the Owner for any defective workmanship or material, which has been provided under this Contract at no cost to the Owner for a period of one year from the date of substantial completion of the System. The guarantee shall include lamps, for ninety days after date of Substantial Completion of the System. Explain the provisions of guarantee to the Owner at the "Demonstration of Completed System".

FINAL OBSERVATION

General: Work shall be completed, and forms and other information shall be submitted for acceptance one week prior to the request for final observation of the installation.

SPECIAL CONSIDERATIONS

Comply with special requirements imposed at site by Owner. This may include badging of employees, prohibition of smoking, special working hours, or special working conditions.

END OF SECTION
CERTIFICATE OF COMPLETED DEMONSTRATION MEMO

Note to Contractor: Do not submit this form at the time Technical Information Brochure is submitted. Submit five copies of information listed below for checking at least one week before scheduled completion of the building. After information has been accepted and inserted in each brochure, give the Owner a Demonstration of the Completed Electrical Systems and have the Owner sign five copies of this form. Provide one signed copy for each brochure. After this has been done, a written request for a final inspection of the System shall be made.

Re: ________________________________________________________________

(Name of Project)

(Division Number and Name)

This memo is for the information of all concerned that the Owner has been given a Demonstration of the Completed Electrical Systems on the work covered under this Division. This conference consisted of the system operation, a tour on which all major items of equipment were pointed out, and the following items were given to the Owner;

(a) Owner's copy of Technical Information Brochure containing approved submittal sheets on all items, including the following; (To be inserted in the Technical Information Brochure after the correct tab).

1. Maintenance Information published by manufacturer on equipment items.
2. Printed Warranties by manufacturers on equipment items.
3. Performance verification information as recorded by the Contractor.
4. Check-out Memo on equipment by manufacturer's representative.
5. Written operating instructions on any specialized items.
6. Explanation of the one-year guarantee on the system.

(b) "As-Built" conditions as described in the record drawing specifications.
(c) A demonstration of the System in Operation and of the maintenance procedures which shall be required.

______________________________________________________________

(Name of General Contractor)

By: ____________________________________________________________

(Authorized Signature, Title & Date)

______________________________________________________________

(Name of SubContractor)

By: ____________________________________________________________

(Authorized Signature, Title & Date)

Brochure, Instruction, Prints, Demonstration & Instruction in Operation Received:

______________________________________________________________

(Name of Owner)

By: ____________________________________________________________

(Authorized Signature, Title, Date)

c: Owner, Architect, Engineer, Contractor, Sub Contractor and General Contractor

(List names as stated in cc: above)
SECTION 26020 TESTS AND PERFORMANCE VERIFICATION

GENERAL

RELATED DOCUMENTS

General: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work specified in this section.

DESCRIPTION

Time: Perform verification work as required to show that the System is operating correctly in accordance with contract documents and manufacturers literature. All verification shall be done after 3-day full operational period.

Submission: Submit check out memos and completed testing results of all systems, cable, equipment, devices, etc., for acceptance prior to being energized or utilized.

QUALITY ASSURANCE

Compliance: Testing shall comply to the following standards;

- NEMA
- ASTM
- NETA
- ANSI C2
- ICEA
- NFPA

QUALIFICATIONS OF TESTING FIRM

Qualification: The testing firm shall be an independent testing organization which can function as an unbiased testing authority, professionally independent of the manufacturers, supplier, and installers of equipment or systems evaluated by the testing firm.

Experience: The testing firm shall be regularly engaged in the testing of electrical equipment devices, installations, and systems.

Accreditation: The testing firm shall meet OSHA criteria for accreditation of testing laboratories, Title 29, Part 1907, or be a Full Member company of the International Electrical Testing Association.
Certification: The lead, on-site, technical person shall be currently certified by the International Electrical Testing Association (NETA) or National Institute for Certification in Engineering Technologies (NICET) in electrical power distribution system testing.

Personnel: The testing firm shall utilize engineers and technicians who are regularly employed by the firm for testing services.

Proof of Qualifications: The testing firm shall submit proof of the above qualifications when requested.

Suggested Companies: NETA certified pre-qualified testing firms for this project are;

- Electro Test Inc. (941) 693-7100  Fax: (941) 693-7772
- Industrial Electrical Testing, Inc. (904) 260-8378  Fax: (904) 260-0737
- Electric Power Systems (407) 578-6424  Fax: (407) 578-6408

**TESTS**

**EQUIPMENT**

Instruments: Supply all instruments required to read and record data. Calibration date shall be submitted on test reports. All instruments shall be certified per NETA standards.

Adjustments: Adjust system to operate at the required performance levels and within all tolerances as required by NETA Standards.

**APPLICATIONS**

Switchboards, Panelboards and Mechanical Equipment Feeders: After feeders are in place, but before being connected to devices and equipment, test for shorts, opens, and for intentional and unintentional grounds.

Cables 600 Volts or Less: Cables 600 volts or less in size #1/0 and larger shall be meggered using an industry approved "megger" with 1000V internal generating voltage. Readings shall be recorded and submitted to the Engineer for acceptance prior to energizing same. If values are less than recommended NETA values notify Engineer. Submit 5 copies of tabulated megger test values for all cables.

Ratings 250V or Less: Cables 250V or less in size #1/0 and larger shall be meggered using an industry approved "megger" with 500V internal generating voltage. Readings shall be recorded and submitted to the Engineer, for acceptance prior to energizing same. Submit (5) copies of tabulated megger test values for all cables.

Transformers (75) KVA and larger. Perform Insulation resistance test and turns ratio test. Submit five (5) copies to Engineer at substantial completion.
MOTORS

Procedure: Test run each motor, (5 HP) and larger. Tabulate and submit 5 copies of the Test Information at substantial completion for final inspection. Refer to form at the end of this Section.

Provisions: With the system energized, line-to-line voltage and line current measurements shall be made at the motors under full load conditions. The condition shall be corrected when measured values deviate plus or minus 10% from the nameplate ratings.

Insulation: Test the insulation resistance's of all motor windings to ground with an appropriate test instrument as recommended by the motor manufacturer, before applying line voltage to the motors. If these values are less than the manufacturer's recommended values, notify the contractor providing the motor for correction before initial start up.

Power Factor: Check power factor of all motors (5 HP) and larger while driving its intended load, and at all operating speeds.

GROUNDS

Electrode Ground: The resistance of electrodes (main service, generators, transformer, etc.) shall not exceed 10 ohms and shall be measured before equipment is placed in operation. Testing shall be performed on all grounding electrode installations. Testing of main ground shall be (3) point method in accordance with IEEE No. 81 Section 9.04 Standard.9. (2) point method for distribution equipment. Testing to be completed before service energized. Submit all ground test readings to the Engineer in tabulated format at substantial completion.

Electrode Ground: The resistance of electrodes (main service, generators, transformer, etc.) shall not exceed 5 ohms and shall be measured by The Contractor before equipment is placed in operation. Testing shall be performed on all grounding electrode installations. Testing shall be 2 point method in accordance with IEEE Standard 81. Submit all ground test readings to the Engineer in tabulated format at substantial completion.

DRY TYPE TRANSFORMERS

Required Factory Tests: Required factory tests shall be as follows;

- Ratio
- Polarity
- Losses
  - No load
  - Full load
- Resistance Measurements
- Impedance
- Temperature
- Impulse Strength
**Sound Level**
**Exciting Current**
**Low-frequency Dielectric Strength**
**ANSI Point and Curve**

Submission: Submit test results with shop drawings.

**EMERGENCY SYSTEM**

General: Submit emergency system tests in accordance with NFPA 110. Refer to emergency section of the specification for additional information.

**EXECUTION**

**SUBMITTALS**

Cable Test Report: Submit Cable Test Report in Triplicate.

Transformer Test Report: Indicate comparative data of ANSI and NEMA Standards. Indicate all characteristic values as specified herein. Certified copies of tests on electrically duplicate units are acceptable.

Check Out Memos: Complete all information on forms at the end of this specification, project information, and certificate of completed demonstration memo. Submit data for examination and acceptance prior to final inspection request.

Tabulated Data: Submit data on 8-1/2 x 11 inch sheets with names of the personnel who performed the test.

Final: Submit accepted memos before a request for final inspection.

**QUANTITIES**

Quantity: Submit 5 copies of the check out memo on each major item of equipment. Insert accepted memos in each brochure with the performance verification information and submittal data.

END OF SECTION
NOTE: MAXIMUM READINGS PERMITTED - 20 MV NEW CONSTRUCTION
40 MV CRITICAL EXISTING CONSTRUCTION
500 MV GENERAL CARE EXISTING CONSTRUCTION
0.1 OHM NEW CONSTRUCTION
0.2 OHM QUIET GROUNDS AND EXISTING

<table>
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<tr>
<th>Room No.</th>
<th>AREA TYPE</th>
<th>VOLTAGE MEASUREMENT</th>
<th>IMPEDANCE MEASUREMENT</th>
<th>REMARKS - IF VOLTAGE READINGS MORE THAN 20MV IN EXISTING CONST. NOTE TESTS &amp; INVESTIGATION REQUIRED</th>
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FACILITY NAME: _______ PROJECT NAME: _______
DATE: _______ TESTED BY: _______
MAXIMUM TEST INTERVALS: _______
WET LOCATIONS - 12 MOS. _______

GROUND TEST REPORT

TYPE METER USED AND EXTERNAL NETWORK IF USED:
MOTOR TEST INFORMATION

Name of Checker:______________________________________________________________

Date Checked:_________________________________________________________________

(a) Name and identifying mark of motor                                     ______________

(b) Manufacturer                                                                 ______________

(c) Model Number                                                                ______________

(d) Serial Number                                                               ______________

(e) RPM                                                                         ______________

(f) Frame Size                                                                  ______________

(g) Code Letter                                                                 ______________

(h) Horsepower                                                                  ______________

(i) Nameplate Voltage and Phase                                                ______________

(j) Nameplate Amps                                                             ______________

(k) Actual Voltage                                                              ______________

(l) Actual Amps                                                                 ______________

(m) Starter Manufacturer                                                        ______________

(n) Starter Size                                                                ______________

(o) Heater Size, Catalog No. and Amp Rating                                    ______________

(p) Manufacturer of dual-element fuse                                         ______________

(q) Amp rating of fuse                                                          ______________

(r) Power Factor at ____________ Speed
   (For variable speed motors provide recording chart over operating range)
TABULATED DATA

VOLTAGE AND AMPERAGE READINGS

SWITCHGEAR OR PANELBOARD

FULL LOAD AMPERAGE READINGS:

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PHASE  A.

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| C TO N  _______  B TO C |

NO LOAD VOLTAGE READINGS

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PHASE  A TO N  _______  A TO B

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| C TO N  _______  B TO C |

_________________________ ENGINEERS REPRESENTATIVE
_________________________ CONTRACTORS REPRESENTATIVE
SECTION 26030 ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. General: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work specified of this section.

1.2 DESCRIPTION

A. Extent: Electrical identification work as required by the Contract Documents or other specifications.

B. Types: Electrical identification work specified in the Contract Documents include the following:

1. Electrical power, control and communication conductors.
2. Operational instructions and warnings.
3. Danger signs.
4. Conduits, boxes, etc.
5. Distribution Equipment.
6. Cabinets.
7. Equipment/system identification signs and tags.

1.3 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacturer of electrical identification products of types required, whose products have been in satisfactory use in similar service for not less than 3 years.

B. NEC Compliance: Comply with NEC as applicable to installation of identifying labels and markers for wiring and equipment.

C. UL Compliance: Comply with applicable requirements of UL Standard 969, "Marking and Labeling Systems", pertaining to electrical identification systems.


E. NEMA Compliance: Comply with applicable requirements of NEMA Standard No's. WC-1 and WC-2 pertaining to identification of power and control conductors.
F. ADA Compliance: All signage shall meet ADA standards. Identification for maintenance purposes shall be as specified herein.

1.4 SUBMITTALS

A. General: Submit shop drawings of all identification materials to be used for this project. Submit one sample of each item with the shop drawings.

PART 2 - PRODUCTS

2.1 ACCEPTABLE SUPPLIERS OR MANUFACTURERS

A. General: Subject to compliance with requirements, manufacturers offering electrical identification products which may be incorporated in the work include, but not limited to, the following:

1. Alarm Supply Co, Inc.
2. Direct Safety Co.
3. Ideal Industries, Inc.
4. LEM Products, Inc.
5. Markal Company
7. Panduit Corp.
8. Seton Name Plate Co.
9. Thomas and Betts Co.
10. Carlton Industries, Inc.

2.2 LANGUAGE

A. General: Provide all products in this section in English.

2.3 ELECTRICAL IDENTIFICATION MATERIALS

A. General: Except as otherwise indicated, provide manufacturer's standard products of categories and types required for each application. Where more than one single type is specified for an application, selection shall be at the installer's option, however, provide a single selection for each application.

B. Conduit System Markers: Color doe fittings every 10-feet on conduit system.
C. Baked Enamel Danger Signs: Provide manufacturer's standard "DANGER" signs of baked enamel finish on 20 gauge steel; of standard red, black and white graphics; 14 x 10 inch size except where 10 x 7 inch is the largest size which can be applied where needed, and except where larger size is needed for adequate vision; with recognized standard explanation wording, and subsequent directive e.g. HIGH VOLTAGE, KEEP OUT; BURIED CABLE, DO NOT DIG; LIVE PARTS, DO NOT TOUCH SWITCH.

D. Engraved Plastic Laminate Nameplates: Provide engraving phenolic plastic laminate, in sizes and thicknesses indicated, engraved with 1/26 inch thick lines with square standard pica lettering and wording as specified herein, black face and white core plies (letter color) for 120/208 volt systems, bright Osceola and white for 277/480 volt and red and white for fire alarm and where noted in the specifications. Punch for mechanical fastening, except where adhesive mounting is necessary because of substrate. Material thickness shall be 1/26 inch. Provide beveled edge in order to eliminate sharp corners. Provide self-tapping stainless steel round head screws. Provide contact type permanent adhesive where screws cannot or shall not penetrate the substrate. Adhesive nameplate shall be permanently installed. Titles shall be 1/2 inch high and all other lettering shall be 1/4 inch high.

E. Underground Type Plastic Line Marker: Manufacturer's standard permanent, bright colored, continuous printed, metal backed plastic tape, intended for direct burial service; not less than 6 inches wide x 4 mils thick. Provide tape with printing which most accurately indicates the type of service or type of buried cable.

F. Junction Box Identification: Provide neat indelible felt tip, stenciled marking on junction box and pullbox covers. Letter sizes shall be 1-inch high minimum. Provide non-stenciled markings inside the junction box and on the exterior edge to match the cover markings.

G. Identify lighting or power circuits in indelible black felt tip on junction box and pull box covers.

2.4 LETTERING AND GRAPHICS

A. General: Coordinate names, abbreviations, and other designations used in electrical identification work, with corresponding designations specified or scheduled. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by the manufacturer and as required for proper identification and operation/maintenance of the electrical system equipment. Comply with ANSI A13.1 pertaining to minimum sizes for letters and numbers.

B. Size: System identification labeling consists of providing minimum 1/2 inch high stenciled black letters for raceway systems.
PART 3 - EXECUTION

3.1 APPLICATION AND INSTALLATION

A. Installation: Install electrical identification products as indicated, in accordance with manufacturer's written instructions, as required by the NEC and as specified herein.

B. Coordination: Where identification is to be applied to surfaces which require a field finish application, install identification after completion of such application. Painting of conduit fittings will be acceptable.

C. Regulations: Comply with governing regulations and requests of governing authorities for the identification of electrical work.

D. Hazards: Identify all rooms, spaces, and equipment which house potential electrical hazards, and label with appropriate signage or indicators.

3.2 RACEWAY SYSTEM IDENTIFICATION

A. Color Coding: All electrical conduit shall be identified by color-coding. Apply color-coded identification on electrical conduit in a neat and workmanlike manner.

B. Identification: Identify all raceways provided or utilized as part of this project as follows;

1. Apply 10 feet on center along the raceway system and at each side of walls or floors, and at branches from mains.

2. Identify the following services;

<table>
<thead>
<tr>
<th>Service</th>
<th>Label</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Low Voltage</td>
<td>120/208 Voltage</td>
</tr>
<tr>
<td>b. High Voltage</td>
<td>277/480 Voltage</td>
</tr>
<tr>
<td>c. Fire Alarm</td>
<td>Fire Alarm</td>
</tr>
<tr>
<td>d. Alarm Monitoring</td>
<td>Alarm</td>
</tr>
</tbody>
</table>

3. Spot Painting on Rough-in;

a. Conduit, raceways, boxes, backboxes, panelboards, etc. shall be spot painted. Conduit shall be identified within 6 inches of the box or enclosure. The entire box and coverplate shall be painted.
b. Use following colors for color bands and for color coding:

<table>
<thead>
<tr>
<th>System</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Normal and Equipment Power</td>
<td>Krylon Black (120/208)</td>
</tr>
<tr>
<td>2) Lighting</td>
<td>Krylon Yellow (277/480)</td>
</tr>
<tr>
<td>3) Fire Alarm</td>
<td>Krylon Red</td>
</tr>
<tr>
<td>4) Equipment Power</td>
<td>Krylon Brown (277/480)</td>
</tr>
<tr>
<td>5) Clean Power</td>
<td>Krylon White (120/208)</td>
</tr>
</tbody>
</table>

3.3 CABLE/CONDUCTOR IDENTIFICATION

A. General: Apply cable/conductor identification, including voltage, phase and feeder number, on each cable/conductor in each box/enclosure/cabinet where conductors of more than one circuit or communication (such as color coded conductors) is provided. Match identification with marking system used in panelboards, shop drawings, contract documents, and similar previously established identification for the project's electrical work.

B. Color Coding: Color code all power and lighting cable. Use wire colored by integral pigmentation, making the wire 100 percent colored. Where not practicable or available (in larger conductor sizes), color code the wire by using colored plastic tape, painting the ends accessible at junction or pull boxes, or other method acceptable to the Engineer. Use the following chart as applicable:

<table>
<thead>
<tr>
<th>CONDUCTOR VOLTAGE</th>
<th>CONDUCTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>120/208</td>
<td>Phase A</td>
</tr>
<tr>
<td></td>
<td>Black</td>
</tr>
<tr>
<td></td>
<td>Phase B</td>
</tr>
<tr>
<td></td>
<td>Red</td>
</tr>
<tr>
<td></td>
<td>Phase C</td>
</tr>
<tr>
<td></td>
<td>Blue</td>
</tr>
<tr>
<td></td>
<td>Neutral</td>
</tr>
<tr>
<td></td>
<td>White</td>
</tr>
<tr>
<td></td>
<td>Equip.Ground</td>
</tr>
<tr>
<td></td>
<td>Green</td>
</tr>
<tr>
<td>277/480</td>
<td>Phase A</td>
</tr>
<tr>
<td></td>
<td>Brown</td>
</tr>
<tr>
<td></td>
<td>Phase B</td>
</tr>
<tr>
<td></td>
<td>Osceola</td>
</tr>
<tr>
<td></td>
<td>Phase C</td>
</tr>
<tr>
<td></td>
<td>Yellow</td>
</tr>
<tr>
<td></td>
<td>Neutral</td>
</tr>
<tr>
<td></td>
<td>Gray</td>
</tr>
<tr>
<td></td>
<td>Equip.Ground</td>
</tr>
<tr>
<td></td>
<td>Green</td>
</tr>
</tbody>
</table>
3.4 OPERATIONAL IDENTIFICATION AND WARNINGS

A. General: Provide identification and warning wherever reasonably required to ensure safe and efficient operation and maintenance of the electrical systems. Provide identification and warning identification if necessary for signage to help prevent misuse of electrical facilities by unauthorized personnel.

B. Plasticized signs: Install self-adhesive plastic signs or similar equivalent identification, instruction or warnings on switches, outlets and other controls, devices and covers of electrical enclosures. Where detailed instructions or explanations are needed, provide plasticized tags with clearly written messages adequate for the intended purposes.

C. Locations: In addition to installation of danger signs required by governing regulations and authorities, install appropriate danger signs at locations indicated and at locations subsequently identified as constituting dangers for persons in or about the project.

D. High Voltage: Install danger signs wherever it is practicable, for persons to come into contact with electrical power of voltages higher than 277 volts to ground.

E. Critical Switches/Controls: Install danger signs on switches and similar controls, regardless of whether concealed or locked up, where untimely or inadvertent operation (by anyone) could result in significant danger to persons, or damage to or loss of property.

F. Electrical Equipment Rooms: Provide warning signage at the entrance to each such room; identify the hazard, and direct non-qualified personnel to stay away.

G. Equipment Identification:

1. Nameplates: Install an engraved phenolic plastic laminate nameplate on each unit of electrical equipment in the building, including central or master unit of each electrical system unless unit is specified with its own self-explanatory identification or signal system. Except as otherwise indicated, provide single line of text. Provide text matching terminology and numbering of the contract documents and shop drawings.

   a. Normal system shall be 1/2 inch high white lettering in a black field.
   b. Emergency system shall be 1/2 inch high white lettering in a red field for life safety, Osceola for critical and green for equipment branch.

2. Locations: Provide nameplates for each unit of the following categories of electrical work;

   a. Switchboard, panelboards, electrical cabinets, and enclosures.
      1) Provide a nameplate inside, outside and above the door (if equipped with one) listing its designation, voltage, source and circuit number.
b. Access panel/doors to electrical facilities.

c. Major electrical switchgear and switchboards.

d. Motor Control Centers.

e. Power Transfer Equipment.

f. Transformers.

g. Motor starters.

h. Disconnect switches.

i. Enclosed circuit breakers.

j. Communication Control Panels, Terminal Cabinets and Equipment Cabinets.

k. Telephone Switching Equipment

l. Remote Annunciators

m. Terminal Boards

n. Install an engraved nameplate on the main electrical switchboard or on a plaque located in the Main Electrical Room indicating the name and cities of the home office of both of the Electrical Engineer and the Electrical Contractor.

o. Other similar equipment as designated by the Engineer.

3. Viewing: Install nameplates at locations indicated and where not otherwise indicated at a location for the best convenience of viewing without interference with operation and maintenance of equipment.

a. Secure to substrate with rigid fasteners. Utilize adhesive where fasteners cannot penetrate substrate.

4. Names: The names or wording used for a particular machine shall be the same as the one used on all motor starters, disconnects and remote button stations nameplates for that machine.

END OF SECTION
SECTION 26110 RACEWAYS AND CONDUIT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. General: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.2 DESCRIPTION

A. General: Provide all supports, hangers and inserts required to mount conduit, pullboxes and other equipment provided under this Division.

B. Support: All items shall be supported from the structural portion of the building. Supports and hangers shall be of a type approved by Underwriters' Laboratories. Wire shall not be used as a support. Boxes and conduit shall not be supported or fastened to ceiling suspension wires or to ceiling channels. Do not install any devices supported by ceiling tiles.

C. Installation: The Contractor shall lay out and provide his work in advance of the laying of floors or walls, and shall provide all sleeves that may be required for openings through floors, walls, etc. Where plans call for conduit to be run exposed, provide all inserts and clamps for the supporting of conduit.

D. Systems: Provide conduit system of empty raceways including terminal cabinets, backboards and outlets as described and specified herein.

1.3 QUALITY ASSURANCE

A. Qualifications: Manufacturers shall be regularly engaged in the manufacture of conduit systems and fittings of types and sizes required, and whose products have been in satisfactory use in similar service for not less than 5 years in the USA.

B. Compliance: Materials shall comply with the latest edition of the following standards as they apply to the different raceway types specified herein;

1. ANSI:

   a. ANSI C80.1: Rigid Steel Conduit (RSC)
   b. ANSI C80.3: Electrical Metallic Tubing (EMT)
2. UL:
   a. UL 1: Flexible Metal Conduit
   b. UL 6: Rigid Steel Conduit (RSC)
   c. UL 360: Liquid-Tight Flexible Metal Conduit
   d. UL 514: Fittings for Metal Conduit
   e. UL 651: Nonmetallic Conduit (PVC)
   f. UL 797: Electrical Metallic Tubing (EMT)
   g. UL 886: Fittings for Hazardous Locations

3. NEMA:
   a. NEMA TC2: Rigid Nonmetallic Conduit (PVC)

4. Federal Specifications:
   a. WW-C-581: Rigid Steel Conduit (RSC)
   b. WW-C-563: Electrical Metallic Conduit (EMT)
   c. WW-C-566: Flexible Steel Conduit
   d. WC-1094A: Nonmetallic Rigid Conduit (PVC)
   e. WC-582A Conduit, Raceway, Metal and Fittings; surface

1.4 SUBMITTALS

A. Products: Submit manufacturer's product data, including technical information on each type of raceway system;
   1. All conduit
   2. Conduit fittings
   3. Plastic (PVC) solvent
   4. Black mastic coating for conduit
   5. Insulating and grounding bushings for conduit
   6. Galvanizing and protective coatings for conduit

B. Compliance: Product data shall show compliance with this section of the specifications, including U.L. label, manufacturer and manufacturer's written installation instructions.

1.5 CONDUIT

A. General: Provide a complete and continuous system of raceways to maintain a protected path for wires and cables to distribute electric power, and low voltage systems throughout the project, utilizing U.L. listed and labeled materials.
B. Accessories: Provide conduit accessories of types, sizes, and materials, as specified herein complying with manufacturers published product information, which match and mate conduit and tubing.

C. Interior Minimum Size: Minimum conduit size for light and power systems shall be 3/4 inch conduit for all power and lighting circuitry homeruns from panelboard to outlet box at first power consuming devices. The remainder of circuitry may be in 1/2 inch conduit, if it contains no more than 4 conductors per conduit (excluding the equipment grounding conductor), and phase conductors no larger than #12 AWG. Switchlegs may be 1/2 inch conduit unless otherwise noted on drawings. Lighting fixture whips shall be 3/8-inch flexible conduit.

D. Site Underground Conduit: Unless otherwise noted, minimum underground raceways shall be 1 inch conduit. Homeruns from the branch circuit overcurrent device, through any control devices to the first exterior junction box or consumption device shall be 1-inch minimum.

E. System Conduit: Provide end bushings on all conduits.

F. Pull Strings: Provide pull strings in all empty raceways. Pull strings shall be nylon and shall be impervious to moisture. Pull strings installed in one inch and smaller conduits shall have a tensile strength of not less than 30 lbs. Pull strings installed in conduits larger than 1 inch shall have a tensile strength not less than 200 lbs.

G. Conduit Bends: The use of NEC Table 346.10 Exception is not allowed.

1.6 LOCATIONS

A. Materials Above Grade: The following conduit types are to be installed above grade where specifically noted herein;
1. Electrical metallic tubing (thin wall)
2. Flexible metal conduit
3. Liquid-tight flexible metal conduit
4. Heavy wall Schedule 40 PVC
5. Galvanized rigid steel conduit

B. Materials Below Grade: The following conduit types are to be installed below grade where specifically noted herein;
1. Rigid galvanized conduit (heavy wall)
C. Materials on Roofs: The following conduit types are to be installed on roofs where specifically noted herein;

1. Rigid steel conduit

1.7 SURFACE RACEWAY

A. General: Provide surface mounted raceway where specifically indicated on the drawings. Raceway shall be metallic and one-piece type. Where wiring channels are specifically specified, they shall be two-piece type.

PART 2 - PRODUCTS

2.1 ELECTRICAL METALLIC TUBING

A. Fittings: Provide compression insulated throat type fittings.

B. Locknuts: Provide locknuts for securing conduit to enclosures with sharp edges for digging into metal, and ridged outside circumference for proper fastening.

2.2 BUSHINGS

A. Bushings: Bushings shall be provided on all terminations, mounted on the ends of all EMT connectors 1-1/4 inches and larger and within all equipment.

B. Construction: Bushings shall have a flared bottom and ribbed sides, with smooth insides to prevent damage to cable insulation.

C. Insulating Ring: Mold a phenolic insulating ring into sizes 1-1/4 inches and larger.

D. Grounding: Provide a screw type grounding terminal on all sizes.

2.3 RIGID METAL CONDUIT

A. Conduit: Conduit ends shall have precision cut hi-torque threads. One end of the conduit shall have a coupling and the other shall be covered with a color-coded plastic thread protector. Conduit shall be manufactured in 10 foot lengths.

B. Fittings: Fittings shall be cut groove steel. Cast fittings are not acceptable.

2.4 FLEXIBLE STEEL CONDUIT

A. Conduit and Standards: A continuous length, spirally wound steel strip, zinc-coated, each convolution interlocked with following convolution into a helix form. Product shall meet Federal Specification WW-C-566 and UL 1242.
B. **Fittings:** Provide conduit fittings for use with flexible steel conduit of the threadless hinged clamp type, and a male threaded end provided with a locknut.

1. Straight terminal connectors shall be one piece body, female end with clamp and deep slotted machine screw for securing conduit.
2. 45 and 90 degree terminal angle connectors shall be 2 piece body, with removable upper section, female end with clamp and deep slotted machine screw for securing conduit.

C. **MC Cable is permitted as follows:**

1. For lighting and receptacle circuits.
2. Al homeruns shall be in conduit to the first box or room where circuit is located. Remainder shall be in MC Cable.
3. Provide Caddy Clip supports in studs for cable. Caddy Clip #FB Series in all other studs to support cable and eliminate rattle.
4. For lighting whip support, utilize Caddy clip #4234 Series.
5. Plastic or steel tie wire will not be acceptable for support of MC cable.

2.5 **LIQUID-TIGHT FLEXIBLE STEEL CONDUIT**

A. **Conduit:** Plastic jacketed (PVC) liquid-tight flexible steel conduit with copper bonding conductor, and steel material galvanized inside and outside.

B. **Fittings:** Provide cadmium plated, malleable iron fittings with compression type steel ferrule and neoprene gasket sealing rings with insulated throat.

2.6 **HEAVY WALL PVC CONDUIT (SCHEDULE 40)**

A. **Conduit:** Schedule 40, 90 degrees C. UL rated, PVC conduit shall be composed of High Impact PVC (polyvinyl chloride C-2000 Compound), and shall conform to industry standards, and be UL listed in accordance with Article 347 of National Electrical Code for underground and exposed use. Materials must have tensile strength of 55 PSI, at 70 degrees F., flexural strength of 11,000 psi, compression strength of 8600 psi. Manufacturer shall have five years extruding PVC experience.

2.7 **SUPPORTING DEVICES**

A. **Hangers:** Hangers shall be made of durable materials suitable for the application involved. Where excessive corrosive conditions are encountered, hanger assemblies shall be protected after fabrication by galvanizing, or approved suitable preservative methods.
B. Materials: Insert anchors shall be installed on concrete or brick construction, with hex head machine screws. Recessed head screws shall be used in wood construction. An electric or hand drill shall be used for drilling holes for all inserts in concrete or similar construction. Installed inserts, brick, shall be near center of brick, not near edge or in joint. Drilled and tapped, and round head machine screws shall be used where steel members occur. All screws, bolts, washers, etc., used for supporting conduit or outlets shall be fabricated from rust-resisting metal, or accepted substitution. Gunpowder set anchors are not permitted.

C. Exterior: Supporting devices for exterior use shall be 326 stainless steel unless otherwise noted on drawings.

D. PVC Coated Conduit: Supporting devices for PVC coated conduit shall be as manufactured by the PVC coated conduit manufacturer and shall match in color and appearance.

2.8 WIREWAYS

A. General: Wireway shall be sized as shown on drawings, NEMA 1, lay-in type. Wireway sides and bottom shall contain no knock-outs. The Contractor shall punch holes required. The cover shall be hinge type with quarter turn fasteners to hold cover shut. Covers and bodies shall be 26 gauge steel. Wireway shall be as manufactured by Hoffman Engineering Company, Square "D" or Steel City.

2.9 MANHOLES

A. Concrete Strength: The design of concrete mixture shall be the responsibility of the contractor as set forth under ASTM Standard C-94 for ready-mixed concrete. The concrete produced shall have a concrete strength at 28 days which shall be not less that 2500 PSI.

B. Concrete Slump: The slump when tested in accordance with ASTM Standard C-143, shall be not more than 3 inches for vibrated concrete and 4 inches for non-vibrated concrete. Ready-mixed concrete shall be mixed and delivered to the project in accordance with ASTM Standard C-94, using Alternative No. 2 for the mix design. With each load of concrete delivered, the producer shall provide in duplicate before unloading at the site, delivery tickets of certification as required by ASTM C-94.

C. Mixing Option: At contractor's option, concrete may be mixed by volume at the project site in an accepted type batch mixer in the manner specified for stationary mixers in ASTM Standard C-94. The portions of cement, aggregate and water shall be selected to provide the characteristics indicated below for the compressive strength specified. Conformance with the strength requirements shall be as determined in accordance with ASTM Standard C-39.
D. Precast Option: Manholes may be of the precast type if accepted, submit drawings, calculations and necessary detail to determine acceptability.

E. Brick: Brick used where indicated shall be sewer and manhole brick conforming to ASTM C-32, Grade MS.

F. Mixture: Mortar shall be mixed in proportions of 1-part Portland Cement, -1/4-part hydrated lime and between 2-1/4 and 3 parts sand by volume. (At contractor's option, mortar may be mixed in the proportions of 1 part Portland Cement and between 4-1/2 and 6 parts of sand by volume).

G. Structural: Reinforcing bars shall be deformed and comply with either of the following ASTM Standards: Billet Steel Bars A-615 or Rail Steel Bars A-626.

H. Forming: Material for concrete forms shall be smooth boards exterior grade plywood or metal.

I. Drainage: Drainage Pipe and Fittings shall be cast-iron, extra strength. Drains shall be plain pattern in accordance with Specification WM-P-541.

J. Covers: Metal Frames, Covers and Gratings, except as indicated or specified otherwise, shall conform to Specification RR-F-621, and shall be of cast iron. Frames and covers of steel shall be welded by qualified welders in accordance with standard commercial practice. Steel covers shall be rolled steel floor plate having an accepted anti-slip surface. Steel gratings shall be of welded construction and conform to the applicable requirements of Specification RR-G-661, Type 1.

K. Accessories: Pulling-in irons shall be steel bars bent in the form indicated, and cast in the walls and floors. In the floor, they shall be centered above or below, and opposite the conduits entering the manhole. Pulling-in irons shall be projected into the manhole approximately 4 inches. Irons shall be zinc-coated after fabrication in accordance with Specifications MIL-Z-17871. Cable Racks, including hooks and insulators, shall be installed in manhole and shall be sufficient to accommodate the present and future cables and shall be spaced not more than 18 inches apart horizontally. The wall bracket shall be Channel or T-Section steel. The hooks shall be of steel or malleable iron and shall be of the removable type. Insulators shall be dry-process glazed porcelain. The metal portion of racks shall be zinc-coated after fabrication in accordance with Specification MIL-Z-17871.

2.10 SURFACE RACEWAY

A. General: Provide a surface raceway system with raceway, boxes and appropriate fittings. Raceway shall be Wiremold V500 or equal.

B. Wiring Channel: Metal raceway where specifically indicated on the contract drawings shall be Wiremold G4000 series, unless otherwise noted.
C. Devices: Provide 20 ampere duplex receptacles 36 inches center-to-center unless otherwise noted.

PART 3 - EXECUTION

3.1 CONDUITS

A. Provide as a minimum 3/4 inch conduit from each of the following device locations to ceiling space. Terminate in ceiling cavity. Provide insulated bushings at ends of all conduits.

1. Security

3.2 IDENTIFICATION OF BOXES

A. Tags: During installation of pull strings all pull strings shall be marked with vinyl tags indicating where the opposite end may be found.

3.3 BLANK PLATES

A. Plates: Unless otherwise noted all outlet boxes shall receive blank plates matching the finish of plates on electrical devices in the same room.

3.4 RACEWAY INSTALLATION

A. Support: All raceways shall be run in a neat and workmanlike manner and shall be properly supported and in accordance with the latest edition of the NEC. Supporting conduit and boxes with wire is not acceptable. Exposed raceways where allowed, shall be supported with clamp fasteners with toggle bolt on hollow walls, and with lead expansion shields on masonry. All conduits shall be securely fastened in place with at least one support per eight foot section. Support within one foot of changes in direction. All required hangers, supports and fastenings shall be provided at each elbow and at no more than one foot from the end of each straight run terminating at a box or cabinet. The use of perforated iron for supporting conduits shall not be permitted. The required strength of the supporting equipment and size and type of anchors shall be based on the combined weight of conduit, hanger and cables. Horizontal and vertical conduit runs may be supported by one-hole malleable straps, clamp-backs, or other accepted devices with suitable bolts, expansion shields (where needed) or beam-clamps for mounting to building structure or special brackets.
B. Hanger Installation: Where 2 or more conduits 1 inch or larger run parallel trapeze hangers may be used consisting of concrete inserts, threaded solid rods, washers, nuts and galvanized "L" angle iron, or Unistrut cross members. These conduits shall be individually fastened to the cross member of every other trapeze hanger with galvanized cast one hole straps, clamp backs, bolted with proper size cadmium machine bolts, washers and nuts. If adjustable trapeze hangers are used to support groups of parallel conduits, U-bolt type clamps shall be used at the end of a conduit run and at each elbow. J-bolts, or approved clamps, shall be installed on each third intermediate trapeze hanger to fasten each conduit.

C. Sealant: Provide a closed cell silicone foam sealant rated to provide a rating equal to the wall, ceiling, or floor assembly rating. Provide seals for the exterior of conduit penetrations consisting of a cast-in-place sleeve with a compressible rubber gasket between the conduit and the sleeve. Provide seals for the interior of the conduit penetrations consisting of gland type sealing bushing or closed cell silicone foam. Provide duct seal inside an appropriate seal-off fitting to seal the interior of the conduit system from water seepage or hazardous gases.

D. Routing: Conduits shall be run parallel to building walls wherever possible, exposed or concealed as specified, and shall be grouped in workmanlike fashion. Crisscrossing of conduits shall be minimized.

E. Location: All raceways except those from surface-mounted switches, outlet boxes or panels shall be run concealed from view. Surface mounted devices and equipment shall be specifically noted on the contract drawings. It is the intent that all raceways shall be run concealed unless specifically noted.

F. Protection: All raceway runs, whether terminated in boxes or not, shall be capped during the course of construction until wires are pulled in and covers are in place. No conductors shall be pulled into raceways until the raceway system is complete.

G. Coordination: All raceways shall be kept clear of mechanical equipment and plumbing fixtures to facilitate future repair or replacement of said fixtures without disturbing wiring. Except where it is necessary for control purposes, all raceways shall be kept away from items producing heat.

H. Masonry Installation: All raceway runs in masonry shall be installed at the same time as the masonry so that no face cutting is required, except to accommodate boxes.

I. Arrangement: All raceways shall be run connecting outlet to circuits generally as shown on the drawings. Provide circuit connection arrangement shown. Actual final arrangement shall be in accordance with the record drawings section as specified herein.

J. Grounding: All branch circuit and feeder raceways shall have a copper system ground conductor within the conduit throughout the entire length of the circuit. All conduit shall be electrically continuous to establish redundant grounding.
K. Empty Raceways: Raceways which do not have conductors provided under this Division of the specifications shall be left with an acceptable nylon pullcord in raceway.

L. Manufacturer: Rigid Metallic Conduit, Electrical Metallic Tubing, Flexible Steel Conduit, Liquid-Tight Flexible Conduit, and PVC Conduit shall be manufactured within the United States, and each shall be as manufactured by one manufacturer.

M. Roof Installation: Conduit installations on roofs shall be kept to a bare minimum. Conduit shall be supported above roof at least 6 inches using approved conduit supporting devices. Supports shall be fastened to roof using roofing adhesive as specified in other sections of this specification.

N. Firewall Installation: Provide pullboxes, junction boxes, fire barrier at fire rated walls etc., as required by NEC Article 300 where required.

O. Dissimilar Metals: Avoid the use of dissimilar metals to reduce the possibility of electrolysis. Where dissimilar metals are in contact, coat all surfaces with corrosion inhibiting compound before assembling.

P. Sealoff Fittings: Provide conduit sealoffs wherever the raceway system enters a hazardous or wet area or areas of drastic temperature change such as coolers, freezers, etc. as required.

Q. Identification: Provide appropriate identification as required by codes and as indicated on the drawings and in accordance with the methods specified herein.

R. Conduit: Conduits shall be anchored down to prevent floating while pouring in concrete.

3.5 SITE UNDERGROUND CONDUIT INSTALLATION

A. General: All underground raceways (with exception of raceways installed under floor slab) shall be installed in accordance with Section 300-5 of the NEC except that the minimum cover for any conduit or duct bank shall be two feet, unless otherwise indicated.

B. Stubs: Spare conduit stubs shall be capped and accurately dimensioned on as-built drawings.

C. Separation: All conduit run underground, or stubbed above floor shall be separated with plastic interlocking spacers manufactured specifically for this purpose, or shall be strapped to Kindorf channel supported by conduit driven into ground or tied to steel.
D. Coating: Rigid metallic conduit installed underground shall be coated with waterproofing black mastic before installation, and all joints shall be recoated after installation.

E. Provide PVC conduit separators at 10 foot intervals along conduit run to maintain spacing and arrangement; install prior to backfilling. Carlon high impact spacers with horizontal and vertical locking intervals.

3.6 RIGID METALLIC CONDUIT

A. Locknuts: Rigid steel box connections shall be made with double locknuts and bushings. Turn down on threads to solidly connect raceway to box or enclosure.

B. Bushings: Grounded insulated bushings shall be used on all rigid steel conduits terminating in panels, wire gutters, or cabinets. Bushing shall be impact resistant plastic molded in an irregular shape at the top to provide smooth insulating surface at top and inner edge. Material in these bushings must not melt or support flame.

3.7 PVC CONDUIT

A. Floor Penetrations Exposed: Where PVC penetrates a floor in an exposed location from underground or in slab, a black mastic coated steel conduit elbow shall be used.

B. Location: No PVC shall be allowed anywhere except underground or in slab, with the exception that PVC conduit may be used in non-fire rated poured block walls and poured in place columns. No PVC elbows will be allowed anywhere on this project.

C. Floor Penetrations in Block: PVC may also be used for penetrations of floor into concrete block or hollow walls up to first outlet box provided outlet box is at a maximum height of 48 inches above finished floor.

D. Ground Conductor Installation: All individual bare copper ground conductors (i.e. service, transformer, or lightning protection grounds) shall be installed in PVC conduit.

E. Joints: PVC joints shall be solvent welded. Threads shall not be permitted on PVC conduit and fittings, except for rigid steel to PVC couplings. Installation of PVC conduit shall be in accordance with manufacturer's recommendations.

F. Restrict Support: PVC conduit shall not be used to support fixture or equipment.

G. Bonds: Field bends shall be made with an approved hotbox. Heating with flame and hand held dryers are prohibited.

H. Where PVC conduit is located under a concrete slab, install conduit 12” below concrete slab. Where long sweep elbows are required conduit may need to be deeper.
3.8 FLEXIBLE CONNECTIONS

A. Vibrating Equipment Connection: All connections to motors or other vibrating equipment (except dry type transformers) or at other locations where required shall be made with not less than 12 inches of flexible liquid-tight steel conduit, using special type of connectors with strain relief fittings at both terminations of conduit, Kellems Type 074-09 Series or accepted substitution.

B. Normal Type: Flex connectors shall have insulated throat and shall be T & B 3100 Series or accepted substitution.

C. Angle Type: Use angle connectors wherever necessary to relieve angle strain on flex conduit.

D. Transformer Connection: Connections to dry type transformers shall be made with flexible conduit.

3.9 ELECTRICAL METALLIC TUBING

A. Location: Install Electrical Metallic Tubing (thin wall) inside buildings, above the ground floor where not subject to mechanical injury.

B. Handling: All cut ends shall be reamed to remove rough edges.

END OF SECTION
SECTION 26120 WIRES AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. General: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work specified of this section.

1.2 WIRES AND CABLES

A. Description: Provide a complete and continuous system of conductors as specified herein. All conductors shall be in accordance with the latest edition of the NEC.

1.3 QUALITY ASSURANCE

A. Qualifications: Manufacturers shall be regularly engaged in the manufacture of wire systems and fittings of types and sizes required, and whose products have been in satisfactory use in similar service for not less than 5 years in the USA.

B. Compliance: Materials shall comply with the following standards as they apply to the different wire types specified herein.

1. UL:
   a. 44 - Rubber insulated wire and cables.
   b. 83 - Thermoplastic insulated wires.
   c. 486-A-80 - Wire connectors and soldering lugs for use with copper.
   d. 486B - Splicing wire connectors
   e. 493 - Thermoplastic insulated underground feeder and branch circuit cables.

2. NFPA:
   a. 70 NEC

1.4 SUBMITTALS

A. General: Submit product data on all different types of conductors specified.

PART 2 – PRODUCTS
2.1 GENERAL

A. Conductors: Branch circuit and feeder conductors for electric power shall be copper type. Utilize THHN/THWN insulation for branch circuits and THWN/XHHW insulation for feeders, unless specifically noted otherwise. Conductors #10 AWG and smaller shall be solid, #8 AWG and larger shall be stranded. No aluminum wiring shall be permitted. All wire shall be sized as shown on the drawings. If no size is shown, wire shall be #12 AWG, except that branch "homeruns" over 50 ft. in length shall be #10 AWG for 120/208V circuits. Wire in vicinity of heat-producing equipment shall be type XHHW insulation. All wiring shall be manufactured in the USA and of 98 percent resistivity. #14 AWG minimum size conductors shall be used for fire alarm system.

B. Taps and Splices: All copper taps and splices in #8 AWG or smaller wire shall be fastened together by means of "wirenut" connectors (Ideal or accepted substitution). All taps and splices in wire larger than #8 AWG shall be made with compression type connectors and taped to provide insulation equal to wire. All taps and splices in manholes or in ground pull box shall be made with compression type connectors and covered with Raychem heavywall cable sleeves (type CTE or WCS) with type "S" sealant coating. Provide sleeve kits as per manufacturer's installation instructions.

C. Color Coding, General: All power feeders and branch circuits #8 AWG and smaller shall be installed with color-coded wire with the same color used for a system throughout the building. Power feeders above #8 AWG shall either be fully color-coded or shall have black insulation and be similarly color-coded with tape or paint in all junction boxes and panels. Tape shall cover the conductor insulation within the box or panel in such a manner so as to allow standard markings to be readily observed.

D. Colors: Unless otherwise accepted, color-code shall be as indicated in the Identification section of the specifications. All switchlegs, other voltage system wiring, control and interlock wiring shall be color-coded other than those listed in the Identification Section of these specifications.

E. Submittals: Submit cut sheets on all major types of wires and cables including splicing tape, and terminating/splicing lugs or connectors and cable sleeves.

2.2 MANUFACTURERS

A. General: Branch circuit and feeder conductors shall be manufactured by one of the following: General Cable Co., Anaconda, Pirelli or Rome Cable Corporation.
PART 3 - EXECUTION

3.1 EXECUTION

A. General: All wiring shall be installed in conduit (power, low voltage and control wiring), unless otherwise indicated or specified under other Sections of this specification. All wiring shall be installed per the latest edition of the NEC.

B. Connections: Conductors #10 and #12 AWG shall be connected with pre-insulated spring connectors incased in a steel shell and rated at not less than 105 degrees C. A minimum of 3/8 inch skirt shall cover the bare wires. The connector shall meet with UL approval for fixture and pressure work, and shall be "Scotch Lok" Type Y, R and B electrical spring connectors as manufactured by the 3M Company or approved equal.

C. Connector Manufacturers: Lugs and wire connectors shall be one of the following: Burndy Corporation, Thomas & Betts, Co., Appleton or ILSCO.

D. Equipment Installations: Neatly form, train and tie the cables in panelboards, cabinets, wireways, switches and equipment assemblies.

END OF SECTION
SECTION 26130 OUTLET BOXES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. General: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work specified of this section.

1.2 DESCRIPTION

A. General: Outlet boxes shall be of such form and dimensions as to be adapted to the specific use and location, type of device or fixtures to be used, and number and size of conductors and arrangement, size and number of conduits connecting thereto.

B. Ceiling Size: Ceiling outlet boxes shall be 4 inch octagonal or 4 inch square by 1-1/2 inches deep or larger as required for number and size of conductors and arrangement, size and number of conduits terminating at them.

C. Wall Size: Switch, wall receptacle, telephone and other wall outlet boxes in drywall shall be 4 inch square by 1-1/2 inches deep. For exposed masonry, provide one piece 4 inch square by 1-1/2 inches deep wall boxes with appropriate 4 inches square cut tile wall covers Steel City series #52-C-49/52-C-52 or accepted substitution. For furred-out block walls, provide 4 inch square box with required extension for block depth and required extension for drywall depth.

1.3 QUALITY ASSURANCE

A. Qualifications: Manufacturers shall be regularly engaged in the manufacture of conduit systems and fittings of types and sizes required, and whose products have been in satisfactory use in similar service for not less than 5 years in the USA.

B. Compliance: Materials shall comply with the following standards as they apply to the different raceway types specified herein.

1. UL-50 & UL-514
2. NEC 70

1.4 FLOOR OUTLETS

A. General: Provide floor outlet boxes as shown on the plans. Installation shall be in accordance with the National Electrical Code, and shall be complete with service fittings as indicated. Equipment shall be listed by Underwriters’ Laboratories, Inc.
1.5 SPECIAL PURPOSE OUTLETS

A. Location: Locate special purpose outlets as indicated on the drawings for the equipment served. Location and type of outlets shall be coordinated with appropriate trades involved. The securing of complete information for proper electrical roughing-in shall be included as work required under this section of specifications.

1.6 SUBMITTALS

A. Submittals: Submit product data on all different types of outlet boxes and associated trim/plaster rings.

PART 2 - PRODUCTS

2.1 GENERAL PURPOSE BOXES

A. General: Provide standard galvanized one-piece steel outlet boxes at all concealed outlets for electric lights, switches, convenience receptacles, telephone outlets, etc. Acceptable manufacturers shall be T&B, Steel City, Raco. Surface outlet boxes and conduit bodies shall be the heavy cast aluminum or iron with external raised hubs - Appleton, Crouse Hinds or Steel City or accepted substitution. Trim rings shall also be of one piece construction.

2.2 FLOOR OUTLET BOXES

A. Standards: Outlets in slab on grade shall conform to Federal Specifications No. WC-526b, Type 1, with threaded conduit hubs.

B. Carpet Locations: In carpeted areas, brass carpet flanges shall be installed to protect carpet edges where flush floor boxes are installed.

C. Construction: All assemblies shall be designed and installed to maintain grounding continuity, fireproofing and watertight integrity. Connections to boxes in slabs on grade shall be made tight or sealed to prevent entrance of moisture. Boxes shall be cast iron construction.

D. Accessories: Box trim, service fittings and accessories shall be brass and as required to provide a complete installation.

E. Manufacturer: Approved manufacturer is Walker, Raco, Steel City or Hubbell.

PART 3 – EXECUTION
3.1 INSTALLATION OF OUTLET BOXES

A. Installation: All flush outlets shall be mounted so that covers and plates shall finish flush with finished surfaces without the use of shims, mats or other devices not submitted or accepted for the purpose. Add-a-Depth ring or switch box extension rings (Steel City #SBEX) are not acceptable. Plates shall not support wiring devices. Gang switches with common plate where two or more are indicated in the same location. Wall-mounted devices of different systems (switches, thermostats, etc.) shall be coordinated for symmetry when located near each other on the same wall. Outlets on each side of walls shall have separate boxes. Through-wall type boxes shall not be permitted. Back-to-back mounting shall not be permitted. Trim rings shall be extended to within 1/8 inch of finish wall surface.

B. Stud Walls: Outlet boxes mounted in metal stud walls, shall be supported to studs with 2 screws inside of outlet box to a horizontal stud brace between vertical studs.

C. Blank Covers: All outlet boxes that do not receive devices in this contract are to have blank plates installed matching wiring device plates.

3.2 MOUNTING HEIGHT

A. Mounting Height: Height of wall outlets to center or bottom of box above finished floor shall be as follows, unless specifically noted otherwise. Verify all heights with the Architectural plans and shop drawings for installation. The following dimensions are a guide only. Specific heights required by governing institutions and laws shall apply.

<table>
<thead>
<tr>
<th>Device Type</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switches &amp; Dimmers</td>
<td>46 inches to centerline</td>
</tr>
<tr>
<td>Receptacles</td>
<td>1 foot 6 inches to centerline</td>
</tr>
<tr>
<td>Branch Panelboards</td>
<td>6 foot 6 inches top of panel trim</td>
</tr>
<tr>
<td>Fire Alarm Pull Station</td>
<td>46 inches to centerline</td>
</tr>
</tbody>
</table>

B. Counter Tops: Bottoms of outlets above counter tops or base cabinets shall be minimum 2 inches above counter top or backsplash, whichever is highest. Outlets may be raised so that bottom rests on top of concrete block course, but all outlets above counters in same area shall be at same height. It is the responsibility of this Contractor to secure cabinet drawings and coordinate outlet locations in relation to all cabinets as shown on Architectural plans, prior to rough-in, regardless of height shown on documents.

C. Wall Outlets: Height of wall-mounted fixtures shall be as shown on the drawings or as required by Architectural plans and conditions. Fixture outlet boxes shall be equipped with fixture studs when supporting fixtures.
3.3 FLOOR OUTLET BOXES

A. Adjustment: Where floor or fill depth is 3 inches or more, adjustable boxes with maximum vertical and angular adjustment for after concrete pour shall be used. After pour is complete, boxes shall be set and readjusted to provide a smooth surface conforming to the elevation and slope of the surrounding finished floor.

END OF SECTION
SECTION 26140 WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. General: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to this section.

1.2 DESCRIPTION

A. General: Provide factory fabricated wiring devices in type, color and electrical rating for the service indicated to provide convenient access to the electrical system for portable and permanent connections, and control of fixed outlets.

B. Ratings: Voltage and ampere rating of switches and receptacles shall be marked on the device, and shall conform to Voltage and Ampacity of system to which applied.

C. Hardware: Devices consist of all the necessary hardware to complete an installation and provide a margin of safety by inaccessibility of live electrical components.

1.3 WALL DIMMING CONTROLS

A. General: Incandescent - Provide dimming controls as indicated on drawings, and as specified herein to provide complete method of controlling the artificial illumination intensity portion of the project. Provide dimmers, controls, interfaces, and ancillary equipment to make a complete dimming system. Devices shall be terminal connected. Do not "back-stab" devices. Devices are to be slide.

B. General: Fluorescent - Provide dimming controls as indicated on drawings, and as specified herein to provide complete method of controlling the artificial illumination intensity portion of the project indicated. Provide dimmers, controls, interfaces, and ancillary equipment, dimming ballast, magnetic or electronic for use with specific control, to make a complete dimming system.

C. Standards: Voltage and ampere rating of dimmer controls shall be marked on dimmer, and shall conform to voltage of system to which applied.

2. ANSI/IEEE Standard C62.41-
   a. Test withstand voltage surges of up to 6000 Volts and current surges of up to 200 Amps for dimmers without damage.
3. Nema WD-1
4. UL 20
1.4 DIMMING CONTROLS QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of wiring devices, of types and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years. Fully test all dimmers for proper operation prior to shipment from the factory. Equipment shall be as that manufactured by Lutron Electronics Co., Hubbell Manufacturing Co., Leviton Manufacturing.

B. Installer: A firm with at least 5 years of successful installation experience on projects with electrical installation work similar to that required for the project.

C. Warranty: Provide a minimum one-year warranty from time of installation acceptance.

1.5 RECEPTACLES AND SWITCHES QUALITY ASSURANCE

A. Manufacturers: Manufacturers shall be companies regularly engaged in manufacture of wiring devices, of types and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years. Acceptable manufacturers are Pass & Seymour, Hubbell, and Leviton Manufacturing.

B. Installer: A firm with at least 5 years of successful installation experience on projects with electrical installation work similar to that required for the project.

C. Compliance: Comply with the latest edition of the following standards;

1. NEMA WD1, WD3 and WD5
2. UL 5, 20 and 231
3. UL 1449
   a. Test withstand voltage surges of up to 6000 volts and current surges of up to 200 amperes without damage.

D. Warranty: Provide a minimum one-year warranty from time of final acceptance.

1.6 SUBMITTALS

A. Wiring Devices: Submit manufacturer's product data on all wiring devices listed on the drawings including;

1. Colors
2. Dimensions
3. U.L. Label
4. Finish
5. Voltage
6. Wiring diagrams
7. Application information
B. Coverplates and Identification: Submit type of identification used for coverplates to comply with the Identification Section as specified herein. Screws to match coverplate color.

1.7 SEQUENCING AND SCHEDULING

A. Coordination: Coordinate with other work including wires/cables, electrical boxes and fittings, and raceways, to properly interface installation of all wiring devices.

PART 2 - PRODUCTS

2.1 WALL DIMMERS

A. Color: Unless otherwise noted, standard device and matching faceplate color shall be as specified in other sections. Match colors with other devices, particularly when multi-gang application requires devices by other manufacturers.

B. Dimensions: Profile projection off the wall of dimmer shall not exceed 0.295 inches beyond the surface of the wall. Dimmers in excess of 1500 watts shall not exceed 0.627 inches. Dimmer shall not exceed 2-3/4 inches in width for units 1000 watts or less and 4-1/2 inches for 1500 watt units. The height of all wattage units shall not exceed 4 1/2 inches. Depth of dimmer within backbox shall not exceed the following;

1. 1-5/26 inches for units 1000 watts and lower.
2. 1-5/8 inches for 1500 watt units.
3. Selected low voltage and 2-location dimmers may exceed the above depth, but shall in no case exceed 1-11/26 inches.
4. All dimmers within the same room or vicinity shall be of the same profile projection. Varying depths or projections shall not be tolerated.

C. Mounting: Dimmers shall be mounted individually in a single gang standard switchbox, and be gangable without removing side sections (fins) or derating each unit's capacity.

D. Operation: No auxiliary dimmers cabinets, control modules, or interfaces shall be required for operation at single location incandescent dimming of 2000 watts or less systems. 3-way dimmers shall be 3-way not one master and one slave.

E. Rating: All devices shall be capable of operating at rated capacity indicated on the drawings without affecting rated lifetime.

F. Temperature: Dimmers shall be capable of operating in an ambient temperature of 0 to 40 degrees C. (30 to 104 degrees F.)

G. Static Discharge: Dimmers shall not be susceptible to damage or loss of memory due to static discharge.
H. Short Circuit Test: Dimmers shall meet the UL 20 short circuit test requirement for snap switches.

I. Filtering: Dimmers shall utilize an LC filtering network to minimize interference with properly installed radio, audio, and video equipment. Provide heavy duty toroidal choke to suppress RFI interference.

J. Type: Dimmers shall be slide type.

2.2 LINEAR SLIDER DIMMERS

A. Operation: Linear Slider Preset Systems Operation shall provide a continuous linear slider movement, which controls lighting intensity in direct proportion to the movement of the slider. Provide a smooth and continuous Square Law Dimming curve. Slider shall be of the dual wiping type, with a smooth movement, and an even pressure requirement for movement along the entire length of the slider. Encase the slider within the dimmer enclosure to prevent accumulation of dust on the control movement.

B. Power-Failure Memory: When power is interrupted and subsequently returned, the lights shall come back on to the same levels set prior to the power interruption. Restoration to some other default or pre-set point is not acceptable, unless specifically noted elsewhere.

C. Regulation: Regulate voltage so that a 10 percent variation in the line voltage shall cause no more than a 5 percent variation in the load voltage when the dimmer is operating at 40 volts (5 percent light output).

D. Full-On Bypass: Dimmer shall contain latching contacts to bypass dimming circuitry when placed in the full on position to achieve 100 percent lighting output.

E. Manufacturer: Manufacturer shall be Pass & Seymour, Leviton or Hubbell.

2.3 FLUORESCENT DIMMING

A. Lamps: Dimmers shall be rated at 277 volts to control 40 lamps of the same current rating, but may be of different lengths.

B. Operation: Dimming operation and performance shall be as follows;

1. Dimming range from 100 to 1 percent light output
2. One and two-lamp fixture packs shall track evenly, with no perceptible difference in light levels for the same type lamps.
3. Different lengths of lamps shall track evenly, with no perceptible difference in light levels for the same type of lamps.
4. Fixture packs shall be inaudible with no apparent humming or buzzing at any point in the dimming range.
5. Use standard lamps for dimming applications. Do not use energy-saving krypton-fill gas lamps. Where applicable, use knife-edge lamp sockets.
   a. Burn fluorescent lamps for 100 hours to "season lamps" before acceptance by the owner.
   b. Warrantee does not become effective until after system is "seasoned" by 100 hour burning time.
6. Electrical noise shall be suppressed to a level that shall not interfere with the normal operation of other properly designed and installed electrical equipment.
7. Minimum light levels shall be user-adjustable in order to compensate for different loading of each dimmer.
8. Use and interface control where necessary for preset systems, or for two location dimming of fluorescent fixtures.

2.4 DIMMER FACEPLATES

A. Features: Faceplate shall snap on to device with no visible means of attachment. Heat fins shall not be visible on front of device.

B. Multigang: Using 2 or more dimmers and/or other wiring devices together. Include mounting frame for proper device alignment and faceplate attachment. Dimmers ganged with other devices in a common location shall be included under a single faceplate of the size and shape to accept all devices located in the ganged mounting. Utilize similar shaped wiring devices to dimmer configuration to keep alignment and appearance uniform.

C. Materials: Color and finish to be selected by the Architect/Engineer unless otherwise noted on the plans, or in these specifications.

2.5 CONVENIENCE RECEPTACLES

A. Twenty Ampere Receptacles: Provide commercial specification grade single or duplex receptacles, 2-pole, 3-wire grounding, with green hexagonal equipment ground screw, ground terminals and poles internally connected to mounting yoke, 20 ampere, 120 volts, with metal plaster ears, side wiring, NEMA configuration 5-20R unless otherwise indicated.

B. Color: Devices connected to the normal system shall be grey in color, unless otherwise noted.

C. Device Type: Unless otherwise noted, in all public areas, provide all receptacles as the duplex modular type. Provide standard devices in non-public areas such as storage rooms, janitor's closet, penthouses & mechanical spaces, and electrical rooms.
D. Construction: Heavy duty nylon face and wraparound mounting strap, locked into and on the body, utilizing heavy-gauge brass ground contacts riveted to strap. Include automatic self-grounding spring to assure ground continuity between mounting strap and metal wall box. T-slot one piece copper alloy contact wipes which interface with plug blades inserted at 3 points. Line terminals shall be screw terminals and accept #14 to #10 AWG copper conductors.

E. Ground Fault Circuit Interrupter: Provide commercial specification grade, duplex, ground fault circuit interrupter receptacles, grounding type, UL rated Class A, Group 1, 20 ampere ratings, 125 volts, 60 Hz; with solid state ground fault sensing and signalling; with 5 milliampere ground fault trip level; equipped with 20 ampere receptacle configuration, NEMA 5-20R. Device shall contain test and reset pushbuttons, with a visual display of the tripped position. All outside receptacles (weatherproof) shall be duplex G.F.C.I. type. Interrupter shall resist tripping from the effects of radio frequency (RF) signals from 10 to 450 MHz.

2.6 SWITCHES

A. Toggle Switches: Provide specification grade, fast-make positive-break, flush single-pole, three and four way, silent operation toggle switches, 20 ampere, 120 volt AC or 277 volt AC as required, with mounting yoke insulated from mechanism, equipped with plaster ears, and side-wired screw terminals. Switches connected to the normal system shall be grey; red for emergency system.

B. Two Pole Switches: Provide two pole switches where drawings indicate the switching of 208 volt systems consisting of two phase conductors.

C. Security Key Switches: Provide key switches where drawings indicate, where a degree of security requires limited access to control of the lighting system.

D. Pilot Light Handle: Handle glows when switch is on. Handle color shall be clear, unless otherwise indicated.

E. Thermal Switch: Provide fractional horsepower switch with melting alloy type overload relay, with number of poles to coordinate with the equipment being controlled. Surface or flush mounted cover, as required, equipped with padlocking device and pilot light. Provide overload relay heaters for each pole of the switch, sized per the manufacturer's instruction, and adjust heater size to permit normal operation of the motor.
F. Color: Devices connected to the normal system shall be grey in color, unless otherwise noted.

2.7 PLUGS AND CONNECTORS


2.8 WIRING DEVICE ACCESSORIES

A. Multigang: Provide all necessary hardware and frames to properly mount various devices in combinations.

B. Exterior Device Covers: Provide "Weatherproof" duplex with stainless steel hinged cover. Device opening shall be standard or modular, to be compatible with the device provided for elsewhere in these specifications.

C. Color: Unless otherwise noted, provide colored faceplates to match devices listed elsewhere in these specifications.

2.9 PRODUCT DESIGN SELECTION

A. Standard Commercial Specification Grade Receptacles: Provide standard commercial specification grade receptacles as follows:

<table>
<thead>
<tr>
<th>Description</th>
<th>Leviton</th>
<th>Hubbell</th>
<th>P &amp; S</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 amp Simplex</td>
<td>#5801</td>
<td>#5351</td>
<td>#5351</td>
</tr>
<tr>
<td>20 amp Duplex</td>
<td>#CR20</td>
<td>#CR20</td>
<td>#5342</td>
</tr>
<tr>
<td>20 amp Duplex GFCI</td>
<td>#6898</td>
<td>#GF-5352</td>
<td>#2091-S</td>
</tr>
<tr>
<td>20 amp Duplex Isolated Gnd.</td>
<td>#5362-IG</td>
<td>#IG-5362</td>
<td>#1G-6300</td>
</tr>
</tbody>
</table>

B. Premium Standard Specification Grade Switches: Provide premium standard specification grade switches as follows:

<table>
<thead>
<tr>
<th>Description</th>
<th>Leviton</th>
<th>Hubbell</th>
<th>P &amp; S</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 amp Single</td>
<td>#1221-2</td>
<td>#1221</td>
<td>#20AC1</td>
</tr>
<tr>
<td>20 amp 3-way</td>
<td>#1223-2</td>
<td>#1223</td>
<td>#20AC3</td>
</tr>
<tr>
<td>20 amp 4-way</td>
<td>#1224-2</td>
<td>#1224</td>
<td>#20AC4</td>
</tr>
<tr>
<td>20 amp Single-Locking</td>
<td>#1221-2L</td>
<td>#1221-L</td>
<td>#20AC1-L</td>
</tr>
<tr>
<td>20 amp 3-way-Locking</td>
<td>#1223-2L</td>
<td>#1223-L</td>
<td>#20AC3-L</td>
</tr>
<tr>
<td>20 amp 4-way-Locking</td>
<td>#1224-2L</td>
<td>#1224-L</td>
<td>#20AC4-L</td>
</tr>
<tr>
<td>20 amp Single-Pilot</td>
<td>#1221-2PL</td>
<td>#1221-PL</td>
<td>#20AC1-CPL</td>
</tr>
<tr>
<td>20 amp 3-way-Pilot</td>
<td>#1223-2PL</td>
<td>#1223-PL</td>
<td>#20AC3-CPL</td>
</tr>
</tbody>
</table>
C. Dimmers: Provide dimmers as follows *per wattage requirements:

<table>
<thead>
<tr>
<th>Description</th>
<th>Lutron</th>
<th>Leviton</th>
<th>Hubbell</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linear Slide</td>
<td>Nova T Star 80,000 series</td>
<td>AS series</td>
<td></td>
</tr>
<tr>
<td>Fluorescent</td>
<td>Nova T Star 86,000 series</td>
<td>AS series</td>
<td></td>
</tr>
<tr>
<td>Rotary</td>
<td>Centurion 60,000 series</td>
<td>AR series</td>
<td></td>
</tr>
</tbody>
</table>

D. Motor Starter Switches: Provide motor starter type switches as follows:

<table>
<thead>
<tr>
<th>Description</th>
<th>Detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manual motor starter switch with overloads</td>
<td>Class 2510</td>
</tr>
<tr>
<td>Manual motor starter switch with overloads and pilot light</td>
<td>Class 2510</td>
</tr>
</tbody>
</table>

E. Device Covers: Provide device covers as follows:

<table>
<thead>
<tr>
<th>Description</th>
<th>Leviton</th>
<th>Hubbell</th>
<th>P &amp; S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stainless steel coverplate</td>
<td>#302 S/S</td>
<td>#302</td>
<td>#302</td>
</tr>
<tr>
<td>Weatherproof stainless steel coverplate</td>
<td>----</td>
<td>----</td>
<td>WP-8</td>
</tr>
<tr>
<td>Weatherproof stainless steel coverplate locking type</td>
<td>----</td>
<td>----</td>
<td>SP-26L</td>
</tr>
</tbody>
</table>

F. Multi-outlet Assembly: Provide a multi-outlet assembly with 20 ampere single devices at 24 inches on center. Assembly shall be Wiremold 2400 Series.

PART 3 - EXECUTION

3.1 INSTALLATION OF WIRING DEVICES

A. General: Provide wiring devices, in accordance with manufacturer's written instructions, applicable requirements of NEC and National Electrical Contractors Associations "Standard of Installation", and in accordance with recognized industry practices to ensure that products serve intended function.

B. Completion: Delay installation of devices until wiring and wall finish is completed.
C. Support: Devices shall be securely supported to box, not supported to device plate. Device shall trim out flush with front of plate. Do not support the device by loosening device mounting screws and attaching the coverplate for leveling.

D. Adjustment: Provide receptacles and switches only in electrical boxes which are clean, free from excess building materials, debris, etc. Adjust devices to plumb when tightened, and in position to receive faceplate. Devices shall not be leveled by using the mounting screws, outlet boxes shall be flush to wall finish prevent leveling problems. Tighten devices and provide securely, so that there shall be no movement during usage.

E. Position: Position ground pin at the top of the device in vertical application, unless otherwise noted.

F. Wiring: Provide screw terminal connections using a single conductor only. Do not "back-stab" devices. Provide single whips for all multiple conductor connections within each box.

3.2 WALL DIMMER INSTALLATION

A. General: Provide dimmers in accordance with manufacturer's written application, wiring, and installation instructions. Applicable requirements of NEC and National Electrical Contractors Associations "Standard of Installation", and in accordance with recognized industry practices to ensure that products serve intended function.

B. Mounting: Provide dimmers only in electrical boxes which are clean and free from excess building materials, debris, etc. Adjust dimmers to plumb when tightened, and in position to receive faceplate. Tighten dimmers so that there shall be no movement during usage.

C. Cover Plates: Provide dimmers and cover plates in true vertical or horizontal alignment as applicable. Plates shall be properly secured by means of screws which have heads with finish matching the plate. Secure plates so as to maintain a snug fit against dimmer surfaces, with no gaps.

D. Position: Position ground pin at the top of the device in vertical application, unless otherwise noted. Slider to be in off position before connection to system.

3.3 APPLICATION OF COVER PLATES

A. Mounting: Provide coverplates in true vertical or horizontal alignment as applicable. Plates shall be properly secured by means of screws which have heads with finish matching the plate. Secure plates so as to maintain a snug fit against wall surfaces with no gaps.
B. Replacement: Replace all coverplates which are warped, cracked, chipped, or whose color does not match the balance of the installation. Replace screws whose threads do not allow the drawing up tight of the coverplate to the device.

3.4 CLEANING

A. Soiled Devices: Clean devices soiled prior to acceptance inspection, to remove all debris and foreign materials, such as paint, varnish, drywall compound, etc.

B. Solutions: Do not use liquid cleaning solutions, etc. on the face of the devices without written direction from the Engineer/Architect.

3.5 TESTING

A. Ground testing: Provide ground testing procedures as specified herein. Prior to energizing circuitry, test wiring devices for electrical continuity, and for short circuits.

B. Polarity: Subsequent to energization, test wiring devices for proper polarity, and to demonstrate operations as required in this and other sections of this Specification.

C. Recording: Record all tests as required in other sections of this specification.
SECTION 26425 DISTRIBUTION SWITCHBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. General: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work specified of this section.

1.2 DESCRIPTION

A. Description of System: Provide factory-assembled, metal-enclosed switchboard for service entrance from line terminals to outgoing feeder terminals, complete, installed, and tested in place.

B. Description of System: Provide factory-assembled, metal-enclosed switchboard for distribution and control of power from line terminals to outgoing feeder terminals, complete, installed, and tested in place.

C. General: Switchboard shall include all main and branch protective devices, related equipment as required or as listed on drawings, with all necessary interconnections, instrumentation, control wiring, etc.

1.3 DISTRIBUTION SWITCHBOARDS QUALITY ASSURANCE

A. ANSI: The latest edition of the Reference Standards for the American National Standards Institute shall apply as follows;

1. ANSI Y32.2 - Graphic Symbols for Electrical and Electronic Diagrams.
3. ANSI C57.13 - Instrument transformers

B. NEMA: National Electrical Manufacturers Association shall apply as follows;

1. NEMA PB2, Dead front Switchboards.
2. NEMA AB1, for molded case circuit breakers and switches.
3. NEMA MS1 for enclosed switches.

C. NFPA: The latest edition of the National Fire Protection Association shall apply as follows;

1. NFPA 70, National Electrical Code (NEC).
2. Refer to Section 26010 for additional references.
D. UL: The latest edition of the Underwriters' Laboratories, Incorporated shall apply as follows;

1. UL Electrical Construction Materials List Switchboards-dead front type (384 W4) WEVZ.
2. UL 891-Dead front switchboards.
3. UL 50 Cabinets and boxes.
4. UL 38 Enclosed and dead front switches.
5. UL 489 Molded case circuit breakers.
6. UL 891 Dead front switchboards.
7. UL 943 Ground fault circuit interrupters.
8. UL 977 Fused power circuit breakers

E. Source Quality Control: Tests to meet NEMA PB2 requirements.


G. Production Tests: Perform tests on completed switchboard assembly.

H. Type: Dielectric tests, Mechanical operation test, Grounding tests, Control wiring tests, Electrical operation tests.

1.4 SUBMITTALS - DISTRIBUTION SWITCHBOARDS

A. General: Submit layouts showing concrete pad dimensions, conduit entrance and available space, bus duct connections, electrical rating, nameplate nomenclature, single-line diagram (in accordance with ANSI Y32.2) indicating all connections and control.

B. Shop Drawings: Shop Drawings shall be submitted for each switchboard and shall clearly indicate all of the following information;

1. Enclosure elevations, studs and details.
2. Complete Construction Information
3. U.L. Label
4. Each overcurrent device amperage rating, circuit number and position/location in the switchboard.
5. Electrical characteristics
6. Dimensions, (width, depth, height, weight)
7. Switchboard classification
8. Frame size, rating and interrupting capacity of each breaker, and of total assembly.
9. Horsepower rating at rated voltage of fused switches and/or breakers.
10. Size and type of fuses being provided.
11. Ranges of all meters (all meters shall be analog).
12. Type of labeling for each overcurrent device and load (Provide at least one sample with shop drawing).
13. Main switchboard nameplate indicating project name; Architect, Engineer and Contractor.
14. Product data for switchboard mounted transformers; transfer switches; main fused "bolt-loc" switches; power breaker; or other specialties clearly and/or separately called out in the contract documents.
15. Bus bar size, type arrangement and spacing (Phase, neutral and ground bar).
16. Transparency log paper time current curves for protective relays, current and potential transformer excitation and saturation curves, and fuses.
17. Protective relay instruction books.
18. Shipping sections.
19. Lug sizes for cables on all switches or breakers.
20. Incoming lug sizes.

C. Product Data: Manufacturer's written recommendations for storage, protection, handling, installation instructions and field test requirements. Record all field tests, itemize data and submit at end of project with project manual.

D. Test Reports: Reports of production and field tests.

E. Operations and Maintenance Data: Provide and comply with manufacturer's instructions for tightening bus connections, performing cleaning, operating and maintaining switchboard.

1.5 QUALITY ASSURANCE

A. Standards: The switchboard shall comply with the latest edition of the following standards;

1. American National Standards Institute (ANSI):
   a. ANSI Y32.2, Graphic Symbols for Electrical and Electronic Diagrams.
   b. ANSI Z55.1 Gray Finishes for Industrial Apparatus and Equipment.
   e. ANSI C37.26 Preferred Ratings, Related Requirements and Application Recommendations for Low Voltage AC Power Circuit Breakers and AC Power Circuit Protectors.
   f. ANSI C37.17 Trap Devices for AC and General Purpose DC Low-Voltage Power Circuit Breakers.
   g. ANSI C37.20 Switchgear Assemblies.
   h. Test Procedures for Low Voltage AC Power Circuit Breakers Used in Enclosures, ANSI C37.50.

2. National Electrical Manufacturers Association (NEMA):
   a. NEMA PB2 - Tests.


4. Underwriters Laboratories (UL)
   a. (384 W4) WEVZ Switchboards
   b. 891 Dead Front Switchboards

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Handling: Only lift switchboard using eyes, yokes, and skids provided by manufacturer.

B. Storage: Do not store indoor switchboard exposed to weather.

C. Protection: Physically protect switchboard against all damage. Cover switchboard with suitable material to avoid damage to finish.

PART 2 - PRODUCTS

2.1 DISTRIBUTION SWITCHBOARDS

A. General: Switchboards shall be deadfront with front accessibility required. The switchboard frame shall be of formed code gauge steel rigidly bolted together to support all coverplates, bussing and component devices during shipment and installation. Steel base channels shall be bolted to the frame to rigidly support the entire shipping section for moving on rollers and floor mounting. Each switchboard section shall have an open bottom and an individually removable top plate for installation and termination of conduit. All front covers shall be screwed on and removable and all doors shall be hinged with removable hinge pins. Top and bottom conduit areas shall be clearly indicated on shop drawings. Switchboards shall be freestanding and completely self supporting structures, 90 inches high.

B. Provide distribution switchboards as manufactured by Square "D", General Electric, Siemens, or Cutler Hammer.
2.2 FINISH

A. Preparation: All steel surfaces shall be chemically cleaned and treated to provide a bond between paint and metal surfaces to help prevent the entrance of moisture and formation of rust under the paint film.

B. Color: The switchboard exterior shall be finished in indoor light grey No. 61, ANSI Z55.1.

C. Coating: Apply corrosion-protective undercoating and allow to dry prior to final coat. Touch up any scratches prior to calling for final inspection.

2.3 BUSSING AND TERMINATIONS

A. Bus bars: Buses shall be plated copper sized on the basis of not more than 1000 ampere per square inch current density. Bussing shall be of sufficient cross-sectional area to meet UL Standard 891 temperature rise. The bus structure shall be braced and rated to withstand mechanical forces exerted during short circuit current conditions when connected directly to a power source having a minimum 50,000 rms symmetrical amperes. A ground bus shall be provided and factory secured to each vertical section of switchgear.

B. Bus Supports: All bus supports, connections and joints shall be bolted with hex-head bolts and Belleville washers to minimize maintenance requirements.

C. Accessibility: Bus connections shall be front accessible. Each switchboard end section shall include all provisions for the addition of future sections.

D. Space Provisions: Where space for future is called for on drawings, provide all necessary hardware and bus, except device connecting straps.

E. Ratings: Switchboard through bus shall have continuous current rating of 100 percent of main device frame size.

F. Terminations: All line and load termination points shall be suitable for the quantity and size of terminated conductors as indicated on the drawings and shall be suitable for each type of conductor material. Terminations shall be front accessible.

G. Hardware: All hardware shall be manufactured from high tensile strength steel and have a suitable protective finish.

H. Bus Duct Connections: When bus duct stubs are required, they shall be suitable for direct connection from the switchboard to the bus duct without any cabling connections.
2.4 ACCESSORIES

A. General: Switchboard shall be provided with adequate lifting means from the factory, and shall be capable of being rolled or moved into installation position and bolted directly to its concrete base (housekeeping pad) without the use of floor sills.

2.5 CONTROL WIRING

A. General: All control wiring conductors shall have heat shrink identification labels on each end of termination. Terminations shall be made to screw terminal strips using accepted conductor terminals. All points of terminal strips shall be labeled to match conductor labeling.

2.6 MAIN SECTION

A. General: The service disconnect devices shall be as specified herein and shall be totally front accessible and front connectable. Main device shall be provided with ground fault protection. Main circuit breaker shall be solid-state with adjustable settings for long-time, short time, instantaneous, long-time delay and short time delay.

B. Analog Instruments and Equipment: The following instruments and associated equipment shall be provided;

1. Ammeter (0-1200 amperes) (0-2000 amperes) (0-3000 amperes)
2. Voltmeter (0-240 volt) (0-600 volt)
3. Ammeter and voltmeter transfer switches
4. Current and potential transformers
5. Fuses and assemblies
6. Power factor meter
7. Kilowatt-hour meter, with demand register.
8. All required interconnecting wiring
9. All instruments shall be 4-1/2 inch square, with plus or minus 1 percent accuracy, analog, and shall be mounted in the entrance section of the switchboard.
10. The compartment shall be (barriered) (unbarriered) and covered with a (formed steel cover plate) (single-hinged door) (double-hinged door) with sealing provisions, a (voltmeter) (ammeter) (power factor meter) (wattmeter) (watthour meter) shall be mounted in the door and supplied with current and potential transformers and instrument transfer switches where required. All front plates used for mounting meters, instrument transfer switches or other front mounted devices shall be hinged with all wiring installed.
C. Ground Fault Protection: Ground fault protection system shall be provided consisting of the following;

1. A ground sensor on line side of main switch encircling all phase and neutral conductors connected to an adjustable solid state ground relay switch which initiates automatic shunt tripping of the main and/or branch circuit interrupting devices.

2. System shall be adjustable from 200 to 1200 primary amperes, and time current characteristics shall provide 6 cycle operation at about ten times setting.

3. Relay output shall operate at 120 volts A.C. fused source from main bus. Provide all terminal blocks, transformer, auto-reset fuses, interconnecting wiring, etc.

4. Submit relay curves and all main/branch breakers for coordination study.

D. Phase Protection: A phase protection system shall be provided as follows;

1. System shall provide loss of phase, phase reversal, low voltage and phase unbalance protection.

2. System shall consist of solid state controller, DPDT relay, terminal blocks, audio and visual failure indicator with local silence switch, adjustable trip delay (1 to 5 seconds) adjustable sensitivity, auto-reset fuses and all interconnecting wiring.

3. Unit shall be mounted in NEMA 1 enclosure adjacent to or mounted on side of main section of switchboard.

4. System shall control shunt trip mechanisms on switchboard circuit breakers equipped with such features.

5. The phase protector system shall be capable of protecting the electrical power system if loss of power shall occur, regardless of phase, as an interruptable source of power.

6. Unit voltage shall match voltage system of main board. Provide additional relay operated, by phase protection system, as required if tripping more than one breaker.

7. Phase protection system unit shall be Time Mark #259 for system voltage.

8. Submit phase protection system layout with shop drawing.
2.7 DISTRIBUTION SECTIONS

A. General: Group mounted molded case circuit breakers, fusible switches, or integrally fused circuit breakers shall be totally front accessible. The branch protective devices are to be mounted in the switchboard to permit easy installation, maintenance and testing without reaching over any line side bussing. The circuit breakers shall be removable by the disconnection of only the load side cable terminations and all line and load side connections shall be individual to each circuit breaker. No common mounting brackets or electrical bus connectors shall be acceptable. Each circuit breaker is to be provided with an externally operable mechanical means to trip the circuit breaker, enabling maintenance personnel to verify the ability of the circuit breaker trip mechanism to operate, as well as exercise the circuit breaker operating mechanisms.

B. Solid State Circuit Breakers: All breakers 600 amperes and above shall be solid-state with adjustable settings for long-time, short-time, instantaneous, long-time delay and short-time delay.

C. All circuit breakers in the switchboard shall be fully rated. No series rating is allowed.

PART 3 - EXECUTION

3.1 INSPECTION

A. Preparation: Examine area to receive switchboard to assure that there is adequate clearance to meet NEC requirements and normal maintenance issues for switchboard installation. Check that housekeeping pads (concrete base) are level and free of irregularities. Start work only after any unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Compliance: Provide switchboard complete in accordance with manufacturer's written instructions, NEC, and all applicable codes.

B. Mounting: Mount switchboard on 4 inch housekeeping pad (concrete base). Pad shall extend 4 inches beyond switchboard edge on all sides with all equipment installed.

C. Mats: Provide continuous rubber insulating mat on floor in front of switchboard. Mat shall extend for the entire length of switchboard plus two feet beyond each side. Mat to be minimum 4 feet wide and 1/2 inch thick. Mat shall lie flat on floor without the use of any adhesive or fastener. Entire edge of mat shall be chamfered. Submit manufacturers data sheet and sample of mat with shop drawings.
3.3 FIELD QUALITY CONTROL

A. General: Provide field tests prior to energization as follows;

1. Megger check and record all data, of phase to phase and phase to ground insulation levels.
2. Continuity.
3. Short Circuit.
4. Proper phase relationship.

B. Provisions: Perform tests according to switchboard manufacturer's instructions.

3.4 ADJUSTMENT AND CLEANING

A. Adjustments: Adjust operating mechanisms for free mechanical movement.

B. Connections: Tighten bus connections and mechanical fasteners.

C. Finish: Touch-up scratched or marred surfaces to match original finish.

3.5 CHECK-OUT MEMO

A. General: Submit check-out memo from switchboard representative.
CHECK-OUT MEMO

NOTE TO CONTRACTOR: Do not submit this form at the time Technical Information Brochure is submitted. This form shall be completed and submitted before Instruction in Operation to Owner or a request for final inspection.

Name of equipment checked: __________________________________________________

Name of manufacturer of equipment: ____________________________________________

Re: ______________________________________________________________________
   (Name of Project)

1. The equipment furnished by us has been checked on the Job by us. We have reviewed (where applicable) the performance verification information submitted to us by the Contractor.

2. The equipment is properly installed, except for items noted below.*

3. The equipment is operating satisfactorily, except for items noted below.*

4. The written operating and maintenance information (where applicable) has been presented to the Contractor, and gone over with him in detail. Five (5) copies of all applicable operating and maintenance information and parts lists have been furnished to him for insertion in each of the Equipment Brochures.

Checked by: _______________________________________________________________

   (Printed Name of Manufacturer's Representative)

   _______________________________________________________________

   (Address and Phone No. of Representative)

   _______________________________________________________________

   (Signature and Title of Person Making Check)

   _______________________________________________________________

   (Date Checked)

cc: Owner, Architect, Engineer, Contractor and Subcontractor

*Exceptions noted at time of check were as follows:
SECTION 26450 GROUNDING

GENERAL

RELATED DOCUMENTS

General: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work specified in this section

GROUNDING ELECTRODES

General: Provide a grounding electrode system, as described in NEC 250, as specified herein and as indicated on plans.

Ground Field / Ground Rods: The ground field shall consist of three 20 ft long vertically driven ground rods arranged in a triangular pattern spaced 20 feet apart. Additional ground rods shall be added as necessary to achieve the desired resistance.

Main Metallic Water Pipe: The building’s main metallic underground water piping shall be utilized as a grounding electrode, provided the metal pipe is installed in direct contact with the earth for a minimum of 10 feet. Bond the main metallic water service within 5 ft. of the entrance of the water pipe into the building.

Building Steel: The building steel shall be utilized as a grounding electrode, provided the steel is in direct contact with the earth or is otherwise effectively grounded.

Rebar: In concrete buildings, provide bond to rebar in concrete.

Resistance: Grounding electrode resistance shall not exceed 10 ohms. Overall resistance of the entire grounding electrode system shall not exceed 5 ohms. Provide additional grounding electrodes as required to meet this value. Refer to Section 26020 for testing requirements.

GROUNDING ELECTRODE CONDUCTOR

Grounding Electrode Conductor: A main grounding electrode conductor, bare copper, sized per NEC, shall be run in PVC conduit from main service equipment to the grounding electrodes. This conductor shall also be bonded to the following:

Telecommunications service ground within 20’ of the electrical service
Gas and other interior metal piping – refer to NEC.
SEPARATELY DERIVED GROUNDING SYSTEMS

Description: Provide a separately derived grounding system where indicated herein and as required by the National Electrical Code. Bond neutral and ground busses together.

Services: Provide a separately derived grounding system for all building electrical services and step-down transformers.

Multiple Buildings: Multiple buildings fed from the same electrical service shall be provided with separate grounding electrode systems, as required by the NEC and specified herein.

BONDING AND EQUIPMENT GROUNDING

Description of System: In general, all electrical equipment (metallic conduit, motor frames, panelboards, etc.) shall be bonded together with a green insulated copper system grounding conductor in accordance with specific rules of Article 250 of the NEC. Equipment grounding conductors through the raceway system shall be continuous from main switch ground bus to panel ground bar of each panelboard, and from panel grounding bar of each panelboard to branch circuit equipment and devices.

Equipment Grounding Conductors: All raceways shall have an insulated copper system ground conductor run throughout the entire length of circuit installed within conduit in strict accordance with NEC. Grounding conductor shall be included in total conduit fill when determining conduit sizes, even though not included or shown on drawings.

Redundant Grounding: In general all branch circuits shall be provided with a redundant grounding system through the use of grounding conductors and metallic conduit.

Bonding: In addition to connections to grounding electrodes, the main service ground shall be bonded to the lightning protection system and other underground metal piping.

Light Poles: All exterior light poles shall have their enclosures grounded directly to a separate driven ground at the light pole in addition to the building ground connection, via the circuit equipment ground conductor.

Bushings: Provide insulated grounding bushings on all metallic feeder conduits terminated within panelboards, switchboards or enclosed overcurrent devices. Provide insulated grounding bushings on all branch circuit conduits where concentric knockouts are used.

Connection to Other Systems: Provide all required grounding and bonding connections as specified herein and as required by the National Electrical Code.
SUBMITTALS

General: Submit product data on ground rods, ground wire, ground connectors, ground bars, and data on exothermic welds.

QUALITY ASSURANCE

Compliance: The entire ground system shall meet or exceed the minimum requirements NEC 250 and IEEE Std. 142 (green book).

PRODUCTS

GROUNDING ELECTRODE AND BONDING CONDUCTORS

General: Except as specified in C below, provide UL and NEC approved types of copper with THWN, THHN, or XHHW with green insulation or green tape on black insulation the entire length of conductor not in conduit.

Size: Grounding electrode conductors shall be sized as specified herein and on the drawings, but in no case shall be smaller than required by NEC 250.

Insulation: Conductors above ground shall be insulated, conductors run below grade shall be bare.

GROUNDING ELECTRODES

A. Ground Rods: Provide copperclad steel, 5/8 inch diameter by 20 feet long vertically driven ground rods. Use of multiple 10 feet sectional ground rods is acceptable.

CONNECTIONS

Bonding: One piece mechanical lugs or wire terminals, properly sized and approved by the local authority having jurisdiction shall be used to bond ground wires together or to junction boxes and panel cabinets.

Underground: All connections and bonds made underground and to building steel shall be exothermic weld type-connections.

INSPECTION WELLS

Location: Provide inspection wells for all ground rods covered by concrete, paving, or other permanent materials that prevent access to ground rods.
Description: Inspection well shall be provided with circular, flush traffic rated, grade mounted, twist lock traffic cover with the word “ground” (or similar) on the cover. Inspection test well shall allow clear access to the ground rod and exothermic weld connection of conductor to ground rod. Clearly mark ground rod locations on as-built drawings.

GROUND BAR

Location: Provide a ground bar connected to the main service ground via a #4/0 grounding conductor in all electrical rooms with step-down transformers.

Description: Ground bar shall be 12” x 2” x ¼” (minimum) copper bus mounted to wall 24” AFF via insulated standoffs. All connections to ground bar shall be made via approved mechanical connections.

Interconnection: In addition to the main service ground, all ground bars shall be interconnected to each other via #4/0 insulated grounding conductor. Each ground bar shall also be bonded to local metallic water piping and building steel via #6 insulated grounding conductor.

INSTALLATION

EXTERIOR

Connection: The main grounding electrode conductor shall be exothermically welded to ground rods and other main system electrodes.

INTERIOR

Installation: Equipment grounding conductors shall be installed as follows:

Where installed in metal conduit, both conductor and conduit shall be bonded at each end.

Have connections accessible for inspection and made with approved solderless connectors brazed (or bolted) to the equipment or structure to be grounded.

Shall in NO case be a current carrying conductor.

Have green insulation, except that grounding electrode conductors may be bare.

Water Meter: Provide properly sized bonding shunt around water meter and/or dielectric unions in the water pipe.
Bushings: Bond all grounding bushings to the equipment ground bus of the panel or switchboard, or overcurrent device in which it is located. Bond shall be made via an insulated bonding conductor of same size as equipment ground conductor run in the circuit.

TESTING

Testing: Provide testing as required in other sections of this specification, including but not limited to sections 26010 and 26020.

Reports: Submit impedance test reports for all separately derived services to the Engineer prior to project completion.

CONNECTIONS

Preparation: All contact surfaces shall be thoroughly cleaned before connections are made, to ensure good metal to metal contact.

END OF SECTION
SECTION 26460 TRANSFORMERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. General: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Specification Section 26010, apply to work specified in this section.

1.2 DRY-TYPE TRANSFORMERS

A. General: Dry type transformers shall be factory assembled, metal enclosed, provided complete with mounting brackets as required.

B. Provide dry type transformers as manufactured by Square "D", General Electric, Siemens, or Cutler Hammer.

1.3 SUBMITTALS

A. Shop Drawings: Shop drawings shall be submitted showing dimensions, wiring diagrams, taps and nameplate nomenclature.

B. Product Data: Product data shall be submitted showing compliance with this section of the specification, manufacturer's written recommendation for storage and protection, and installation instructions.

1.4 PRODUCT STORAGE AND HANDLING

A. Protection: Physically protect transformers against damage as recommended by manufacturer.

B. Storage: A waterproof covering shall be kept around all transformers until they are ready to be energized.

1.5 SUBMITTALS

A. General: Provide shop drawings and product data on transformer showing compliance with these specifications including:

1. Pad dimensions with openings required.
2. Complete dimensions and drawings on transformer.
3. Coolant properties.
4. Incoming compartment equipment
5. Accessories.
PART 2 - PRODUCTS

2.1 CONSTRUCTION - DRY TYPE TRANSFORMERS

A. Listing: Dry type transformers shall be U.L. listed and certified to meet NEMA ST-1 with convection cooling and ST20.

B. Testing: Transformers shall be tested and rated for sound level in accordance with ASA-C89.1-1961.

C. Insulation: Class H insulation shall be employed for transformers above 30 KVA with maximum temperature rise of 150 degrees C. over 40 degrees C. Class F insulation shall be employed for transformers up to and including 30 KVA with a maximum temperature rise of 115 degrees C. over 40 degrees C.

D. Windings: Three phase units shall be wound delta-wye. Each three phase transformer shall have three separate sets of coils. No Scott T connections, open delta, or two coil arrangements shall be permitted.

E. Taps: Voltages shall be compatible with the application. Taps shall be provided two at plus 2-1/2 percent increments and two minus 2-1/2 percent increments from rated voltage.

F. BIL: Basic impulse level shall be 90 KV.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Mounting: Transformers shall be mounted where accessible. No units may be mounted behind partitions, above ceilings, etc. Each transformer shall be mounted on 3 inch concrete base extending 3 inches outside all sides.

B. Noise Isolation: Flexible conduits shall be used to isolate noise.

C. Grounding:

1. Grounding and bonding shall be per NEC. Provide #4/0 AWG conductor run in 1 inch conduit; loop conductor from transformer to transformer and ground at main service ground.

2. Provide ground to building steel and size ground per NEC 250.94.

END OF SECTION
SECTION 26470 PANELBOARDS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS
   General: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work specified of this section.

1.2 DESCRIPTION
   Description: Provide panelboards with main breaker or main lugs where shown on the drawings, of a dead front, distributed phase sequence design. Panelboards shall be equipped with thermal-magnetic molded case circuit breakers with frame and trip ratings as indicated in the schedules.

1.3 QUALITY ASSURANCE
   ANSI: the latest edition of the Reference Standards for the American National Standards Institute shall apply as follows;
   
   ANSI Y32.2 - Graphic Symbols for Electrical and Electronic Diagrams.
   ANSI Z55.1 Gray finishes for Industrial Apparatus and Equipment.

   NEMA: National Electrical Manufacturers Association shall apply as follows;
   
   NEMA PB1 Panelboards
   NEMA PB1-57 Gutter space

   NFPA: The latest edition of the National Fire Protection Association shall apply as follows;
   
   NFPA 70, National Electrical Code (NEC).

   UL: The latest edition of the Underwriters' Laboratories, Incorporated shall apply as follows;
   
   UL Electrical Construction Materials List, panelboards-dead front type.
   UL 67 Panelboard wiring gutter space, bus heat rise test.
   UL 50 Cabinets - Rigidity and gauge of steel.

   Listing: Panelboards shall be listed by Underwriters Laboratories and bear the UL or other nationally recognized testing laboratory label. Where required, panelboards shall be listed for use as service entrance equipment.
1.4 SUBMITTALS

Shop drawings:

Product data shall be submitted on:

Panel
Cabinet
Bus
Construction
Dimensions

Shop drawings shall be submitted for every panel, and shall clearly indicate all of the following information:

U.L. Label
Each circuit breaker amperage rating, circuit number and position/location in panel
Electrical characteristics of panel
Main bus rating
Main device rating
Mounting type
Dimensions, (width, depth, height, weight)
Bus material
Interrupting capacity of minimum rated breaker
Panelboard classification
Submit coordination curves on log-log paper for all breakers, fuses, transformers, etc.

If dimensions for equipment proposed in submitted shop drawings are different than was shown on drawings, contractor shall submit sketches showing layout of proposed equipment.

Coordination Study: The Contractor shall expect an additional 10 working days for panelboard and switchboard review to allow the Engineer to design the coordination study.

1.5 OVERCURRENT PROTECTIVE DEVICES - DESCRIPTION

Description of System: Connections of all items using electric power shall be included under this division of the specifications, including necessary wire, conduit, circuit protection, disconnects and accessories. Securing of roughing-in drawings and connection information for equipment involved shall also be included under this division. See other divisions for specifications for electrically operated equipment. Provide overcurrent protection for all wiring and equipment in accordance with the NEC, all federal, state and local codes as required and/or as shown on the drawings.
1.6 OVERCURRENT PROTECTIVE DEVICES – SUBMITTALS

1.7

Shop drawings and product data: Shop drawings shall clearly indicate;

- Frame sizes and interrupting capacity of all circuit breakers.
- Horsepower ratings of rated voltage of fused switches and/or circuit breakers.
- Size and type of fuses being provided.
- Device is U.L. Listed, and bears the U.L. Label.
- Device complies with these specifications, drawings, and applicable standards of NEMA, IEEE, ANSI, and ASA.

PART 2 – PRODUCTS

2.1 PANELBOARDS

Equipment: The panelboard bus assembly shall be enclosed in a steel cabinet and shall be surface or flush mounted as shown in the schedules. The box shall be fabricated from galvanized steel with standard baked enamel finish. Panelboard front shall include a door and shall have a flush, cylinder tumbler-type lock with catch and spring-loaded stainless steel door pull. All panelboard locks shall be keyed alike. All panel cabinets shall be a minimum of 20 inches wide. Fronts shall have adjustable indicating trim clamps which shall be completely concealed when the doors are closed. Doors shall be mounted with completely concealed steel hinges. Panel front shall not be removable with door in the locked position.

Bus: Panelboard bus structure and main lugs or main circuit breaker shall have current ratings as shown on the panelboard schedule. Bus shall be insulated and bus bar connections to the branch circuit breakers shall be of the "distributed phase" or phase sequence type. All current carrying parts of the bus structure shall be tin plated copper. A full size insulated neutral bus bar shall be provided. Provide system grounding tin plated copper bus bar bonded to the panelboard cabinet for connection of system grounding conductors. This bar shall be mechanically and electrically isolated from the neutral bar except where panelboard is used as service entrance equipment.

Molded Case Circuit Breakers: All panelboard branch circuit breakers shall be bolt-on thermal-magnetic molded case type. Breakers shall be 1, 2 or 3 pole with an integral crossbar to assure simultaneous opening of all poles in multi-pole circuit breakers. Breakers shall have an overcenter, trip-free, toggle-type operating mechanism with quick-make, quick-break action and active handle indication. Handles shall have "ON", "OFF", and "TRIPPED" positions. Bolt-on circuit breakers shall be able to be installed in the panelboard without requiring additional mounting hardware.
Solid State Circuit Breakers: Provide solid state circuit breakers for all breakers 400 amperes and above. Breakers shall have adjustable settings for long time pickup, long time delay, short-time pickup and short time delay.

120/208 Rating: 120/208 volt circuit breakers shall have interrupting ratings a minimum of 10,000 rms symmetrical amperes at 240 volts AC maximum.

277/480 Rating: 277/480 volt circuit breakers shall have interrupting ratings a minimum of 14,000 rms symmetrical amperes minimum at 277 volts AC (single pole) or 480Y/277 volts AC 2 and 3 pole.

Switching Type: Single pole, 15 and 20 ampere circuit breakers intended to switch fluorescent lighting loads on a regular basis shall carry the SWD marking.

Directories: Provide (2) two typed panelboard directory for each panelboard and indicate the actual circuit number used, room name and type of load. Room names shall be the actual name or room number used not necessarily as shown on the drawing. Panel directories shall include all room numbers and names. Where panel schedules are indicated on the drawings as "receptacles or "lighting", etc., it shall be the responsibility of the Contractor to include the specific area served.

Bracing: Panelboard as a complete unit shall be braced for a minimum short circuit rating equal to or greater than the lowest breaker symmetrical interrupting capacity as shown on the schedule. However, all panelboards shall be fully rated. No series ratings are allowed.

Grounding: All panelboard cabinets shall have a system grounding bar bonded to the panelboard cabinet for connection of system grounding conductors. This bar shall be mechanically and electrically isolated from the neutral bar.

Stubs: Provide four 3/4 inch conduits from all flush mounted panels to adjacent accessible ceiling space and mark "for future use". Provide pull cord in all empty conduits and provide plastic end bushing.
Design Selection:

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Square &quot;D&quot;, NQOD</th>
<th>Square &quot;D&quot;, NF Series</th>
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<tbody>
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<td></td>
<td>General Electric: A-Series</td>
<td>General Electric: A-Series</td>
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<td></td>
<td>Siemans: S1 Series</td>
<td>Siemans: SL/SE Series</td>
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<table>
<thead>
<tr>
<th>Current Range</th>
<th>600A thru 1200A</th>
</tr>
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<tbody>
<tr>
<td>Square &quot;D&quot;: I-Line</td>
<td>Square &quot;D&quot;: I-Line</td>
</tr>
<tr>
<td>General Electric: Spectra Series</td>
<td>General Electric: Spectra Series</td>
</tr>
</tbody>
</table>

### 2.2 OVERCURRENT PROTECTIVE DEVICES - INTEGRALLY FUSED CIRCUIT BREAKERS

General: The integrally fused molded case circuit breaker shall be provided as shown on the drawings and shall consist of a molded housing in which is combined (1) a standard molded case circuit breaker providing overload-short circuit protection within its interrupting capacity and ON-OFF switching function and (2) current limiters internally mounted on the load side of the circuit breaker of such ratings that their time current limiting characteristics shall coordinate with the time current tripping characteristics of the circuit breaker elements. This coordination to result in interruption by the circuit breaker alone of fault level currents up to the IC of the circuit breaker and interruption by the current limiter in conjunction with the circuit breaker of fault level currents above the interrupting capacity of the circuit breaker.

Current Limiter: A removable cover shall be provided over the current limiter section of the integrally fused circuit breaker. The current limiter housing covers shall be interlocked with the breaker tripping mechanism such that the breaker shall trip upon removal of the cover. This cover shall be so interlocked with the breaker that the circuit breaker cannot be turned to the ON position with the cover removed. Current limiters shall have a spring loaded plunger which, when the limiter blows, is released to actuate the circuit breaker common trip bar mechanism opening all breaker poles simultaneously.

Interlocks: The limiters shall be individually interlocked with the breaker element tripping mechanism so that no limiter can be inserted until the breaker is in the OFF position. The circuit breaker and limiters are to be interlocked so that the circuit breaker cannot be closed if a limiter is either missing or has blown.
Fuse Limiters: Fuse limiters shall be individually removable from the molded case housing.

Molded Case Circuit Breaker: The molded case circuit breaker shall be ambient temperature compensating. The circuit breaker shall be provided with thermal magnetic trip rated at amperes continuous current as shown on drawings.

Integrally Fused Circuit Breaker: The integrally fused circuit breaker shall be capable of interrupting available short circuit currents up to 200,000 RMS symmetrical amperes at voltage up to 600 VAC.

Standards: Ratings, clearances and performance of the integrally fused circuit breaker shall be in accordance with applicable standards of NEMA, IEEE and ASA.

Shunt Trip: The breaker shall be capable of being shunt-tripped by a remote switching device and shall have external terminals for this function. Shunt-trip mechanism shall be provided on breaker as called for on drawings. Coil voltage of shunt-trip mechanism shall match remote device voltage.

2.3 OVERCURRENT PROTECTIVE DEVICES - CURRENT LIMITING BREAKERS
Current Limiting: These breakers shall be molded case with inherent current limiting ability. They shall limit available fault of up to 100,000 rms symmetrical amperes to less then 10,000 amperes.

PART 3 – EXECUTION

3.1 INSPECTION
General: Examine area to receive panelboard and assure that there is adequate clearances to meet NEC requirements and normal maintenance issues.

Correction: Start work only after any unsatisfactory conditions have been corrected.

3.2 INSTALLATION
General: Provide panelboards in complete accordance with manufacturer's written instructions and all applicable codes.

Support: Panelboards shall be rigidly supported and installed per manufacturers recommended supporting instructions, with beams provided if necessary, to suit actual site conditions. Panels shall not be directly mounted to masonry walls. Use kindorf or similar channel.

Storage and Delivery: Panelboards shall be delivered to the site during that phase of panelboard installation in order to avoid storing panels on site where damage may occur. Replace any damaged parts prior to energizing panel. Cover panelboard to avoid damage to finish.
Mounting: Do not mount equipment directly to masonry or concrete walls. Provide two uni-strut spacers between wall and panelboard.

Operations and Maintenance Data: Manufacturer's instructions for tightening bus connections, cleaning, operation and maintenance.

3.3 QUALITY CONTROL
General: Field test prior to energization;

Megger check, and record all data, of phase to phase and phase to ground insulation levels.

Continuity.

Proper phase relationship.

3.4 CHECK-OUT MEMO
General: Submit check-out memo from panelboard representative.

END OF SECTION
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. General: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work specified of this section.

1.2 QUALITY ASSURANCE FOR MOTOR CONTROLS

A. Compliance: Materials shall comply with the latest edition of the following standards as they apply to the different motor control types.

B. ANSI: The latest edition of the Reference Standards for the American National Standards Institute shall apply as follows;

1. American National Standard Institute (ANSI);
   a. ANSI Y32.2, Graphic Symbols for Electrical and Electronic Diagrams.

C. NEMA: National Electrical Manufacturers Association shall apply as follows;

1. NEMA ICS-1, 2, 3, 4, 5, 6, controls and systems.

D. NFPA: The latest edition of the National Fire Protection Association shall apply as follows;

1. NFPA 70, National Electric Code (NEC).

E. UL: The latest edition of the Underwriters' Laboratories, Incorporated shall apply as follows;

1. UL Electrical Construction Materials List, motor controllers motor-control centers.
1.3 INSTALLATION OF MOTOR CONTROL EQUIPMENT

A. Responsibility: Unless specifically noted otherwise, motor starters for all equipment requiring them shall be installed as part of this Division in conformance with other Sections of the specifications. Mechanical equipment which has packaged starters, shall be supplied with the mechanical equipment.

B. Manufacturer: All starters shall be of the same manufacturer Square "D", General Electric, Siemens, or Cutler Hammer.

1.4 DESCRIPTION OF SYSTEM FOR MOTOR CONTROLS

A. General: All control, power and interlock wiring required for proper operation of equipment furnished as part of other Divisions and requiring raceways shall be provided under this Division. All control, power and interlock wiring shall be in conduit and shall be color-coded.

1.5 DESCRIPTION OF SYSTEM FOR MOTOR CONTROLS

A. Description: Motor controls shall be factory-assembled, metal-enclosed motor control units for distribution and control of power from incoming line terminals to outgoing feeder terminals, installed and tested in place.

B. Provisions: Motor Control Units shall include all protective devices and equipment as listed on drawings or as included in these specifications, with necessary interconnections, instrumentation, and control wiring.

1.6 SUBMITTALS FOR MOTOR CONTROLS

A. Products: Submit manufacturer's product data, including technical information on each type of motor control as follows;

1. Motor Control Centers:
   a. Layouts showing concrete pad dimensions, conduit entrance and available space, bus duct connections, electrical ratings, nameplate nomenclature, and single-line diagrams in accordance with ANSI Y32.2 indicating connections and controls with numbered terminals.
   b. Shop Drawings shall clearly indicate:
      1) Frame sizes and Interrupting Capacity of each starter/motor circuit protector unit and total assembly.
      2) Horsepower ratings at rated voltage of starter/motor circuit protector unit.
      3) Type of labels and labeling for every device and what it feeds.
      4) Nameplate giving name of project; Architect, Engineer and The Contractor.
      5) Bus bar size, arrangement and spacing.
2. Individually mounted AC Magnetic Starters:
   a. Shop Drawings shall clearly indicate:
      1) Frame sizes and Interrupting Capacity of starter and/or disconnect unit.
      2) Horsepower rating at rated voltage of starter and/or disconnect unit.
      3) Electrical ratings.
      4) Single line diagram for power and control connections with numbered terminals and all required accessories.
      5) All required accessories.

3. Motor Control Centers and Individually Mounted Starter:
   a. Manufacturer's written recommendation for storage and protection, installation instructions and field test requirements.

B. Test Reports: Provide reports of all production and field tests. Tests shall include rated continuous and short circuit currents, dielectric, grounding, operation and control.

C. Operations and Maintenance Data: Provide manufacturer's instructions for tightening bus connections, performing cleaning, and operating and maintaining motor control unit.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING FOR MOTOR CONTROLS

A. Lifting: Lift motor control center using eyes, yokes, and skids provided by manufacturer.

B. Storage: Do not store indoor motor control units exposed to weather.

C. Protection: Physically protect motor control units against damage from work of other trades. Cover motor control units with suitable material to avoid damage to finish.

1.8 DESCRIPTION OF DISCONNECTS

A. General: All disconnect switches shall be heavy-duty type, unless specifically noted otherwise. Switches shall be fusible or non-fusible and sized as noted on the drawings.

B. Ratings: Switches shall be 240 volt rated on systems up to and including 120/208V and 600V rated on higher voltage systems. Provide NEMA 1 enclosures, unless otherwise noted. All switches for motors shall be dual horsepower rated. All switches mounted outdoors shall be NEMA Type 3R.

C. Lugs: Provide lugs on disconnect switches as required to accept conductors specified on drawings.

D. Manufacturers: Same as Motor Control Equipment 1.03B.
1.9 SUBMITTALS FOR DISCONNECTS

A. Products: Submit product data on all types of disconnects provided as part of the contract documents.

1.10 DESCRIPTION OF OVERCURRENT PROTECTIVE DEVICES

A. Description of System: Connections of all items using electric power shall be included under this division of the specifications, including necessary wire, conduit, circuit protection, disconnects and accessories. Securing of roughing-in drawings and connection information for equipment involved shall also be included under this division. See other divisions for specifications for electrically operated equipment. Provide overcurrent protection for all wiring and equipment in accordance with the NEC, all federal, state and local codes as required and/or as shown on the drawings. Should there be disagreement over the size of or application of, an overcurrent protection device called for on the drawings, it shall be brought to the attention of the Engineer immediately.

1.11 SUBMITTALS FOR OVERCURRENT PROTECTIVE DEVICES

A. Products: Submit manufacturer's product data for all overcurrent devices required as part of the contract documents.

B. Shop Drawings: Shop drawings shall clearly indicate;

1. Frame sizes and interrupting capacity of all circuit breakers.
2. Horsepower ratings of rated voltage of fused switches and/or circuit breakers.
3. Size and type of fuses being provided.
4. Device is U.L. Listed, and bears the U.L. Label.
5. Device complies with these specifications, drawings, and applicable standards of NEMA, IEEE, ANSI, and ASA.

PART 2 - PRODUCTS

2.1 INDIVIDUALLY MOUNTED AC MAGNETIC STARTERS

A. Combination Starter and Disconnect: Combination starters and disconnect switches shall be a combination across-the-line magnetic type starter with motor circuit protection (magnetic only breaker) disconnect, rated in accordance with NEMA Standards, sizes and horsepower rating. Final magnetic setting of MCP shall be field set and recorded. Unit shall be mounted on NEMA I enclosures, unless otherwise noted.
B. Individual Starter Without Disconnect: Individually mounted starters shall be across-the-line magnetic type rated in accordance with NEMA Standards, sizes, and horsepower ratings. Unit shall be mounted on NEMA I enclosure, unless otherwise noted.

C. General: Starters shall be equipped with double break silver alloy contacts. All contacts shall be replaceable from front without removing starter from enclosure. Overload relays shall be provided in each phase, and shall be melted alloy or bimetallic type. Thermal units shall be of the one-piece construction and interchangeable.

D. Accessories: Starters shall be equipped with auxiliary contacts, as required for proper control functions, minimum of two normally open auxiliary contacts, in addition to the normally open auxiliary seal-in interlock and shall be suitable for the addition of at least two additional external electrical interlocks, one normally open and one normally closed. All starters shall have green "run" pilot light, "Hand-Off-Auto" selector switch, and nameplate. Control voltage shall be as required. Starters shall contain fused control transformers to provide correct control voltage.

E. Power Monitor: All motors shall include three-phase power monitor as manufactured by Time Mark Corporation (Model #A258B, for 480V, 3 phase systems) (Model #258B for 208V/240V, 3 phase systems) (Model #B258B for 120V systems) providing solid state protection by opening starter for loss of any phase, low voltage of any or all phases, and phase reversal. Monitor shall be field adjustable for drop-out voltage of (340-480 VAC)(260-240 VAC)(85-125 VAC).

2.2 CIRCUIT BREAKER OVERCURRENT PROTECTIVE DEVICES

A. General: Circuit breakers for applications other than panelboards shall be bolt-on type. All circuit breakers shall be molded-case, quick-make, quick-break, thermal magnetic type, and shall be U.L. listed and rated for voltage and class of service to which applied. Double and triple pole breakers shall be of the common trip, single handle type. Circuit breakers shall have minimum rating of 10,000 AIC at 240V and 14,000 AIC at 480V, unless required by other sections of the contract documents. Circuit breakers shall be fully rated. Series rating is not allowed.

2.3 OVERCURRENT PROTECTIVE DEVICES - CURRENT LIMITING BREAKERS

A. General: Current limiting breakers shall be provided as called for on the drawings.

B. Molded Case Breakers: These breakers shall be molded case with inherent current limiting ability. They shall limit available fault of up to 100,000 rms symmetrical amperes to less than 10,000 amperes.
PART 3 - EXECUTION

3.1 INSPECTION

A. Coordination: Examine area to receive motor-control units to assure adequate clearance for motor control unit installation.

B. Provision: Start work only after unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. General: Provide motor control units in accordance with manufacturer's written instructions, and the NEC.

3.3 FIELD QUALITY ASSURANCE

A. Testing: Perform tests according to motor control unit manufacturer's instructions. Field tests prior to energization as follows;

1. Megger check of phase to phase to ground insulation levels.
2. Continuity.
3. Short Circuit.

3.4 ADJUSTMENT AND CLEANING

A. General: Adjust operating mechanisms for free mechanical movement.

B. Connections: Tighten bus connections and mechanical fasteners.

C. Finish: Touch-up scratched or marred surfaces to match original finish.

3.5 CHECK-OUT MEMO

A. General: Submit check-out memo from motor control center representative.

END OF SECTION
SECTION 26490 AUTOMATIC TRANSFER SWITCH

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. General: Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.2 DESCRIPTION

A. General: Provide automatic transfer switches of the size, number of poles, amperage, voltage and withstand ratings as shown on the contract drawings and as specified herein.

B. Description: Using a Nema 1 enclosure, the switches shall automatically transfer the load to the generator during normal power outages. The switches shall be fully rated, electrically operated, mechanically held unit with both electrical and mechanical interlocks to prevent simultaneous energizing of both sides.

1.3 QUALITY ASSURANCE

A. Manufacturer Requirements: Firms regularly engaged in manufacture of automatic transfer switches, of types and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Manufacturers: Subject to compliance with the requirements of this specification, provide an automatic transfer switch manufactured by one of the following:

Manufacturer

a. Russelectric, Inc.
b. Automatic Switch Company
c. Zenith Company

C. Standards: Comply With The Following Standards:

1. UL-1008

   a. As a precondition for acceptance, transfer switch, complete with timers relays and accessories shall be listed by Underwriters Laboratories, Inc. in their Electrical Construction Materials Catalog, and accepted for use on emergency systems.
b. When conducting temperature rise tests to Paragraph 99 of UL-1008 the manufacturer shall include post-endurance temperature rise tests to verify the ability of the transfer switch to carry full rated current after completing the overload and endurance tests.

c. Produce UL 1008 closing and withstand ratings for 3 cycles at 480 volts. certified test reports from an independent testing laboratory to verify the identical samples have been subject to three phase short circuit current at voltage indicated on drawings, for a minimum of 3 cycles duration, without contact damage or contact welding and without the use of current limiting fuse protection. Oscillograph traces are to be supplied to verify that the test parameters have been met.

1.4 SUBMITTALS

A. Shop Drawings: Provide all equipment cabinet dimensions and wiring diagrams as required.

B. Product Data: Provide all applicable options, accessories, and interrupting or withstanding current ratings. Provide all electrical characteristics and data as required to show compliance with these specifications.

C. Testing: Provide test results from UL 1008 as listed above.

1.5 PRODUCT HANDLING

A. Equipment Storage: The Contractor shall store items provided under this specifications until time of installation. Such storage shall meet the requirements of the system supplier and be accepted by the Engineer. The stored equipment shall not be delivered to the site until it is to be installed.

B. Protection: Use all means necessary to protect the materials of this section before, during and after installation and to protect the installed work and materials from the activities of all other trades.

C. Replacement: In the event of damage, immediately make all repairs and replacements necessary to the acceptance of the Engineer and at no cost to the Owner.

PART 2 - PRODUCT

2.1 GENERAL

A. Type: Provide 4 pole automatic transfer switches as shown on plans, with full load current and voltage rating as shown, 60 Hz normal and emergency.
B. Load Types: The transfer switch shall be capable of switching all classes of load, and shall be rated for continuous duty when installed in a nonventilated enclosure that is constructed in accordance with Underwriters Laboratories, Inc., Standard UL-1008.

C. Accessories: All relays, timers, control wiring and accessories to be front accessible.

2.2 COMPONENTS

A. Features: Provide the following transfer switch features;

1. The transfer switch shall be double throw, actuated by a single electrical operator momentarily energized; and mechanically connected to the transfer mechanism by a simple over center type linkage with a total transfer time not to exceed 1/6 of a second.

2. The mechanism shall be a high speed actuator, capable of transferring successfully in either direction with 70 percent of rated voltage applied to the switch terminals.

3. Circuit breaker switches are not acceptable.

4. Mechanical interlocking of transfer switches to prevent unintended interconnection of the normal and alternate sources of power.

5. A means of safe manual operation of the transfer switch.

B. Main Contacts: The normal and emergency contacts shall be positively interlocked mechanically and electrically to prevent simultaneous closing. Main contacts shall be fully rated, arc quenching, mechanically locked in both the normal and emergency positions without the use of hooks, latches, magnet, or springs and shall be renewable silver-tungsten alloy protected by arcing contacts, with magnetic blowouts on each pole. Contacts shall be able to withstand high fault current levels without contact damage or separation. Parallel main contacts are not acceptable.

C. Exercise Timer: Include an exerciser with the transfer switches for exercising the generator in loaded or unloaded condition, up to every 268 hours for a period adjustable from a minimum of 20 minute intervals to 24 hours.

D. Engine Start Delay: Time delay to override momentary normal source power outages to delay engine start signal and transfer switch operation. Adjustable 0.5 to 3 seconds, factory set at 3 seconds.

E. Load Test Switch: Load test switch to simulate normal power failure. (Maintained type).
F. Contact Failure indicators: Contact to close on failure of normal source to interface with data acquisition panel. Contact to open on failure of normal source to initiate customer functions.

G. Pilot lights: Green push to test pilot light on the cabinet door to indicate the main switch in normal position. Red push to test pilot light on the cabinet door to indicate the main switch in emergency position.

H. Auxiliary Contacts: Provide an auxiliary contact closed in normal position. Provide an auxiliary contact closed in emergency position.

I. Additional Contacts: Two sets of relay contacts shall be provided to open and close upon loss of the normal power supply.

2.3 OPERATION

A. Low Voltage: Provide engine starting contacts in transfer switches to start the generating plant if any ungrounded phase of the normal source drops below 70 percent of rated voltage, after a non-adjustable time delay period of 1 to 3 seconds, to allow for momentary dips.

B. Transfer: The transfer switch shall transfer to emergency as soon as the generator source voltage and frequency have reached 90 percent of rated values.

C. Stabilization; After restoration of normal power on all phases to 90 to 95 percent of rated voltage, adjustable time delay period of 2 to 25 minutes shall delay transfer to normal power until it has had time to stabilize. If the emergency power source shall fail during the time delay period, the time delay shall be by-passed, and the switch shall return immediately to the normal source.

D. Generator No-Load Operation: Whenever the switch has retransferred to normal, the engine-generator shall be allowed to operate at no load for a fixed period of time (5 minutes) to allow it to cool before shut-down.

E. Test Switch: The transfer switch shall include a test switch to simulate normal power failure with actual load transfer.
PART 3 - EXECUTION

3.1 CONNECTIONS

A. Tightening Connectors: Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Stds. 486A and 486B.

END OF SECTION
SECTION 26500 LIGHTING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS
A. General: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work specified of this section.

1.2 DESCRIPTION
A. Description of System: Light fixtures provided under this Division shall be provided complete with lamps and all necessary trim and mounting hardware, and installed as shown on the drawings. Light fixtures shall be neatly and firmly mounted, using standard supports for outlets and fixtures. Lamps shall be included in the system guarantee for a period of 90 days after final acceptance of the building. All fixtures and associated products shall be UL listed for the application intended.

1.3 SUBMITTALS
A. Shop Drawings: Shop drawings shall be submitted for all fixtures ballasts, lamps, special accessories, etc. Submittals for fixtures that require modifications either as specified or as required to fit this projects' architectural field conditions (i.e. luminous ceiling, wall/slot fixtures, special fixtures) shall also be provided.

Shop drawings shall be complete showing all dimensions and installation instructions required for this project’s architectural/field conditions.

Shop drawings for exterior post/pole mounted light fixtures shall be provided and shall clearly indicate handhole and lightning protection ground lug mounted to post/pole at handhole inside post/pole. Submit information on pole mounting, concrete base, etc.

B. Product Data: Product data shall be submitted for all light fixtures showing:

- dimensions
- U.L. Label
- fusing
- metal gauge
- lens/louver thickness
- finish
- voltage
- lamps
- ballasts
C. Product data shall be submitted showing manufacturer's written recommendations for storage and protection, and installation instructions.

1.4 PRODUCT STORAGE AND HANDLING

A. Protection: Physically protect fixtures against damage as recommended by manufacturer.

PART 2 - PRODUCTS

2.1 GENERAL

A. Fusing: All fluorescent fixtures provided under this Division ballasts shall be individually fused with a renewable fuse in an external GLR holder. All fluorescent ballasts shall be CBM-ETL accepted, and shall be of the automatic thermal resetting type Class P. Provide ten extra renewable fuses to the Owner.

B. Testing: All fixtures shall adhere to UL Test Standard No. 1571 and Section 410-65(c) of the National Electrical Code.

C. Mounting: The contractor shall provide fixture trims and supports as required to match type of ceiling system. No ceiling fixture shall be ordered until the Ceiling System Installer has given written acceptance of the method and location of fixture hanging and fixture type. Fixtures shall be supported independent of the suspended ceiling system. Provide closed link jack chain at all four corners of fixtures utilizing a trapeze inverted "Y" connection. Provide individual supports at all four corners when trapeze connections conflict with mechanical work.

D. Exterior Poles: All exterior post/pole mounted light fixtures shall have handhole near base. Hand hole shall provide easy access to light fixture fusing and lightning protection ground lug. Lightning protection ground lug shall be provided inside post/pole, electrically in contact with pole, for connection to ground rod. Provide ground wire from ground lug to ground rod, concealing ground wire through post/pole base. Anchor bolts shall be galvanized.

E. Labels: All light fixtures and ballasts shall be UL listed. All light fixtures shall not have any labels exposed to normal viewing angles. This includes manufacturer labels and U.L. labels. All labels hall be concealed within the body of the fixture. No manufacturers name or logo shall appear on the exterior of any light fixtures unless accepted in writing by the engineer.
F. Exterior Fixtures: All lighting fixtures mounted outdoors subject to dampness and insects shall have gasketing material between lens door and frame to completely seal interior of fixture. Knockouts and holes in fixtures housing shall be closed and sealed. All fixtures shall be complete with lamps, shielding, brackets, concrete bases, anchor bolts and all necessary fittings and accessories for a complete installation.

2.2 ELECTRONIC BALLAST

A. General: Ballast shall be electronic type, high power factor and shall be covered by a three-year warranty against defects. Warranty shall include payment for normal labor costs of replacements of inoperative in-warranty ballasts. Ballast shall be rated for voltage system to which applied. The electronic ballast shall incorporate the following min. features:

1. Solid state ballast shall be compatible for use with F-32(32W), F-25(25W) and F-17(17W) straight biax-type lamps.
2. Ballast shall be high frequency (20-62.5 KHz) and operate without detectable flicker.
3. Ballast shall be constant current rated 95 percent power factor.
4. Ballast shall have a thermo-setting, non-toxic, fire retardant partial filler to serve as a conformal coating and protective insulator against both internal and external damage.
5. Ballast shall have internal regulation of power consumption and light output under input line fluctuations.
6. Ballast shall be minimum "A" sound rated and operate quiet.
7. Ballast case temperature shall not exceed 90 degrees C.
8. Ballast shall contain MOV transient surge protection.
10. Ballast shall have total harmonic distortion of less than 20 percent.
11. Ballasts (including compact fluorescent ballasts) shall be Instant Start Type.

B. Suggested Manufacturers: All ballasts shall be compatible to lamps provided. Ballasts shall be provided by one of the following manufacturers. No substitutions are allowed:

1. Universal Lighting Technologies Triad
2. Advance Mark VII
3. Osram Sylvania Quicktronic
4. Motorola
2.3 - HID BALLASTS

A. General: High intensity discharge ballasts shall be constant wattage auto transformer, high power factor type with renewable type KTK fuses in HEB holders. Voltages shall comply with system to which applied. Provide ten extra renewable fuses to the Owner.

B. Suggested Acceptable Manufacturers: Valmont, Advance, MagneTek.

C. Indoor HID Ballasts: Ballasts shall be encapsulated in standard fluorescent type ballasts cases for quiet operation. Ballasts shall be high power factor. Sound rating shall be minimum "B".

D. Suggested Ballasts: All ballasts shall be compatible with lamps provided. Ballast shall be manufactured by one of the following:

1. Valmont
2. Advance
3. Universal Lighting Technologies

2.4 T-8 FLUORESCENT LAMPS

A. General: Provide lamps as follows:

1. 2 foot lamps, T-8, 17 watts, 3500 degrees K, 80 minimum CRI, 1350 minimum initial lumens, 20,000 average life.

2. 3 foot lamps, T-8, 25 watts, 3500 degrees K, 80 minimum CRI, 2150 minimum initial lumens, 20,000 average life.

3. 4 foot lamps, T-8, 32 watts, 3500 degrees K, 80 minimum CRI, 2850 minimum initial lumens, 20,000 average life.

B. Design Selection: OSRAM-Sylvania, GE, or Philips.

2.5 COMPACT FLUORESCENT

A. Lamps shall be 3500 degrees K, CRI of 82 minimum. Lamps 13 watts and below shall be rated minimum 10,000 hours life. Lamps 18 watts and above shall be rated minimum 20,000 hours life. Refer to light fixtures schedule for wattage of lamps.

B. Design Selection:

1. OSRAM-Sylvania
2. GE
3. Philips
2.6 INCANDESCENT LAMPS

A. General: Incandescent lamps shall be rated 130 volts. Average minimum rated lamp life shall be 2500 hours.

2.7 EXTERIOR POLES

A. Exterior Poles: All exterior post/pole mounted light fixtures shall have handhole near base. Hand hole shall provide easy access to light fixture fusing and lightning protection ground lug. Lightning protection ground lug shall be provided inside post/pole, electrically in contact with pole, for connection to ground rod. Provide ground wire from ground lug to ground rod, concealing ground wire through post/pole base. Anchor bolts shall be galvanized.

B. Wind Rating: All poles shall be rated for 120 mph winds, plus 1.3 gust factor with the E.P.A. of fixtures mounted on the pole.

C. Poles shall be direct buried or secured to concrete bases, as indicated on drawings.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Sealing: Ducseal shall be installed to seal all conduits entering exterior light fixtures from underground.

B. Instructions: Install all fixtures in accordance with manufacturer's written instructions and NEC.

C. Suspended Installation: Pendant mounted fluorescent fixtures installed in exposed ceiling areas are to be suspended from structure with all-thread rods and 1-1/2 x 1-1/2 inch Kindorf channels, full length of fixture/row. Mount outlet box at structure with flexible connection to fixture.

D. Coordination: Coordinate fixtures installed in mechanical rooms with piping and ductwork prior to installation and relocate fixtures as required to provide proper illumination and access.

E. All ballasts shall be securely mounted to eliminate resonate humming.
3.2 LAMPS

A. Lamps: Provide two extra lamps for every HID lamp type. Provide ten extra lamps for every incandescent lamp type. Provide ten extra lamps for every fluorescent lamp type.

B. Lamps shall be “burned in” for a period of 30 days prior to substantial completion of the project. All lamps requiring replacement (flickering, burn out, etc.) during this period through 90 days after Owner Acceptance shall be done so at no additional cost.

3.3 CLEAN-UP

A. Luminaires: Prior to the Owner move-in, the Contractor shall clean all fixtures and remove any dust or dirt. Wash lens and glassware using cleaner such as "Windex" and dry with absorbent cloth. Clean plastic per manufacturer's recommendations; do not wipe. Clean "Alzak" aluminum surfaces (reflectors, fixture cones and the like) per manufacturer's recommendations being careful to remove fingerprints and smudges.

END OF SECTION
1.1 SCOPE

A. Section 26010, Basic Electrical Requirements - Electrical of this specification applies to all work in this section.

B. Provide all labor, material, equipment and services to perform all operations required for the complete installation and related work as required in all contract documents.

C. Work under this section includes the basic construction materials for the erection and installation of a complete sports lighting facility for this project.

D. These drawings and specifications were prepared with the following equipment manufacturers as being identified and capable of meeting the performance requirements described herein and are approved to bid this project:

2. Qualite International Series
3. Hubbell SLS System

E. The following information is to be submitted by approved equipment manufacturers no later than ten (10) days prior to bid date:

1. Computer derived calculations/drawings indicating initial and maintained average footcandle levels for each playing field. Calculations to be accomplished as specified herein. Written statement for uniformity ratio and KW load.

2. Construction drawing on manufacturers stationary detailing luminaire(s) to be utilized for this project.

3. Layout indicating dimensioned pole locations.

4. Drawing of each unique pole to be utilized for this project. Drawing to indicate pole type embedment method(s), sealed by a Florida Registered Professional Engineer.

5. Letter on equipment manufacturers letterhead.
6. Manufacturers warranty statements for luminaire(s) and pole(s) and replacement policy.

7. Summary of fixtures required on a per field basis and light aiming point plan showing focus points and reflector types.

8. A registered professional engineer, independent of manufactruer, shall verify and stamp wind load certification of the luminaire assembly using accepted industry calculation method. Physical testing of assemblies shall include results of actual material). Equipment manufacturers who desire to be identified as being capable of meeting performance requirements of this project shall submit the following information in addition to items 1 through 8 above:

9. Proof of experience indicating minimum of six (6) most recent projects. Three (3) of the projects shall have been within the State of Florida. Provide project name, contact person and telephone number for each.

F. Failure on the part of fixture and pole manufacturers to submit all required information will result in rejection of bid. Notification of compliance with pre-bid information requirements will be addendum issued prior to bid date. No other written or verbal representation shall be considered as approval to bid this project.

1.2 SUBMITTALS

A. Submit shop drawings in accordance with Section 26010 of this specification. Shop drawing submittals shall be submitted as one complete package bound together in a binder. Submittals shall include:

1. Lighting layout drawings
2. Aiming drawings
3. Complete computer derived calculations for primary playing field areas
4. Complete computer derived calculations for secondary areas beyond playing fields as described herein
5. Construction drawings on manufacturers stationary detailing all aspects of luminaire to be utilized for this project
6. Fixture manufacturers warranty
7. Concrete pole and associated equipment
8. Embedment design for each type of direct burial concrete pole and wind load calculations bearing professional Engineers seal
9. Pole manufacturers warranty
10. Ballast make and warranty
11. Lamp make and warranty
12. Maintenance and instruction manuals
13. Manufacturer shall submit a computer derived lighting scan with spill control showing point by point horizontal footcandle levels on playing surface, maximum ratio, number of luminaires and initial lamp lumens, average tilt factor and maintenance factor.

PART 2 - MATERIALS

2.1 LUMINAIRE ASSEMBLY

A. Sports lighting luminaire, lamp, ballast and related equipment are specified and scheduled herein and as detailed on drawings. The luminaire assembly shall consist of lamp, lamp socket, reflector, lens, lamp housing, adjustable aiming assembly, ballast, cross arm(s) with integral wiring, wiring and pole clamps. Basis of design shall be Musco Sports Lighting TLC or approved equal.

B. Construction and Design

1. Luminaire - The luminaire shall have the following characteristics:

   a. The luminaire assembly shall be capable of withstanding forces equal to 125 MPH wind levels with a gust factor of 1.3 without structural damage or misalignment of the luminaire or the assembly.

   b. The reflector shall be .062 one-piece spun 3002 aluminum with Alzak process finish.

   c. The lens shall be heavy duty tampered glass with stainless steel lens ring. Lens ring to be fastened to reflector via hinge door and/or through use of stainless steel clips and #12 stainless steel safety chain. Lens rims will be sealed to reflect assembly using a one-piece silicone gasket.

   d. Mogul lamp socket housing shall be cast aluminum with integral aiming bracket.

   e. All hardware shall be stainless steel.

   f. Luminaire shall be UL listed and approved. The luminaire and ballast shall be completely prewired for ease of installation and service. All internal wiring shall be 14 gauge or larger. Filters shall have a secured activated charcoal filter to prolong optical performance.
g. Vertical and Horizontal aiming bracket shall be pre-set at factory to a computer engineered layout and feature a positive repositioning pin.

2. Lamps - Lamps shall be 1000 or 1500 w. as indicated metal halide and be Venture MS-1500(1000)-HOR or prior approved equivalent. No horizontal lamps allowed.

3. Ballast - The ballast shall be capable of starting and operating one 1500 watt metal halide lamp, lamp wattage as indicated. The fixture manufacturer shall submit a statement that the ballast furnished is in full compliance with the lamp/ballast specifications available to the fixture manufacturer from the lamp manufacturer at time of manufacturer. Ballast shall be high power factor, constant wattage, auto transformer peak lead type. The line power factor of the lamp/ballast system shall not be less than 90%. There shall be an individual ballast for each luminaire. A maximum of two ballasts per ballast enclosure shall be located remote with the capacitors and double fusing.

4. Ballast Housing: Shall be hot dipped galvanized (including door) with a NEMA 3R rating with no side screw holes and shall be located remote from the luminaires (located 10' above ground level). Ballast housing shall be full strength stainless steel piano hinge, stainless steel latch and 1/4" silicone gasket, and shall not a load bearing member of the attachment means of the pole. Ballast housing shall be powder coated after fabrication.

5. Cross Arms - Cross arms shall be factory fabricated of steel tubing M.I.G. welded together. The entire assembly shall be hot dip galvanized after fabrication. Cross arm shall be specifically manufactured to accommodate luminaries to be installed. All fasteners utilized to attach luminaries shall be stainless steel. The junction box on the crossarm assembly shall be galvanized steel and NEMA 3R rated. Minimum dimensions of the junction box shall be 6" x 6" x 4" for ease of maintenance.

2.2 POLE PRESTRESSED REINFORCED CONCRETE

A. Scope

1. This section covers design, fabrication and installation of prestressed concrete poles to be used to support sports lighting equipment.

2. The poles are to be statically spun round concrete poles.
3. Poles shall be designed and constructed so that all wiring and grounding facilities are concealed within the pole. All hand holes and wire inlets/outlets shall be cast into the pole during manufacturing process. No field drilling of poles shall be required.

B. Design

1. Poles with luminaire assembly shall be designed to withstand force equal to 120 MPH wind load with 1.1 gust factor.

2. Poles shall be designed to meet design requirements with luminaire assemblies required to accommodate maintained footcandle level indicated. Luminaire assembly quantities and wind load characteristics shall be established by luminaire manufacturer.

3. Pole submittal information shall include calculations and drawings signed and sealed by a Florida Registered Engineer indicating compliance with these design requirements.

4. To minimize flexural cracking under design load, the prestressing steel shall be stressed initially to a minimum of 70% of ultimate for standard stress relieved strand or 75% of ultimate low relaxation type strand.

C. Materials and Manufacturer

1. The concrete mix shall be designed for a 28 day compression strength of 8500 psi for statically cast poles. Cement quality shall be in accordance with ASTM-C150.

2. The prestressing steel reinforcement shall conform with ASTM-A426. Steel spiral reinforcement shall conform with ASTM-A82. All structural steel shall conform with ASTM-A36 and be hot dipped galvanized in accordance with ASTM-A123. Hand hole frames shall be cast aluminum alloy.

3. Poles are to be manufactured in accordance with latest edition of "Guide Specifications for Prestressed Concrete Poles" as published by Prestressed Concrete Institute.

4. Poles shall have a smooth natural form finish, soft gray in color.
5. An anodized aluminum nameplate shall be cast into wall of pole approximately 48" A.F.G. identifying manufacturer, date of manufacture, mounting height of luminaire assembly above finish grade, pole ID as indicated on plans and maximum luminaire capacity. Plate shall face away from playing field.

6. Conduit entrance opening(s) shall be 18" below grade.

D. Handling and Erection

1. Shop drawing shall clearly identify pick-up points for unloading and erection.

2. Final determination of required burial depth and nature of back fill material shall be determined by a Florida Registered Engineer qualified in this area of expertise. The Engineer shall be engaged by pole manufacturer. Submittal information shall include calculations and drawings signed and sealed by this Engineer.
2.3 SPORTS LIGHTING SYSTEM PERFORMANCE

A. The manufacturers shall furnish luminaries in quantities and NEMA beam patterns to meet or exceed the following criteria:

1. Maintained Footcandle Level (minimum at 36" above field surface)
   a. Football Fields  
      Track  
      50 FC Maintained  
      30 FC Maintained
   b. Softball & Baseball Fields
      1) Infield  
      2) Outfield  
      50 FC maintained  
      30 FC maintained
   c. Tennis and Basketball Courts
      Track  
      30 FC maintained

2. Uniformity ratios
   a. Football Field  
      Track  
      1.5:1  
      2.0:1
   b. Softball & Baseball Fields
      1) Infield  
      2) Outfield  
      2.0 to 1  
      2.5 to 1

2.4 CALCULATION METHODS

A. Light Loss Factors: The performance criteria requires lighting equipment which will provide initial average light values, after adjustment for an average lamp tilt factor. In determining the target average light values, a recoverable light loss factor of 0.8 is to be applied, in addition to the adjustment for average lamp tilt factor.

   Target Light Levels  =  Initial Light Levels x Recoverable LLF
Recoverable LLF = LLD x LDD = 0.80

B. Printouts shall be prepared for both initial footcandles and maintained footcandles. Printouts shall be prepared to include number of locations equal to or exceeding the following:

<table>
<thead>
<tr>
<th>Sport</th>
<th>Grid Size</th>
<th>Points on the Field and Track</th>
</tr>
</thead>
<tbody>
<tr>
<td>Football</td>
<td>30' X 20' GRID</td>
<td>72 points on the field and 48 on the track</td>
</tr>
<tr>
<td>Softball</td>
<td>20' X 20' GRID</td>
<td>Infield-25 points and outfield-158 points</td>
</tr>
<tr>
<td>Baseball</td>
<td>30' X 30' GRID</td>
<td>Infield-25 points and outfield-119 points</td>
</tr>
<tr>
<td>Practice Field</td>
<td>30' X 20' GRID</td>
<td>171 points on the field area</td>
</tr>
</tbody>
</table>

C. Calculations shall include entire primary playing area as well as the following areas:

- Football - Primary playing area and the track

2.5 Warranty – 10 year warranty

Manufacturer will provide services, including all materials and labor, to maintain the sports lighting equipment by the lighting manufacturer for ten years according to original design criteria, including the alignment of luminaires on the pole top luminaire assembly. Lamps will be group replaced at such time that the lamps exceed their useful life, which is 3,000 hours for the 1500 watt lamps (or which is 6,000 hours for the 1000 watt lamp). Individual lamp outages will be repaired when more than 10% of the lamps are out on any one field or when the lamp outages materially effect the usage of the field.

Manufacturer shall be responsible for and provide the warranty services. To assure full compliance with this warranty, manufacturer shall provide the Owner with a signed Certificate of Insurance which guarantees the commitment for the entire ten years as to each of the above terms. The insurance policy shall be fully funded on an actuarially sound basis and underwritten by a top-rated insurance company.

END OF SECTION 26501
SECTION 26670 LIGHTNING PROTECTION SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. General: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work specified of this section.

1.2 DESCRIPTION

A. General: Provide a complete lightning protection system as specified herein. The lightning protection system shall be installed by a professional firm presently engaged in installation of Master Labeled or LPI certified lightning protection systems. The system as completed shall comply with the latest edition of UL96A, Installation Requirements for Lightning Protection Systems, National Electric Code (NEC) and NFPA-780 "Lightning Protection Code." The system shall meet all requirements of these codes and the Lightning Protection Institute Standard of Practice LPI-175. All components required for a full LPI certification plate shall be provided whether or not such materials are specifically addressed by the contract drawings or described herein.

WHERE MULTIPLE CODES ARE STATED IN THIS SECTION THE MOST STRINGENT WILL APPLY TO THIS PROJECT. THE ENGINEER OF RECORD SHALL ENFORCE THE MOST STRINGENT WHERE CONFLICTS AND/OR INTERPRETATIONS OCCUR BETWEEN THE CODES.

B. Qualification: All installers shall be experienced and UL master labeled and LPI certified systems or of equivalent qualification, as accepted in writing by the engineer of record. A UL/LPI certified installer shall be on the project site at all times during installation of the systems and shall supervise all of the installation. Installer shall be subject to approval by Owner/Engineer.

1.3 SPECIAL REQUIREMENTS FOR COUNTERPOISE CONDUCTOR

A. Counterpoise: As a minimum, the counterpoise conductor shall be connected to each of the following system components utilizing heavy duty, U.L. products:

1. Each down conductor.

2. All counterpoise conductors on power and communications ducts which enter the building.
3. The building electrical service ground.

4. All metallic water and gas services entering the building (ahead of meter).

5. Counterpoise conductor on site light circuits leaving the building.

6. All metallic fence posts, safety railings, etc., or any other metallic item within fifty feet of the project building.

1.4 SUBMITTALS

A. General: Shop drawings identifying all system wiring and component placement, including all details, shall be submitted to the Engineer for review. The Contractor shall not perform any portion of the Work until the respective submittal has been accepted. All work shall be in accordance with accepted submittals.

B. Detail Submission: Details shall be submitted to the Engineer for review indicating the method of cabling connections and attachments starting at the top of the project building to the ground rods at the counterpoise. All details shall be appropriate for the project.

C. Identification: All product data sheets submitted, for proposed system components, shall clearly identify the item being submitted and shall indicate the UL label.

D. Suppression Device: All transient voltage surge suppressors for the project shall be submitted at the same time the lightning protection floor plans, details and product data sheets are submitted. Each suppressor shall clearly indicate the item to be protected and shall comply with Section 26709 of these specifications. Suppressors shall be provided as required in NFPA 780 unless otherwise indicated on the drawings or otherwise specified.

E. Deviations: The Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the acceptance of shop drawings, product data, samples or similar submittals unless the Contractor has specifically informed the Engineer in writing of such deviation at the time of submittal and the Engineer has given written acceptance to the specific deviation.

F. Certification: Provide documentation of LPI certification or equivalent qualification of exact installer intended to do this particular job.
PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Labels: All materials used for the system installation shall comply in size, composition and weight to all requirements of NFPA UL and LPI for the class of system in which they are installed. All materials shall be labeled or listed by Underwriters Laboratories, Inc. for use in master labeled or LPI certified lightning protection systems.

B. Material: Generally, the external lightning protection system at the roof level shall be constructed of aluminum cable and aluminum compatible components. The internal lightning protection system, starting with the down conductors and concluding at the ground termination system (counterpoise and dissipation points) shall be constructed of copper cable and copper compatible components. Likewise, all bonding conductors, equipotential loop conductors, etc, shall also be constructed of copper cable and components.

C. Compatibility: All portions of the system, weather copper or aluminum, shall be galvanically compatible to the building material to which they are to be attached. Connections between copper and aluminum portions of the system shall be made with appropriate bimetallic coupling devices. In all areas, the conductor shall be supported to maintain clearance from all galvanically incompatible materials and/or installed from same.

D. Components: All system components (i.e. air terminals, bases, connectors, cable, thru-roof fittings, ground rods, etc.) shall be, to the maximum extent possible, the product of a single manufacturer. All components shall be heavy duty construction utilizing hexagonal head bolts for fastening. All hospital project air terminal bases shall be securely mounted to the project roof by means of mechanical fasteners. Adhesive type air terminal bases are not acceptable. Submit in shop drawings for proposed air terminal mounting details.

2.2 AIR TERMINALS

A. General: Air Terminals shall be aluminum or copper as required to match the building system to which they attach. Air terminals shall protrude a minimum of 10 inches above the object to be protected. Center roof air terminals shall be 24” high. Air terminal points shall be blunt with the radius of curvature equal to their rod diameter.

B. Base: Each air terminal shall be equipped with the correct type of base for the location in which it is mounted.

C. Roof Top Equipment: Air terminals and interconnecting cables shall be provided for all roof mounted equipment (fans, A/C equipment, etc.) subject to a direct strike as required by NFPA 780.
2.3 CONDUCTORS

A. General: Main roof conductors shall be aluminum and provide a two-way path from each air terminal horizontally or downward to connections with ground terminals. Conductors shall be free of excessive splices and sharp bends. No bend of a conductor shall form an included angle of less than 90 degrees nor have a radius of bend of less than 8 inches. Conductors shall be secured to the structure at intervals not exceeding 3 feet. Cables connected to “thru-roof” connectors may rise from the roof to the connector at a maximum slope of 3 inches per foot, not exceeding 3 feet horizontally in air. Air terminal conductors shall be concealed behind parapet and drawn tight.

B. Down Conductors: Down conductors shall be copper and shall be concealed in the exterior wall construction or structural columns. Down conductors shall be spaced at intervals averaging not more than 100 feet around the perimeter of the structure. In project structures of structural steel frame construction, down conductors may be omitted and roof conductors shall be connected to the structural steel frame at intervals averaging not more than 100 feet around the perimeter of the structure. Connections to the steel frame shall be made with heavy duty bonding plates having 8 square inches of contact surface.

C. Main conductor cable shall be 28 strands of 14 gauge copper wire, 1/2 inch diameter, 115,000 cm, 35 lbs per 1000 feet (2/O minimum).

D. Shop Drawing: Submit all conductor type in shop drawing form. Each conductor shall be identified as to location in the lightning protection system.

2.4 ROOF PENETRATIONS

A. General: Roof penetrations required for down conductors or for connections to structural steel framework shall be made using thru-roof type assemblies with solid bars and appropriate roof flashing. Roof flashing shall be compatible with the roofing system and shall be provided under this contract and installed by the roofing contractor. Submit roof flashing data sheets and letter of acceptance from roofing contractor in shop drawing package.

2.5 COMMON GROUNDING

A. General: Common grounding of all ground mediums within the project building shall be made by interconnecting with main size conductors and heavy duty fittings.

B. Bonding: Grounded metal bodies located with the required bonding distance (as determined by the bonding distance formulas in NFPA 780) shall be bonded to the system using bonding conductors and fittings. Bond to rebar utilizing Cadweld braze connections.
C. Lightning protection system ground locations shall not exceed 25 ohms measured at ground electrode.

2.6 GROUND TERMINATIONS

A. General: Two ground terminations shall be provided for each down conductor rod and shall consist of two 5/8 inch x 10 feet copper-clad ground rod with 10 to 15 foot separation. Each down conductor shall be connected to the ground rods by an exothermic weld connection. Tops of ground rods shall be located 2 feet below finished grade and 2 feet from the foundation wall and shall extend a minimum of 20 feet vertically into the earth. Where a counterpoise is provided, rods shall be interconnected with the counterpoise.

B. General: Where the structural steel framework is utilized as the main conductor for the system, perimeter steel columns shall be grounded at intervals averaging not more than 60 feet apart. Steel columns shall be grounded using bonding plates having 8 square inches of surface contact area. Conductors from the grounded connections to the ground termination shall be full size copper lightning conductors.

2.7 FASTENERS

A. General: Conductor fasteners shall be manufactured of a material which is compatible with the type of conductor being supported. Fasteners shall be of sufficient strength to properly support each conductor or terminal base, etc.

2.8 ACCEPTABLE MANUFACTURERS

A. Manufacturers: Equipment manufactured by Thompson Lightning Protection, Inc. Harger Lightning Protection or Heary Brothers shall be considered acceptable.

PART 3 - EXECUTION

3.1 INSTALLATION OF CONDUCTORS

A. General: Conductors shall be installed to interconnect all air terminals to the system of grounding electrodes, and in general provide a minimum of at least 2 paths to ground from any point on the system. Conductors shall provide a horizontal or downward path between the system air terminals and grounding electrode system. No bend in any conductor shall exceed 90 degrees or have a radius of less than 8 inches.

B. Routing: Conductors shall be routed in such a manner that maximum concealment from public view is achieved. Down conductors shall be in one-inch PVC conduit from roof to grade.
C. Counterpoise Conductors: Counterpoise conductors shall be installed after finished grades are established to insure specified depth and to minimize the possibility of damage. Any counterpoise conductor which is cut or damaged shall be repaired or replaced with no additional cost to the contract.

D. Connections: All connections between conductors below grade shall be exothermically welded. Improper application of weld shall be replaced at no additional cost to the contract.

3.2 INSTALLATION OF GROUND RODS

A. General: Ground rods shall be installed vertically at each down conductor position at a minimum of 2 feet from the building foundation wall. Inspection and documentation at each grounded location, weld, depth of counterpoise, etc., shall be made by the owners representative prior to backfill. Contractor shall notify engineer in writing at conclusion of his work. Allow a minimum of one week for engineer to make the inspection after notification from contractor.

3.3 BONDING OF SECONDARY METALLIC BODIES

A. General: All metallic equipment located within 6 feet of a lightning protection conductor shall be bonded to the lightning protection system.

B. Structure Grounding: Provision shall be made at the roof level on reinforced concrete structures for bonding between the down conductors, metallic elements of the roof system and metallic exterior wall systems.

C. Bonding: All down conductors run in concrete columns shall be bonded to the reinforcing steel at the top and the bottom of the column. All metallic items within 6 feet of each down conductor shall be bonded to the down conductor.

3.4 GENERAL WORKMANSHIP

A. General: All elements of the Lightning Protection System shall be installed in a professional and workmanlike manner consistent with the best industry practices.

B. Concealed Installation: All system components shall be concealed to the maximum extent possible to preserve the aesthetic appearance of the project building on which the system is installed.
3.5 COORDINATION WITH OTHER TRADES

A. Coordination: The Contractor shall coordinate his work with all trades, to insure the use of proper materials and procedures in and around the roof in order not to jeopardize the roofing warranty.

B. Fasteners: Where fasteners are to be embedded in masonry or the structural system, those fasteners shall be provided to insure installation at the proper time of installation.

C. Certification: Upon completion of the installation the Contractor shall provide to the owner the Master Label issued by Underwriters Laboratories, Inc. for the installation, or the LPI certification issued by LPI.

END OF SECTION
SECTION 26709 TRANSIENT VOLTAGE SURGE SUPPRESSION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. General: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to this section.

1.2 DESCRIPTION

A. General: Transient voltage surge suppression (TVSS) or surge protection device (SPD) is the description and equipment required for the protection of all AC electrical circuits and electronic equipment from the effects of lightning induced voltages, external switching transients and internally generated switching transients.

1.3 REFERENCE STANDARDS AND PUBLICATIONS

A. General: The latest edition of the following standards and publications shall comply to the work of this section;

2. ANSI/IEEE C62.41 (IEEE 587) Guide for Surge Voltages in Low-Voltage AC Power Circuits Categories A, B and C. In addition, table 8, 10x1000µs high exposure testing
4. IEEE Standard 142 - Recommended Practice for Grounding
5. IEEE Standard 518 Recommended Guide on Electrical Noise
6. UL-1283 for EMI Filters
8. NFPA 70 National Electrical Code
10. NFPA 780 Lightning Protection Standard.
11. Military Standard (MIL Std.) 220A
13. CCITT Rec. K-17 Waveform specification for electronic system
14. NEMA LS-1.
1.4 SYSTEM PERFORMANCE CRITERIA

A. General: Surge suppression, grounding and bonding shall effectively protect the systems to which it is applied against lightning, transients, internal spikes, and other surge transients throughout the useful life of the system. Surge protection devices and related grounding and bonding systems shall be designed and installed in such a manner that normal operation, performance ratings, and listing of the system is not impaired by the installation of such devices, wiring or connections.

B. Intent: The intent of this specification is to allow manufacturers with varying equipment concepts to provide transient voltage surge suppression which will properly protect equipment within the guidelines set forth herein. Specific manufacturers listed shall be used as the basis of design, however, submitted components shall comply to the minimum and maximum values listed and shall be equal to or better than the specific manufacturers type specified herein. The listed data specified herein shall be used for the comparative analysis of all manufacturers specified herein.

1.5 MANUFACTURER QUALIFICATIONS

A. Repair: The surge protection devices manufacturer shall offer factory repair service and replacement for all units. The manufacturer shall provide this service within four working days, and provide replacement components shipped to the Owner for installation within the allocated response time.

B. Acceptable Manufacturers: Only the following acceptable manufacturers shall be considered; LEA International, Advanced Protection Technologies & Leviton.

C. Installation Certification: The manufacturer shall furnish a letter indicating that the installation was inspected by a factory authorized representative and meets all of the manufacturer's wiring and installation requirements. The Contractor shall submit a check-out memo to the manufacturer indicating the date when the equipment was put into service and the actual method of installation. Submit three copies to the Engineer for review.

C. Manufacturers requesting product approval must meet or exceed the written specification contained herein. Manufacturers requesting approval must receive written verification of product acceptance from the specifying engineer 14 days prior to bid date by addendum. Submit manufacturer's certified test data indicating the ability of the product to meet or exceed requirements of this specification. Third party testing showing the product can withstand the manufacturer's published surge current rating for multiple impulses must be submitted for approval consideration. Manufacturer's that require the use of current limiting devices, internal or external to the surge protection device, will not be considered for approval.
1.6 WARRANTY

A. Period: All surge protection devices and supporting components shall be guaranteed by the installing contractor to be free of defects in materials and workmanship for a period of five years from the date of substantial completion or service activation for the system to which the suppressor is attached.

B. Replacement: Any suppressor which shows evidence of failure or incorrect operation during the warranty period shall be repaired or replaced at no expense to the Owner including labor and materials. Since "Acts of Nature" or similar statements include the lightning threat to which these suppression devices shall be exposed, any such clause limiting warranty responsibility in the general conditions of this specification shall not apply to this section. The warranty shall cover the entire device not just the modules.

C. Installation: Main switchboard SPD shall be mounted internal to switchboard. Installation of SPD's in or on electrical equipment shall in no way compromise or violate equipment listing, labeling, or warranty of the equipment. TVSS shall be installed by switchboard manufacturer. TVSS manufacturer shall ship TVSS for internal mounting to switchboard manufacturer. Refer to section 26425.

1.7 SUBMITTAL

A. General: SPD wiring, bonding, and grounding connections shall be indicated on the wiring diagrams for each system. Include installation details demonstrating mechanical and electrical connections to equipment to be protected.

B. Testing: The test data submitted shall be specific for the actual method on installation proposed. Submittals will not be reviewed unless they include proper project related data. Interpretation of standard manufacturers published data will not be acceptable unless the data coincides with the actual installation procedure.

C. Submittals: The surge protection submittal shall also include, but shall not be limited to, the following additional data;

1. Complete data for each suppressor type indicating conductor sizes, conductor types, connection configuration, lead lengths and all appropriate dimensions.
2. Dimensions for each suppressor type indicating mounting dimensions and required accessory hardware.
3. Manufacturers certified test data indicating the ability of the product to meet or exceed requirements of this specification.
4. If requested, a sample of each suppressor type to be used for testing and evaluation shall be submitted.
5. Drawings shall be provided indicating surge protection device mounting arrangement and lead length configuration, and mounting arrangement of remote diagnostic equipment and assemblies.

6. List and detail all protection systems such as fuses, disconnecting means and protective materials.

PART 2 - PRODUCTS

2.1 SINGLE SOURCE SUPPLY

A. Single Source Supply: All AC power SPD's shall be manufactured by a single manufacturer. All system SPD's shall be manufactured by a single manufacturer.

B. SPD's shall be listed in accordance with UL 1449 Standard for Safety, Transient Voltage Surge Suppressors, 2nd Edition, and UL 1283, Electromagnetic Interference Filters.

2.2 PERFORMANCE

A. Data: The surge suppression equipment shall meet or exceed the minimum performance criteria as follows:

<table>
<thead>
<tr>
<th>EQUIPMENT TYPE</th>
<th>MINIMUM TOTAL SURGE CURRENT/PHASE</th>
<th>CAT</th>
<th>SYSTEM MAXIMUM RESPONSE TIME IN NANOSECONDS</th>
<th>COMPONENT MAXIMUM RESPONSE TIME IN NANOSECONDS</th>
<th>MINIMUM COMMON/ &amp; NORMAL MODE NOISE REJECTION IN DB.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SERVICE ENTRANCE</td>
<td>300,000 A</td>
<td>C3</td>
<td>5</td>
<td>1</td>
<td>40</td>
</tr>
<tr>
<td>DISTRIBUTION EQUIPMENT 400 AMPERES &amp; LARGER</td>
<td>225,000 A</td>
<td>B3</td>
<td>5</td>
<td>1</td>
<td>40</td>
</tr>
<tr>
<td>PANELBOARD</td>
<td>120,000 A</td>
<td>A3</td>
<td>5</td>
<td>1</td>
<td>40</td>
</tr>
</tbody>
</table>
B. Voltage Ratings: Voltage ratings shall be as follows;

1. 120, 120/208, 30 4W "Y" or 120/240 volt systems
2. 277/480 30 4W "Y" volt systems
3. 208V. or 480V. 30 3W delta

C. There shall be seven modes of protection: 3-modes (Line-to-Ground), 3-modes (Line-to-Neutral), and 1-mode (Neutral-to-Ground) for a 3-phase, 4-Wire plus ground voltage system. (Line-to-Neutral-to-Ground is not an acceptable substitute for Line-to-Ground.)

D. Third party testing showing the products ability to meet IEEE C62.41, table 8, 10x1000 high exposure testing

1. Three Phase, Four Wire:

<table>
<thead>
<tr>
<th>EQUIPMENT</th>
<th>3 PHASE 4 WIRE</th>
<th>VOLTAGE RATINGS</th>
<th>TEST WAVE CATEGORY</th>
<th>VOLTAGE TEST RATING</th>
<th>BIWAVE CURRENT TEST WAVE RATING</th>
<th>MAXIMUM CLAMPING VOLTAGES</th>
</tr>
</thead>
<tbody>
<tr>
<td>SERVICE ENTRANCE</td>
<td>120/208V</td>
<td>C3</td>
<td>20 KV</td>
<td>10 KA</td>
<td>600 V</td>
<td></td>
</tr>
<tr>
<td></td>
<td>277/480V</td>
<td>C3</td>
<td>20 KV</td>
<td>10 KA</td>
<td>1000 V</td>
<td></td>
</tr>
<tr>
<td>DISTRIBUTION EQUIPMENT</td>
<td>120/208V</td>
<td>B3</td>
<td>6 KV</td>
<td>3 KA</td>
<td>600 V</td>
<td></td>
</tr>
<tr>
<td></td>
<td>277/480V</td>
<td>B3</td>
<td>6 KV</td>
<td>3 KA</td>
<td>1000 V</td>
<td></td>
</tr>
<tr>
<td>PANELBOARDS</td>
<td>120/208V</td>
<td>B3</td>
<td>6 KV</td>
<td>3 KA</td>
<td>600 V</td>
<td></td>
</tr>
<tr>
<td></td>
<td>277/480V</td>
<td>B3</td>
<td>6 KV</td>
<td>3 KA</td>
<td>1000 V</td>
<td></td>
</tr>
</tbody>
</table>
2. Three Phase, Three Wire:

<table>
<thead>
<tr>
<th>EQUIPMENT</th>
<th>VOLTAGE RATING</th>
<th>TEST WAVE CATEGORY</th>
<th>VOLTAGE TEST RATING</th>
<th>BIWAVE CURRENT TEST WAVE RATING</th>
<th>MAXIMUM CLAMPING VOLTAGES</th>
</tr>
</thead>
<tbody>
<tr>
<td>SERVICE ENTRANCE</td>
<td>480V</td>
<td>C3</td>
<td>20 KV</td>
<td>10 KA</td>
<td>1500 V</td>
</tr>
<tr>
<td>DISTRIBUTION EQUIPMENT</td>
<td>480V</td>
<td>B3</td>
<td>6 KV</td>
<td>3 KA</td>
<td>1500 V</td>
</tr>
</tbody>
</table>

E. Each MOV contained with a current diversion module shall be individually fused (component level safety fusing). For the assurance of safety purposes, this feature must be a standard design feature and not an optional feature of the product. The individual component fusing shall allow a reduction of protection rather than an automatic complete loss of protection.

F. The service entrance and distribution/panelboard units shall be UL 1283 listed as an electromagnetic interference filter. Standardized insertion loss data shall be obtained utilizing MIL-STD E220A 50 $$\Omega$$-insertion loss methodology. Minimum insertion loss shall be as follows:

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Insertion Loss (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100kHZ</td>
<td>34</td>
</tr>
<tr>
<td>1MHZ</td>
<td>51</td>
</tr>
<tr>
<td>10MHZ</td>
<td>54</td>
</tr>
<tr>
<td>100MHZ</td>
<td>48</td>
</tr>
</tbody>
</table>

G. Unit Operating Voltage: The nominal unit operating voltage and configuration shall be as shown on the contract documents. The maximum continuous operating voltage (MCOV) of all components shall not be less than 125%.

H. Power Interruption: During normal suppression operation, the unit shall not short circuit or crowbar the power flow that would result in an interruption to the load. Building power shall not require interruption for maintenance.
I. Visual Indication: Visual indication on the cover of the enclosures shall indicate proper system operation. Visual indication shall also indicate mode failure.

J. Modular SPD's shall use a separate path to building ground, the equipment safety ground is not to be used as a transient ground path.

K. SPD's shall be constructed using MOV based modules. The SPD shall have a response time of less than one nanosecond with six inches or less of connected lead length for any individual protection mode.

2.3 SURGE SUPPRESSION

A. Surge Suppression: Modular, solid state componentry, bipolar and bi-directional operation shall be provided for service entrance and distribution equipment. Protection modules shall be individually fused.

B. Fused Disconnect: SPD's shall be provided with an integral fused disconnect switch for service entrance panels, internally mounted shall use pull out type disconnect switch switch. Switches shall have an AIC fault withstand rating equal or greater than the AIC rating of the equipment being protected. The disconnect switch shall have an interlocking rotary type safety switch that turns power off to the device upon opening of the enclosure for inspection and/or module replacement.

C. Enclosures: Enclosures shall be as follows;

1. Minimum 14 gauge painted steel with fully hinged door for SPD's at service entrance and distribution equipment 400 amperes and over.
   a. NEMA 12 Dust-tight and drip-tight.

2.4 AUDIBLE AND VISUAL SYSTEMS

A. Service Entrance Equipment

1. Install in front enclosure of equipment

2. Features:
   a. Equipment with LED indicator lights per phase.
      1) Protection: Supressor Working - Green LED's.
      2) Loss of Protection: Supressor Burnout – Green LED's not illuminated.
3) LED's shall be field replaceable.

b. Visual indication of proper SPD connection and operation shall be provided both on the modules and redundant on the front door of the enclosure. The indicator lights shall indicate which phase, as well as which module is operational. SPD's that require a separate diagnostic test kit to determine and verify proper SPD operation shall be provided with such a test kit.

c. SPD's shall incorporate copper bus bars for the surge current path. Small round wiring or plug-in modules are not acceptable. Field-replaceable surge current diversion modules shall be bolted to the bus bars for reliable low impedance connections.

d. Accessories:

1) Local audible alarm to operate under system or component failure.

2) Local alarm silencing switch.

3) Digital surge counters to record transient voltage occurrences

B. Distribution Panel Protection

1. Features

a. Equipment with LED indicator lights per phase LED shall extinguish to indicate malfunction/loss of protection of surge suppressor.

b. LED's shall be field replaceable.

c. Audible alarm and silence switch.

d. SPD's shall be provided with an integral disconnect. The disconnect switch shall have an interlocking rotary type safety switch that turns power off to the device upon opening the enclosure for safe inspection and/or module replacement.

e. Visual indication of proper SPD connection and operation shall be provided both on the modules and redundant on the front door of the enclosure. The indicator lights shall indicate which phase, as well as which module is operational. SPD's that require a separate diagnostic test kit to determine and verify proper SPD operation shall be provided with such a test kit.
f. SPD's shall incorporate copper bus bars for the surge current path. Small gauge round wiring or the use of plug-in modules is not acceptable. Field-replaceable surge current diversion modules shall be bolted to the bus bars for reliable low impedance connections.

C. Subpanel Protection

1. The sub panel/panel board panel TVSS equipment shall meet or exceed the minimum performance criteria as follows:
   a. The maximum surge current rating shall be a minimum of 120,000 Amps/phase.
   b. SPD shall be a compact non-modular design. The mounting position of the SPD shall allow a straight and short lead-length connection between the SPD and point of connection in the panel board.
   c. Visual indication of proper SPD operation shall be easily viewed on the front door of the enclosure. The indicator lights shall indicate the presence of protection on each phase.
   d. The enclosure type shall have minimum rating of NEMA 12.
   e. Provide a 20A, 3pole breaker for each panel board (type 3) TVSS device.

2.5 MANUFACTURERS

<table>
<thead>
<tr>
<th>TVSS MANUFACTURER (DRAWING DESIGNATION)</th>
<th>SERVICE ENTRANCE (TYPE 1)</th>
<th>DISTRIBUTION EQUIPMENT 400 AMPERES &amp; LARGER (TYPE 2)</th>
<th>SUB PANEL PANELBOARDS (TYPE 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEA INTERNATIONAL*</td>
<td>GB-200S</td>
<td>GB-100S</td>
<td>CFS</td>
</tr>
<tr>
<td>LEVITON*</td>
<td>57000-M3S</td>
<td>57000-M3S</td>
<td>47000</td>
</tr>
<tr>
<td>ADVANCED PROTECTION TECHNOLOGIES*</td>
<td>TEXHP-CL-G</td>
<td>TEXHP-CX-G</td>
<td>TE-XT</td>
</tr>
</tbody>
</table>
* Manufacturer is contingent on meeting criteria of section 2.02.

2.6 BONDING AND GROUNDING CONDUCTORS AND MATERIALS

A. Size: Conductors utilized for surge suppressor bonding shall be a minimum of #6 AWG solid insulated copper unless otherwise specified.

B. Bus: Ground bus or strip material shall be copper, a minimum of 26 gauge in thickness and three inches wide unless otherwise specified. Bus materials may be secured to surfaces with an appropriate mastic material or mechanical fasteners. Bus connections shall be bolted and reinforced as necessary to provide a permanent and secure connection.

C. Rods: Unless otherwise specified, all surge suppression grounding electrodes, where provided, shall be 5/8” diameter copperweld rods, twenty feet in length.

D. Connections Compliance: Connectors, splices, and other fittings used to interconnect grounding conductors, bonding to equipment or ground bars, shall comply with requirements of the National Electric Code and be accepted by Underwriters Laboratories for the purpose.

E. Connectors: Connectors and fittings for grounding and bonding conductors shall be of the compression type in above grade locations. Connections below grade shall be exothermically welded or brazed.

F. Dissimilar Materials: Bonding connections between electrically dissimilar metals shall be made using exothermic welds or using bi-metal connectors designed to prevent galvanic corrosion.

PART 3 - EXECUTION

3.1 SEGREGATION OF WIRING

A. General: All system wiring shall be classified into protected and non-protected categories. Wiring on the exposed side of suppression devices shall be considered unprotected. Surge suppressor grounding and bonding conductors shall also fall into this category.

B. Protection: All wiring between surge suppressors and protected equipment shall be considered protected and connected in accordance with the latest edition of the NEC.
C. Separation: A minimum of three inches of separation shall be provided between parallel runs of protected and unprotected wiring in control panels, terminal cabinets, terminal boards and other locations. In no case shall protected and unprotected wiring be bundled together or routed through the same conduit. Where bundles of protected and unprotected wiring cross, such crossings shall be made at right angles.

3.2 INSTALLATION OF SURGE PROTECTIVE DEVICES

A. Installation at Service Entrance and Distribution Panels: Suppressors shall be installed in Service Entrance switchboards and as close as practical to distribution equipment to be protected consistent with the available space, however, do not exceed three feet. SPD's installed in this manner shall utilize the equipment chassis as a medium for bonding of their ground terminals. Bonding jumpers not exceeding two inches in length shall be installed between the chassis and suppressor ground terminals. Bolted connections with star washers shall be used to insure electrical and mechanical integrity of connections to the equipment chassis. Conductors from SPD's shall attach to main service bus connection in the service entrance equipment on the load side of the electrical utility company metering equipment.

B. Installation at Lighting and Appliance Panelboards: The SPD shall be installed as close as practical to the electric panel or electronic equipment to be protected, consistent with available space. SPD's shall be close nipped to the device being protected in a position near the neutral bus which will minimize lead length between the SPD's and the buses and disconnect means to which the SPD connects. Pre-wired leads shall be field cut to minimize the length between the SPD and panel connection point. SPD leads shall not extend beyond the suppressor manufacturer's recommended maximum lead length without specific approval of the Engineer. Leads shall be twisted up to the connection points. Do not splice factory leads.

C. Workmanship: SPD's shall be installed in a neat, workmanlike manner. Lead dress shall be consistent with recommended industry practices for the system on which these devices are installed.

D. Disconnect: The main service entrance devices shall be provided with an integral disconnect switch with fuses. The disconnect switch shall be fused with current limiting fuses. Switches must have a fault withstand AIC rating equal to or greater than the power distribution equipment being protected. All panelboard SPD's shall be fused.

3.3 TESTING

A. Disconnect SPD prior to meggar testing of service entrance, distribution equipment and panelboards.

END OF SECTION
1. **GENERAL NOTES:**

These general technology systems installation notes are intended for insertion on all SDOC technology systems construction drawings and plans.

These installation notes are provided as a courtesy intended to draw attention to specific installation criteria as supplemental amplifying information made readily available to complement (and never supercede) the in-depth technology systems installation details provided by the project architect and project engineer on the conformed construction plans and specifications documents in addition to in-depth detail found in the latest version of the SDOC division 27 technology systems standards and specifications.

(In these general notes on construction documents the term contractor refers to the general contractor committed and obligated in all instances to the SDOC facilities department for all technology systems installations at all new construction and renovation projects.)

(For all SDOC information and technology services department technology projects the term contractor refers to the primary technology contractor committed and obligated to all technology systems installations for district technology department contracted technology systems projects.)

All items detailed in the general notes are gleaned from the School District of Osceola County, Florida SDOC division 27 technology systems standards and specifications and shall be complied with in strict adherence to all applicable sections of these standards and specifications with no exception.

The most current version of the School District of Osceola County, Florida (SDOC) division 27 technology systems standards and specifications shall be located at the SDOC website under the media and instructional technology services department section at: (http://www.osceola.k12.fl.us/depts./IMC/index.asp) Any question regarding current validity or content of these standards and specifications shall be addressed immediately with the information and technology services department technology systems construction project managers.

Any contractor failing to acquire the appropriate up to date standards and specifications proceeds at their own peril and shall be subject to replacement of any and all inappropriately installed or substandard out of date components, cabling, supports and field devices as deemed unacceptable by the school district authorized field representatives at no additional cost to the school district to the complete satisfaction of the technology services department technology construction project managers and authorized district representatives with no exception.
2. **CONTRACTOR REQUIREMENTS:**

1. THE PREMISE DISTRIBUTION CABLE SYSTEM SOLUTION INSTALLED SHALL BE ONE (1) OF THE FOLLOWING THREE (3) MANUFACTURERS ONLY: COMPLETE CLOSED PANDUIT, ORTRONICS OR AMP/TYCO SOLUTION. ALL CABLE, COMPONENTS AND SOLUTION INSTALLATION PRACTICES OF THE TECHNOLOGY SYSTEMS CONTRACTOR SHALL MATCH THE CHOSEN MANUFACTURER’S LIST OF APPROVED PARTNERS AND SHALL BE CURRENTLY CERTIFIED BY THE MANUFACTURER TO PROVIDE A MINIMUM WARRANTY OF FIFTEEN (15) YEARS FROM DATE OF INSTALLATION. THE TECHNOLOGY SYSTEMS CONTRACTOR SHALL SUBMIT WRITTEN DOCUMENTED PROOF AS EVIDENCE OF ACCEPTANCE FROM THE MANUFACTURER TO SDOT ITSD AUTHORIZED TECHNOLOGY REPRESENTATIVES SATISFYING THE REQUIREMENTS OF THE DISTRICT THAT THE PROPOSED TECHNOLOGY SYSTEMS CONTRACTOR IS A CURRENT AUTHORIZED INSTALLING AGENT/COMPANY TO OFFER THE SELECTED TECHNOLOGY MANUFACTURER’S CLOSED SYSTEM AND WARRANTY FOR PROPERLY REGISTERED AND APPROVED PROJECTS IN THE STATE OF FLORIDA. SELECTED TECHNOLOGY SYSTEMS CONTRACTOR SHALL PROVIDE COPIES OF CURRENT MANUFACTURER CERTIFICATION FOR SELECTED PRODUCT SOLUTION PRIOR TO THE COMMENCEMENT OF ANY INSTALLATION. FAILURE TO PRODUCE SATISFACTORY EVIDENCE / PROOF TO SDOT ITSD AUTHORIZED TECHNOLOGY REPRESENTATIVES PRIOR TO INSTALLATION SHALL RESULT IN REMOVAL OF SAID CONTRACTOR AND REPLACEMENT WITH A CONTRACTOR WHO CAN PROVIDE SATISFACTORY PROOF AND EVIDENCE AS A CURRENT AUTHORIZED INSTALLING AGENT/COMPANY SATISFYING ALL SDOT TECHNOLOGY REQUIREMENTS TO PROPERLY PROVIDE AND INSTALL AN AUTHORIZED SELECTED TECHNOLOGY MANUFACTURER’S CLOSED SYSTEM AND WARRANTY. INSURE SDOT VERIFICATION OF ALL REQUIRED CREDENTIALS.

2. THE SELECTED TECHNOLOGY CONTRACTOR SHALL HAVE AN RCDD (REGISTERED COMMUNICATIONS DISTRIBUTION DESIGNER) ASSIGNED AS THE PROJECT MANAGER. SELECTED TECHNOLOGY CONTRACTOR SHALL PROVIDE DOCUMENTED PROOF AS EVIDENCE OF CURRENT AUTHORIZED RCDD CERTIFICATION. FAILURE TO PRODUCE SATISFACTORY EVIDENCE / PROOF TO SDOT ITSD AUTHORIZED TECHNOLOGY REPRESENTATIVES PRIOR TO INSTALLATION SHALL RESULT IN REMOVAL OF SAID CONTRACTOR AND REPLACEMENT WITH A CONTRACTOR WHO CAN PROVIDE SATISFACTORY PROOF AND EVIDENCE AS A CURRENT AUTHORIZED RCDD SATISFYING ALL SDOT TECHNOLOGY REQUIREMENTS TO PROPERLY PROVIDE AND INSTALL SDOT TECHNOLOGY SYSTEMS. INSURE SDOT VERIFICATION OF ALL REQUIRED CREDENTIALS.

3. LOCATIONS SHOWN FOR NEW EQUIPMENT AND DEVICES ARE DIAGRAMATIC ONLY AND SHALL BE FIELD LOCATED DURING A SITE WALK-THROUGH BY THE CONSTRUCTION CONTRACTOR, ELECTRICAL/SYSTEMS ENGINEER AND SDOT TECHNOLOGY CONSTRUCTION PROJECT MANAGER.

4. DRAWINGS ARE DIAGRAMATIC ONLY. THE GENERAL CONTRACTOR IS RESPONSIBLE FOR PROVIDING AND INSTALLING ALL MATERIAL AND LABOR NECESSARY IN PROPER AND APPROPRIATE LOCATIONS FOR THE FULL AND PROPER FUNCTIONING OF THE SYSTEM U.O.N. AS AND WHERE ACTUALLY REQUIRED FOR PLACEMENT BY SDOT AUTHORIZED INFORMATION AND TECHNOLOGY SYSTEMS DEPARTMENT AUTHORIZED PERSONNEL.

5. ALL FIREWALL AND SMOKE BARRIER VOICE, DATA, INTERCOM, VIDEO SURVEILLANCE AND INTRUSION DETECTION SECURITY, AUDIO ENHANCEMENT, INTERACTIVE BOARD AND PROJECTOR, SOUND, CATV AND LOCAL HAND HELD RADIO CABLE RUN PENETRATIONS SHALL BE SLEEVED. ALL FIREWALL AND SMOKE BARRIER PENETRATIONS SHALL BE INSTALLED BY A CURRENT CERTIFIED FIRE AND SMOKE RATED INSTALLATION TECHNICIAN. INSURE SDOT VERIFICATION OF ALL REQUIRED CREDENTIALS. ALL FIREWALL AND SMOKE BARRIER PENETRATIONS SHALL BE APPROPRIATELY SLEEVED, CLAMPED, CAULKED AND FIRESTOPPED IN ACCORDANCE WITH CURRENT CODE MANDATES FOR FIRE AND SMOKE RATED BARRIERS. PROPERLY SLEEVE. CLAMP AND FIRE STOP ALL FIREWALL AND SMOKE BARRIER PENETRATIONS. CONTRACTOR SHALL UTILIZE U/L APPROVED AND CERTIFIED PRODUCTS ONLY. AT ALL MDF AND IDF SPACE BARRIER PENETRATIONS EZ PATH CABLE FIRE STOPPING SYSTEMS PRODUCTS PART NUMBER EP33FWS SHALL BE UTILIZED FOR REENTERABLE AND REUSEABLE INTUMESCENT FIRESTOPPING OR SDOT TECHNOLOGY DEPARTMENT APPROVED AND U/L APPROVED AND CERTIFIED EQUIVALENT PRODUCTS.

6. ALL VOICE, DATA, INTERCOM, VIDEO SURVEILLANCE AND INTRUSION DETECTION SECURITY, AUDIO ENHANCEMENT, INTERACTIVE BOARD AND PROJECTOR, SOUND, CATV AND LOCAL HAND HELD RADIO CABLE RUNS PENETRATING ANY WALL SHALL BE SLEEVED REGARDLESS RATING OF WALL. ALL NON-FIREWALL AND NON-SMOKE BARRIER WALL PENETRATION SLEEVES SHALL BE PROPERLY SLEEVED, CLAMPED AND CAULKED AT ALL NON-FIREWALL AND NON-SMOKE BARRIER SLEEVE PENETRATIONS FOR PREVENTION OF INSECT AND RODENT INTRUSION.

7. ALL CONDUITS AND SLEEVES SHALL BE REAMED AND BUSHED PRIOR TO THE INSTALLATION OF ANY CABLEING.

8. ALL WORK ASSOCIATED WITH THE INSTALLATION OF THE VOICE, DATA, INTERCOM, VIDEO SURVEILLANCE AND INTRUSION DETECTION SECURITY, AUDIO ENHANCEMENT, INTERACTIVE BOARD AND PROJECTOR, SOUND,CATV, LOCAL HAND HELD RADIO AND CLEAN POWER “SYSTEMS” SHALL BE PERFORMED AT A MINIMUM IN ACCORDANCE WITH, YET NOT LIMITED TO THE MOST RECENT VERSIONS OF THE FOLLOWING:
9. THE GENERAL CONTRACTOR SHALL PROVIDE A SAMPLE OF LABELING FOR ALL SYSTEMS FOR ENGINEER/OwNER APPROVAL PRIOR TO COMMENCEMENT OF INSTALLATION.

10. ALL LABELING SHALL BE TYPEWRITTEN, PERMANENT, INDELIBLE WRAP AROUND LABELS. ALL TECHNOLOGY “SYSTEMS” CABLES INTERIOR, EXTERIOR, BACKBONE, NETWORK INFRASTRUCTURE, INTERCOM, SECURITY, TELEVISION, INTERACTIVE BOARD AND PROJECTOR, AUDIO ENHANCEMENT, SOUND AND GROUNDING CABLES SHALL BE LABELED ON BOTH ENDS TO IDENTIFY THE FAR END TERMINATION POINT. ALL LABELS SHALL BE DURABLE HUMIDITY RESISTANT PERMANENTLY AFFIXED “WRAP AROUND” LABELS THAT ARE ATTACHED IN A MANNER THAT SHALL PROHIBIT THEIR BEING UNFASTENED ONCE INSTALLED DUE TO HUMIDITY OR OTHER NORMAL CONDITIONS OF THE ENVIRONMENT IN WHICH THEY ARE ATTACHED.

11. ALL TECHNOLOGY SYSTEMS BACKBONE CONDUITS, INNERDUCTS, SUPPORTS, MANHOLES, VAULTS, PEDESTALS, TECHNOLOGY CONDUIT STUB UPS, BARRIER PENETRATION AND OTHER CABLE PENETRATION SLEEVES, GROUND CABLES AND GROUNDING BUS BARS ON THE TECHNOLOGY CONSTRUCTION PLAN SHEETS SHALL BE PROVIDED AND INSTALLED, TERMINATED AND ADEQUATELY TESTED BY THE ELECTRICAL CONTRACTOR UNDER THE GENERAL CONTRACTOR.

12. ALL PROVISION, INSTALLATION, SUPPORTS, TERMINATIONS, LABELING, PROGRAMMING, ADJUSTMENTS AND TESTING FOR TECHNOLOGY PROJECT INSTALLATIONS DESCRIBED AND DETAILED ON THE TECHNOLOGY CONSTRUCTION PLAN SHEETS SHALL BE ACCOMPLISHED BY AN SDOC PRE-APPROVED QUALIFIED AND CERTIFIED TECHNOLOGY CONTRACTOR OR AS APPLICABLE AN SDOC PRE-APPROVED QUALIFIED AND CERTIFIED SECURITY CONTRACTOR UNDER THE GENERAL CONTRACTOR. ALL INTERCOM SYSTEM INSTALLATIONS SHALL ONLY BE ACCOMPLISHED BY THE SDOC APPROVED QUALIFIED AND CERTIFIED INTERCOM CONTRACTOR UNDER THE GENERAL CONTRACTOR.

13. THE SDOC INFORMATION AND TECHNOLOGY SERVICES DEPARTMENT SHALL ALWAYS BE CONSULTED FOR ALL TECHNOLOGY SYSTEMS INSTALLATION DETAILS AND TASKS REGARDLESS THE ORIGINATING SDOC DEPARTMENT. IN ANY RESPECT, WHETHER DIRECTLY OR COLLATERALLY THE NEED TO ADDRESS TECHNOLOGY SYSTEMS DETAILS AND TASKS IS “INADVERTENTLY” MANIFESTED OR WHERE THE INTENT IS TO ACCOMPLISH A PLANNED PROJECT TECHNOLOGY SYSTEMS DETAIL OR TASK THE SDOC INFORMATION AND TECHNOLOGY SERVICES DEPARTMENT SHALL ALWAYS BE CONSULTED WHERE TECHNOLOGY SYSTEMS ARE INVOLVED.

14. ALL TECHNOLOGY SYSTEMS TASKS REGARDLESS CIRCUMSTANCE SHALL ONLY BE ACCOMPLISHED BY COMPETENT QUALIFIED AND CERTIFIED SDOC INFORMATION TECHNOLOGY SERVICES DEPARTMENT APPROVED CONTRACTOR SOURCES AND AGENTS MAINTAINING CURRENT CERTIFICATIONS AND QUALIFICATIONS IN THEIR FIELD OF EXPERTISE TO SPECIFICALLY ADDRESS INSTALLATION DETAIL AND TASKS ASSOCIATED WITH EACH SINGULAR AND INDIVIDUAL PARTICULAR TECHNOLOGY SYSTEM FOR WHICH SOLICITED AS AND WHERE DEEMED CURRENTLY CERTIFIED AND COMPETENT BY THE INFORMATION TECHNOLOGY SERVICES DEPARTMENT.

15. GENERAL CONTRACTORS AND THEIR SUB-CONTRACTORS SHALL NOT OF THEIR OWN ACCORD CONTRACT ANY OUTSIDE SOURCE FOR ACCOMPLISHMENT OF ANY DETAIL OR TASK RELATED TO TECHNOLOGY SYSTEMS INSTALLATIONS WHERE THE ASSOCIATED TECHNOLOGY RELATED CONTRACTOR HAS NOT FIRST BEEN SUBMITTED TO AUTHORIZED REPRESENTATIVES OF THE SDOC INFORMATION TECHNOLOGY SERVICES DEPARTMENT FOR SCREENING REVIEW AND APPROVAL OF PROPER CURRENT CERTIFIED CREDENTIALS AND QUALIFICATIONS PRIOR TO COMMENCEMENT OF WORK AND IS THEN SUBSEQUENTLY APPROVED BY THE INFORMATION TECHNOLOGY SERVICES DEPARTMENT IN DOCUMENTED FORMAT TO PROCEED AS AUTHORIZED INSTALLERS.

3. FIBER OPTIC AND COPPER CABLE NOTES:

1. REFERENCE RISER DIAGRAMS FOR ALL REQUIRED COUNTS AND ROUTING SPECIFICS REGARDING FIBER OPTIC BACKBONE AND ALL COPPER BACKBONE TIE CABLES BETWEEN BUILDINGS. THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE TECHNOLOGY SYSTEMS BACKBONE CABLE INSTALLATION BY THE SELECTED ELECTRICAL / TECHNOLOGY CONTRACTOR WHO SHALL PROVIDE,
INSTALL, SUPPORT, TERMINATE, LABEL, TEST AND WARRANTY ALL BACKBONE CABLE RUNS DETAILED ON THE RISER DIAGRAM.

2. IT IS THE GENERAL CONTRACTOR’S RESPONSIBILITY TO VERIFY WHETHER OR NOT PLENUM RATED CABLE IS REQUIRED FOR ALL TECHNOLOGY SYSTEMS BACKBONE AND INTERIOR INFRASTRUCTURE CABLES INSTALLED IN ALL BUILDINGS.

3. BUILDING EXTERIOR TECHNOLOGY SYSTEMS BACKBONE CABLE VAULTS, MANHOLES, IN GROUND, ABOVE GROUND WALL MOUNTED AND ABOVE GROUND PEDESTAL MOUNTED FULL BOXES SHALL BE DISTANCED AT NOT MORE THAN 200 FEET BETWEEN EACH VAULT, MANHOLE AND FULL BOX AS SPECIFIED IN SDOC TECHNOLOGY SYSTEMS DIVISION 27 STANDARDS AND SPECIFICATIONS.

4. CABLE SUPPORTS:

a. THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL / TECHNOLOGY SYSTEMS CONTRACTOR PROVIDES AND Installs SDOC APPROVED CABLE SUPPORTS AND FASTENING DEVICES END TO END FROM THE RESPECTIVE MDF BETWEEN AND TO EACH SUBSEQUENT IDF LOCATION AND INTERIOR FROM EACH COMMUNICATIONS MDF AND IDF CLOSET LOCATION TO THE POINT OF TERMINATION FOR ALL FIELD DEVICES AND WORK STATION LOCATIONS ALONG THE ENTIRE CABLE RUN FOR ALL TECHNOLOGY SYSTEMS INTERIOR AND EXTERIOR BACKBONE CABLES AND ALL TECHNOLOGY SYSTEMS INTERIOR BUILDING INFRASTRUCTURE CABLES.

b. BUILDING EXTERIOR AND INTERIOR TECHNOLOGY SYSTEMS BACKBONE CABLE SUPPORTS SHALL BE IN THE FORM OF A NETWORK OF “J” HOOKS OR OTHER SDOC APPROVED SUPPORT DEVICES. BUILDING EXTERIOR SUPPORTS SHALL BE INSTALLED AT ALL VAULTS, MANHOLES, IN GROUND, ABOVE GROUND WALL MOUNTED AND ABOVE GROUND PEDESTAL MOUNTED FULL BOXES. SUPPORTS IN THESE LOCATIONS SHALL BE DISTANCED AS DETERMINED ADEQUATE BY SDOC INFORMATION AND TECHNOLOGY DEPARTMENT CONSTRUCTION PROJECT MANAGERS.

c. ALL TECHNOLOGY SYSTEMS BUILDING INTERIOR INFRASTRUCTURE CABLE “SYSTEMS” SHALL BE INSTALLED WITH SUPPORTS WHICH SHALL BE IN THE FORM OF A NETWORK OF ADEQUATELY SIZED “J” HOOKS TO INSURE FILL CAPACITY IS NOT EXCEEDED, PROPERLY SUPPORTED “J” HOOKS WITH SUPPORTS PROVIDED AND INSTALLED IAW SDOC DIVISION 27 TECHNOLOGY SYSTEMS STANDARDS AND SPECIFICATIONS BY THE CONTRACTOR TO ACCOMODATE THE CABLE LOAD INSTALLED AND ALL “J” HOOKS SHALL BE ROUTINELY SPACED EVERY FIVE (5) FEET COMPLETE WITH VELCRO WRAPS AT EACH “J” HOOK SUPPORT LOCATION AND EVERY TWO (2) FEET IN BETWEEN FOR THE ENTIRE RUN AND LENGTH OF ALL INSTALLED CABLES. ADDITIONAL “J” HOOKS SUPPORTS SHALL BE ADDED AS DETERMINED NECESSARY BY SDOC INFORMATION AND TECHNOLOGY DEPARTMENT CONSTRUCTION PROJECT MANAGERS. ALL UTP COPPER CABLE RUNS SHALL BE INSTALLED IAW ALL CURRENT SDOC DIVISION 27 TECHNOLOGY SYSTEMS STANDARDS AND SPECIFICATIONS AND ALL TECHNOLOGY SYSTEMS CABLES SHALL MAINTAIN A TWENTY-FOUR (24) INCH SEPARATION FROM FLUORESCENT LIGHT FIXTURES (REFER TO BICSI TDMM FOR ALL OTHER CABLING SEPARATION AND SPACING REQUIREMENTS). REFER TO SDOC TECHNOLOGY SYSTEMS DIVISION 27 STANDARDS AND SPECIFICATIONS FOR ADDITIONAL AND AMPLIFYING INFORMATION ON SUPPORT HANGARS AND APPROVED METHODS.

d. ALL GEL FILLED OUTSIDE PLANT DIRECT BURIED BACKBONE TYPE CABLES ENTERING BUILDINGS INCLUDING VOICE, TELEVISION, UTP AND OTHER GEL FILLED AND OUTSIDE PLANT/DIRECT BURIED BACKBONE TYPE CABLES SHALL NOT EXCEED 50 FEET TO THE POINT OF TERMINATION, ON THE INTERIOR OF ANY BUILDING. IT SHALL BE THE GENERAL CONTRACTOR’S RESPONSIBILITY TO VERIFY THAT THIS CODE REQUIREMENT IS NOT EXCEEDED. IF CIRCUMSTANCES DICTATE A NECESSITY TO EXCEED 50 CONDUCTOR FEET, THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL / TECHNOLOGY CONTRACTOR PROVIDES AND Installs, SUPPORTS, REAMS AND BUSHES INTERMEDIATE OR RIGID METALLIC CONDUIT THAT SHALL EXTEND THE ENTIRE RUN THROUGH ALL APPLICABLE BUILDING PORTIONS TO THE POINT OF CABLE TERMINATION IN EACH MDF AND ALL SUBSEQUENT IDF CLOSET LOCATIONS.

5. CABLE INSTALLATION AND SERVICE SLACK:

a. ALL INTERIOR AND EXTERIOR INDOOR / OUTDOOR AND DIRECT BURY RATED TECHNOLOGY SYSTEMS BACKBONE CABLES AND ALL INTERIOR INFRASTRUCTURE UTP CATEGORY 6 (OR ABOVE AS DEMANDED BY PROJECT SPECIFICATIONS) DATA COPPER CABLE IN SPECIFIC AND ALL OTHER INTERIOR INFRASTRUCTURE TECHNOLOGY SYSTEMS CABLE INSTALLATIONS SHALL BE PROPERLY INSTALLED ONLY BY SDOC PRE-APPROVED MANUFACTURER TRAINED PROFESSIONAL TECHNICIANS CURRENTLY CERTIFIED AND QUALIFIED BY THE MANUFACTURER AS INSTALLERS FOR THE RESPECTIVE TECHNOLOGY SYSTEM.

b. ALL INTERIOR AND EXTERIOR INDOOR / OUTDOOR AND DIRECT BURY RATED TECHNOLOGY SYSTEMS BACKBONE CABLES AND ALL INTERIOR INFRASTRUCTURE UTP CATEGORY 6 (OR ABOVE AS DEMANDED
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ADDENDUM “B”

BY PROJECT SPECIFICATIONS) DATA COPPER CABLE IN SPECIFIC AND ALL OTHER INTERIOR INFRASTRUCTURE TECHNOLOGY SYSTEMS CABLE INSTALLATIONS SHALL NEVER EXCEED MANUFACTURERS RECOMMENDATIONS FOR LENGTH, BEND RADIUS AND FULL TENSION WITH CONTRACTOR PROVIDED AND INSTALLED APPROVED GROUNDING AND SURGE PROTECTION FOR ALL TECHNOLOGY SYSTEMS CABLING AS REQUIRED.

c. ALL TECHNOLOGY SYSTEMS BACKBONE CABLES SHALL TRANSITION NEATLY AND SMOOTHLY IN A UNIFORM MANNER WITH NO “TAG LINES” AND SHALL BE SUPPORTED WITH “J” HOOKS OR SDOC APPROVED EQUAL SUPPORTS ON THE INTERIOR WALLS WHERE FEEDING THOROUGH COMMUNICATIONS VAULTS, MANHOLES AND IN GROUND FULL BOXES. ALL “FEED THROUGH” TECHNOLOGY SYSTEMS BACKBONE CABLES SHALL BE DRESSED ALONG THE SIDES OF THE INTERIOR WALLS OF EACH LOCATION AND SHALL BE SECURED WITH VELCRO WRAPS AT EACH “J” HOOK AND IN BETWEEN AS DEEMED NECESSARY BY SDOC INFORMATION AND TECHNOLOGY DEPARTMENT CONSTRUCTION PROJECT MANAGERS. NO OTHER SERVICE SLACK IS REQUIRED AT THESE LOCATIONS U.O.N.

d. ALL TECHNOLOGY SYSTEMS BACKBONE CABLES SHALL TRANSITION NEATLY AND SMOOTHLY IN A UNIFORM MANNER WITH NO “TAG LINES” AND SHALL BE SUPPORTED WITH SDOC APPROVED SUPPORT CLAMPS ON THE INTERIOR WALLS WHERE FEEDING THOROUGH EACH WALL MOUNTED AND ABOVE GROUND PEDESTAL MOUNTED FULL BOX. ALL FEED THROUGH TECHNOLOGY CABLES SHALL BE NEATLY DRESSED FROM THEIR POINT OF ENTRY INTO THE BOX AND SHALL CONTINUE ALONG THE EDGE OF EACH BOX ON BOTH INTERIOR SIDES AND TOP ALONG THE WALLS OF EACH LOCATION TO THE POINT OF EXIT FROM THE BOX. ALL FEED THROUGH CABLE RUNS SHALL BE SECURELY FASTENED WITH SDOC APPROVED FASTENERS AND SUFFICIENT VELCRO WRAPS AS DEEMED NECESSARY BY SDOC INFORMATION AND TECHNOLOGY DEPARTMENT CONSTRUCTION PROJECT MANAGERS. ADHESIVE FASTENERS ARE NOT AN SDOC APPROVED FASTENING DEVICE IN ANY APPLICATION. ADDITIONAL SERVICE SLACK IN THE FORM OF A SECOND 360 DEGREE TURN AROUND THE INTERIOR OF THE BOX IS NOT ROUTINELY REQUIRED U.O.N. YET SHALL BE AN OPTION AT THESE LOCATIONS AS DETERMINED NECESSARY BY SDOC INFORMATION AND TECHNOLOGY SERVICES DEPARTMENT CONSTRUCTION PROJECT MANAGERS WHO SHALL BE CONSULTED PRIOR TO CABLE INSTALLATION.

e. ALL TECHNOLOGY SYSTEMS BACKBONE CABLES SHALL BE NEATLY AND SMOOTHLY DRESSED IN A UNIFORM MANNER WITH NO “TAG LINES” AND SUPPORTED HOMERUN INSTALLED WITHOUT SPLICES BETWEEN THE ORIGINATING MDF AND ALL SUBSEQUENT IDF CLOSET LOCATIONS AND SHALL HAVE TEN (10) FEET OF SERVICE SLACK NEATLY AND SMOOTHLY IN A UNIFORM MANNER WITH NO “TAG LINES” INSTALLED DRESSED AND SUPPORTED IAW SDOC DIVISION 27 TECHNOLOGY SYSTEMS STANDARDS AND SPECIFICATIONS AT EACH TERMINATING END.

f. AT EACH MDF AND ALL SUBSEQUENT IDF CLOSET LOCATIONS ALL TECHNOLOGY SYSTEMS BACKBONE / TIE CABLE SERVICE SLACK SHALL BE NEATLY AND SMOOTHLY IN A UNIFORM MANNER WITH NO “TAG LINES” INSTALLED DRESSED AND SUPPORTED BELOW CEILING ON THE VOICE AND DATA BACKBOARD AT ASSIGNED RESPECTIVE TECHNOLOGY SYSTEMS BACKBONE CABLE COLOR CODED SECTIONS IDENTIFIED FOR EACH TECHNOLOGY SYSTEM AND SHALL BE SUPPORTED AT THESE BACKBOARD LOCATIONS WITH MINIMUM THREE (3) “J” HOOKS PLACED AT EQUAL DISTANCES FOR A WIDE CIRCULAR TRANSITION THAT SHALL NOT VIOLATE MANUFACTURER RECOMMENDED BEND RADIUS SPECIFICATIONS. SERVICE SLACK SHALL BE SECURELY FASTENED WITH VELCRO WRAPS AS DEEMED NECESSARY BY SDOC INFORMATION AND TECHNOLOGY DEPARTMENT CONSTRUCTION PROJECT MANAGERS. SERVICE SLACK SHALL BE SECURED WITH VELCRO WRAPS AT ALL “J” HOOKS AS A MINIMUM AND IN BETWEEN TO ELIMINATE AND PREVENT “FANOUT” AS DEEMED NECESSARY BY SDOC INFORMATION AND TECHNOLOGY DEPARTMENT CONSTRUCTION PROJECT MANAGERS.

g. ALL GEL FILLED FLOODED VOICE, TELEVISION, UTP AND OTHER OUTSIDE PLANT/DIRECT BURIED BACKBONE TYPE CABLES SHALL BE TERMINATED BELOW CEILING ONLY ON THE RESPECTIVE MDF AND IDF CLOSET LOCATION VOICE AND DATA BACKBOARD ONLY.

h. IN NO CIRCUMSTANCE SHALL ANY GEL FILLED FLOODED CABLE IN ANY MDF AND IDF SPACE CONTINUE TRANSITION FROM THE SPACE VOICE AND DATA BACKBOARD TO ANY FREE STANDING TWO POST RACK OR CABINET ENCLOSURE MOUNTING BACK. ALL GEL FILLED FLOODED CABLES OF THIS NATURE SHALL ALWAYS TERMINATE AT AND ON THE VOICE AND DATA BACKBOARD ONLY AND FROM THE VOICE AND DATA BACKBOARD SHALL THEN BE TRANSITIONED TO ALL FREE STANDING TWO POST RACKS OR CABINET ENCLOSURE MOUNTING RACK EQUIPMENT LOCATIONS USING APPROPRIATE INDOOR UTP PVC JACKETED NON GEL FILLED CABLE ONLY.

i. ALL SINGLE MODE AND MULTIMODE FIBER OPTIC BACKBONE CABLES SHALL BE NEATLY AND SMOOTHLY DRESSED IN A UNIFORM MANNER WITH NO “TAG LINES” AND SUPPORTED HOMERUN INSTALLED WITHOUT SPLICES BETWEEN THE ORIGINATING MDF AND EACH SUBSEQUENT IDF WITH TIGHT BUFFERED, INDOOR / OUTDOOR RATED CABLE AND SHALL BE TERMINATED WITH DUPLEX SC CONNECTORS U.O.N. ALL MULTIMODE FIBER OPTIC CABLE SHALL BE 50um/125um U.O.N. ALL SINGLE MODE AND MULTIMODE FIBER OPTIC CABLES SHALL HAVE TEN (10) FEET OF SERVICE SLACK INSTALLED BELOW CEILING AT EACH TERMINATING END.

j. THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL / TECHNOLOGY CONTRACTOR PROVIDES AND INSTILLS ALL SINGLE MODE AND MULTIMODE FIBER OPTIC BACKBONE CABLES IN RACK MOUNT FIBER OPTIC CABLE PATCH PANELS WHICH SHALL BE OPTICAL CABLE CORPORATION (OCC) “ONLY” OR SDOC PRE-APPROVED EQUIVALENT.
k. ALL INTERIOR BUILDING INFRASTRUCTURE UTP COPPER CABLE SHALL HAVE SERVICE SLACK INSTALLED AT THE MDF AND ALL SUBSEQUENT IDF CLOSET ENDS WHICH SHALL BE NEATLY INSTALLED DRESSED AND SUPPORTED ABOVE CEILING ON OPEN WALL SPACE AND SHALL REST ON "J" HOOK SUPPORTS WHICH SHALL BE SECURED WITH VELCRO WRAPS AT ALL "J" HOOKS AND EVERY TWO (2) FEET IN BETWEEN.

l. TECHNOLOGY SYSTEMS COPPER UTP, FIBER OPTIC, INTERIOR OR EXTERIOR BACKBONE OR INFRASTRUCTURE CABLES, RUNS, CABLE BUNDLES AND OR CABLE SERVICE SLACK FOR ANY CONTRACTOR INSTALLED TECHNOLOGY SYSTEM SHALL NOT REST OR TOUCH ON ANY EMT OR PVC CONDUITS, PIPING, VENTILATION DUCTING OR ANY OTHER PASSIVE OR ACTIVE COMPONENT, DEVICE, EQUIPMENT, CABLEING, HANGARS, THREADED RODS, STRAPS OR OTHER SUPPORTS WHERE INSTALLED BY OTHER TRades AND INTENDED FOR USE AS CEILING SUPPORTS OR BY MECHANICAL, ELECTRICAL OR PLUMBING TRades ABOVE CEILING.

m. ALL INTERIOR INFRASTRUCTURE TECHNOLOGY SYSTEMS UTP CATEGORY 6 (OR ABOVE MANDATED BY PROJECT SPECIFICATIONS) COPPER DATA CABLES SHALL BE NEATLY AND SMOOTHLY DRESSED IN A UNIFORM MANNER WITH NO "TAG LINES" AND SUPPORTED HOMERUN INSTALLED WITHOUT SPLICES FROM THE ORIGINATING MDF AND SUBSEQUENT IDF CLOSET LOCATION PATCH PANEL PORTS TO THE TERMINATED RJ45 MODULES INSTALLED AT ALL BUILDING FIELD DEVICE AND FIELD WORK STATION LOCATIONS.

n. ALL CATEGORY 6 COPPER DATA CABLES AT ALL FIELD LOCATIONS SHALL BE INSTALLED IN DATA OUTLET BOX LOCATIONS U.O.N. AS INDICATED ON TECHNOLOGY "T" SHEET PLANS WHICH U.O.N. SHALL BE FOUR (4) INCH DUAL LEVEL EMT BOXES INSTALLED WITH SINGLE GANG "F-RING" COUPLED TO ONE (1) INCH EMT CONDUIT STUB UPS WHICH SHALL VERTICALLY STUB OUT AND BE SEALED AT ALL WALL PENETRATIONS ABOVE CEILING AND SHALL BE REAMED AND BUSHED ABOVE CEILING IN THE DIRECT VICINITY OF CATEGORY 6 (OR ABOVE) COMPLIANT "J" HOOKS OR WHERE SDOC APPROVED CABLE TRAY IS LOCATED FOR TRANSITION ABOVE CEILING.

o. EACH UTP CATEGORY 6 (OR ABOVE AS MANDATED BY PROJECT SPECIFICATIONS) COPPER DATA CABLE SHALL HAVE A MINIMUM THREE (3) FOOT SERVICE SLACK INSTALLED ABOVE CEILING ON "J" HOOK(S) WITHIN MAXIMUM OF SIX (6) FEET DISTANCE FROM INSTALLED DATA OUTLET STUB OUT AT ALL BUILDING FIELD DEVICE AND FIELD WORK STATION LOCATIONS AND A TEN (10) FOOT SERVICE SLACK SHALL BE INSTALLED ABOVE CEILING AT THE MDF AND ALL SUBSEQUENT IDF CLOSET LOCATIONS.

p. ALL SINGLE DROP "WAP" WIRELESS ACCESS POINT INTERIOR INFRASTRUCTURE UTP CATEGORY 6 (OR ABOVE AS DEMANDED BY PROJECT SPECIFICATIONS) COPPER DATA CABLE RUNS SHALL BE NEATLY AND UNIFORMLY DRESSED AND SUPPORTED HOMERUN INSTALLED ABOVE CEILING FROM THE "WAP" FIELD / DEVICE END LOCATION TO THE LOCAL MDF OR IDF PATCH PANEL PORT LOCATIONS. ALL SINGLE "WAP" CABLES SHALL HAVE A MINIMUM TEN (10) FOOT SERVICE SLACK ON THE FIELD DEVICE END AT EACH CABLE AND A SHALL HAVE MINIMUM TEN (10) FOOT SERVICE SLACK INSTALLED ABOVE CEILING AT THE RESPECTIVE MDF AND IDF CLOSET LOCATIONS. WHEN INSTALLATION IS COMPLETE AND THE CEILING TILES ARE CLOSED ALL SINGLE "WAP" FIELD DEVICE PORTS WHERE PHYSICALLY INSTALLED SHALL BE MARKED WITH A TYPEWRITTEN PERMANENT AND INDELIBLE ID LABEL INDICATING "WAP#" (PATCH PANEL PORT NUMBER) ON THE CEILING TILE GRID AT THE IMMEDIATE LOCATION OF THE "WAP" FIELD DEVICE WHERE PHYSICALLY LOCATED ABOVE CEILING.

q. ALL OTHER INTERIOR INFRASTRUCTURE TECHNOLOGY SYSTEMS UTP AND OTHER COPPER TECHNOLOGY CABLES INCLUDING YET NOT LIMITED TO TELEPHONE, COAXIAL, AND SECURITY LOW VOLTAGE CABLE INSTALLATIONS SHALL BE HOMERUN WITHOUT SPLICES FROM THE ORIGINATING MDF AND EACH SUBSEQUENT IDF CLOSET TO ALL BUILDING FIELD DEVICE AND FIELD STATION LOCATIONS AND A TEN (10) FOOT SERVICE SLACK SHALL BE INSTALLED ABOVE CEILING AT THE MDF AND ALL SUBSEQUENT IDF CLOSET LOCATIONS.

6. CABLE SLEEVES / SLEEVING:

a. THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL / TECHNOLOGY CONTRACTOR FOR ALL VARIETIES OF TECHNOLOGY SYSTEMS CABLE INSTALLATIONS SHALL PROVIDE AND INSTALL U/L COMPLIANT SLEEVES, CAULK, PACKING MATERIAL AND ALL OTHER MATERIALS UTILIZED FOR FIRE RATED AND SMOKE RATED PENETRATIONS WHERE ALL VARIETIES OF TECHNOLOGY SYSTEMS CABLE SLEEVING IS INSTALLED AT ANY AND ALL LOCATIONS WHERE INSTALLED TECHNOLOGY SYSTEMS CABLES OF ANY TYPE OR VARIETY WILL PENETRATE ANY EXISTING WALL OR BARRIER.

b. CABLE SLEEVING SHALL BE INSTALLED REGARDLESS THE FIRE OR SMOKE RATING OR LACK OF FIRE OR SMOKE RATING OF ANY PARTICULAR WALL. ALL COMPONENTS OF EACH SLEEVE SHALL BE IN
COMPLETE COMPLIANCE WITH THE FIRE / SMOKE CODE FOR THE WALL OR BARRIER IN QUESTION. ALL MATERIALS SHALL BE U/L APPROVED AND COMPLIANT FOR THEIR USE AND SHALL MAINTAIN IN COMPLETE COMPLIANCE THE FIRE OR SMOKE RATING AND INTEGRITY OF THE EFFECTED WALL, FLOOR OR OTHER BARRIER PENETRATION WITH NO EXCEPTION.

c. IN NO CIRCUMSTANCE SHALL ANY SDOC TECHNOLOGY CABLING SYSTEM INSTALLATION TRANSITION THROUGH ANY UNSLEEVED WALL PENETRATION WHETHER EXISTING HOLE OR NEW CONTRACTOR INSTALLED UNSLEEVED HOLE, WHETHER NEATLY CUT OR PLAINLY PUNCHED THROUGH. ALL SDOC TECHNOLOGY CABLING SYSTEM INSTALLATIONS SHALL ONLY TRANSITION THROUGH CONTRACTOR PROVIDED AND INSTALLED SLEEVING WITH NO EXCEPTION.

d. INSTANCES WHERE PRE-EXISTING INSTALLATION PRACTICES WOULD INDICATE OTHERWISE SHALL BE DISREGARDED BY ALL EFFECTED TECHNOLOGY CONTRACTOR FOR NEW SDOC TECHNOLOGY CABLING SYSTEM INSTALLATIONS AT ALL PRE-EXISTING SITES.

e. AT ALL MDF AND IDF CLOSET LOCATIONS AND ALL OTHER WALL PENETRATION LOCATIONS ALL TECHNOLOGY SYSTEMS CABLING SHALL TRANSITION VERTICALLY FROM ABOVE TO BELOW CEILING AND HORIZONTALLY THROUGH ALL FIRE AND SMOKE RATED AND ALL NON RATED WALLS BOTH INTERIOR AND EXTERIOR IN U/L APPROVED SLEEVES OF ADEQUATE SIZE NOT TO VIOLATE FILL CAPACITIES INDICATED IN NATIONAL ELECTRIC CODE DIRECTIVES. THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL / TECHNOLOGY CONTRACTOR PROVIDED AND INSTALLED SLEEVING SHALL BE OF APPROPRIATE SIZE TO ACCOMMODATE A MINIMUM 25% INCREASE IN CABLE FILL.

f. ALL INTERIOR WALL SLEEVING INSTALLED SHALL BE CLAMPED AROUND THE OUTER SLEEVE AT THE WALL ON BOTH SIDES OF EACH WALL WITH U/L APPROVED MATERIALS TO PREVENT THE SLEEVE FROM SLIDING. WHERE INSTALLED.

g. ALL SLEEVING INSTALLED SHALL BE SEALED 360 DEGREES AROUND THE EXTERIOR SURFACE OF EACH SLEEVE AT THE WALL ON BOTH SIDES WITH U/L APPROVED MATERIALS TO MAINTAIN THE FIRE AND OR SMOKE RATING OF EACH WALL. FOR NON RATED WALL SLEEVING "ONLY" NON FLAMABLE CAULK SEALANT IS AUTHORIZED FOR USE AROUND THE EXTERIOR SURFACE.

h. ALL SLEEVING INSTALLED SHALL BE SEALED ON THE INTERIOR OF THE SLEEVE WITH U/L APPROVED NON FLAMABLE REMOVEABLE PACKING MATERIALS TO MAINTAIN THE FIRE AND OR SMOKE RATING OF EACH WALL WHERE INSTALLED AND AS APPROVED BY CODE MAY BE INSTALLED ON MINIMUM ONE SIDE. FOR NON RATED WALL SLEEVING NON FLAMABLE REMOVEABLE PACKING MATERIAL SHALL BE INSTALLED ON MINIMUM ONE SIDE TO PREVENT RODENT AND INSECT INTRUSION AND TO DAMPEN SOUND.

i. ALL REQUIREMENTS FOR GROUNDING OF EMT SLEEVING SHALL APPLY IAW NATIONAL ELECTRIC CODE DIRECTIVES. IN-DEPTH SLEEVE REQUIREMENTS ARE DETAILED IN SDOC DIVISION 27 TECHNOLOGY SYSTEMS STANDARDS AND SPECIFICATIONS YET DO NOT RELIEVE THE CONTRACTOR OF THEIR RESPONSIBILITY TO PROVIDE A 100 PERCENT SATISFACTORY INSTALLATION AS DETERMINED BY THE SDOC FACILITIES BUILDING OFFICIAL, SDOC CODE COMPLIANCE OFFICIAL AND SDOC INFORMATION AND TECHNOLOGY SERVICES DEPARTMENT CONSTRUCTION PROJECT MANAGERS.

7. FIBER OPTIC AND COPPER CABLE TESTING:

a. THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED TECHNOLOGY SYSTEMS CONTRACTOR(S) SHALL TEST ALL INSTALLATIONS OF FIBER OPTIC AND ALL UTP COPPER DATA AND OTHER COPPER TECHNOLOGY SYSTEMS CABLES.

b. ALL CONTRACTORS SHALL PROVIDE AND UTILIZE TEST EQUIPMENT ONLY HAVING CURRENT CALIBRATION STICKERS WITH LEGIBLE PERMANENT DATES POSTED WITHIN CURRENT APPLICABLE SPECIFIED CALIBRATION PERIODS. ALL TEST EQUIPMENT UTILIZED SHALL HAVE A LEGIBLE CALIBRATION STICKER AFFIXED IN PLACE. ALL TEST EQUIPMENT SHALL BE PRODUCED UPON REQUEST FOR SDOC INSPECTION PRIOR TO USE AND ALL EQUIPMENT HAVING CALIBRATION FOUND EXPIRED SHALL BE REJECTED AND ONLY CORRECTLY CALIBRATED TEST EQUIPMENT IS ON SITE AND APPROVED FOR USE BY SDOC INFORMATION AND TECHNOLOGY SERVICES DEPARTMENT CONSTRUCTION PROJECT MANAGERS.

c. UPON RECEIPT AT PROJECT SITE THE PROJECT ENGINEER AND THE GENERAL CONTRACTOR SHALL ENSURE THE SELECTED TECHNOLOGY CONTRACTOR SHALL TEST ALL OPTICAL FIBER CABLING STRANDS WHILE STILL ON THE CABLE REELS. THE CONTRACTED TECHNOLOGY SYSTEMS CONTRACTOR SHALL UTILIZE AN OTDR TO VERIFY THE CABLE LENGTH AND TO IDENTIFY AND LOCATE ANY CABLE DEFECTS. SPLICES AND CONNECTORS INCLUDING THE LOSS VALUE OF EACH FIBER OPTIC STRAND. ALL STRANDS OF ALL FIBER OPTIC CABLE SHALL BE TESTED PRIOR TO INSTALLATION TO DETERMINE CONTINUITY OF EACH STRAND END TO END AND SHALL BE DETERMINED TO BE FREE OF DEFECT WITH DOCUMENTED PROOF. TECHNOLOGY CONTRACTOR SHALL RETAIN THE TEST DATA AND INCLUDE THE RECORD FOR OWNER RETENTION AT PROJECT COMPLETION. ALL FIBER OPTIC AND
COPPER CABLES FOUND DEFECTIVE SHALL BE REPLACED WITH CABLING FREE OF FAULTS PRIOR TO INSTALLATION.

d. UPON COMPLETION OF INSTALLATION OF THE FIBER OPTIC CABLES, THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED TECHNOLOGY CONTRACTOR SHALL CONDUCT TESTING OF ALL FIBER OPTIC CABLES AND CONNECTORS FROM ONE END WITH AN OTDR WITH LAUNCH FIBERS AT BOTH ENDS FOR EVERY INSTALLED STRAND.

e. UPON COMPLETION OF INSTALLATION, THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED TECHNOLOGY CONTRACTOR SHALL CONDUCT TESTING OF ALL BACKBONE COPPER CABLE WHICH SHALL INCLUDE PROPER CABLE LOCATION IDENTIFICATION, VERIFICATION OF CABLE CONTINUITY AND VERIFICATION OF PROPER PAIR SEQUENCING AND IN ADDITION AS A MINIMUM THE USE OF TYPICAL OHM METER TEST EQUIPMENT FOR IDENTIFICATION AND ELIMINATION OF ANY AND ALL SHORTS, OPENS, GROUNDS AND WHERE APPLICABLE AND NECESSARY SHALL CONDUCT CABLE INSULATION TESTS ACCOMPLISHED WITH THE USE OF MEGGER TEST EQUIPMENT FOR TELEPHONE, COAXIAL, AND SECURITY LOW VOLTAGE CABLES INSTALLED. ALL TESTING SHALL BE AS REQUIRED BY SDOC DIVISION 27 STANDARDS AND SPECIFICATIONS AND ALL CABLE AND COMPONENT SPECIFIC MANUFACTURER'S WARRANTY PROGRAMS.

f. UPON COMPLETION OF INSTALLATION, THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED TECHNOLOGY CONTRACTOR SHALL CONDUCT TESTING OF ALL INTERIOR INFRASTRUCTURE UTP CATEGORY 6 (OR ABOVE AS MANDATED BY PROJECT SPECIFICATIONS) DATA COPPER CABLE WHICH SHALL BE ACCOMPLISHED AS A MINIMUM BY TYPICAL UTP LANMETER TEST EQUIPMENT AND ANY OTHER TEST EQUIPMENT REQUIRED FOR PROPER VERIFICATION AS MANDATED IN SDOC DIVISION 27 TECHNOLOGY SYSTEMS STANDARDS AND SPECIFICATIONS AND AS MANDATED BY MANUFACTURERS CABLE WARRANITY PROGRAM.

g. EACH SINGLE “WAP” FIELD END DEVICE CABLE SHALL BE CATEGORY 6 COMPLIANT CABLE AND SHALL HAVE RJ45 MODULES INSTALLED, TERMINATED, TESTED, LABELED AND WARRANTED FROM MODULE TO CATEGORY 6 PATCH PANEL PORT IN THE SAME MANNER AS ALL OTHER CATEGORY 6 CABLES INSTALLED IN THE TECHNOLOGY UTP CATEGORY 6 COPPER DATA SYSTEM. CABLE TEST RESULTS SHALL BE PROVIDED BY CONTRACTOR FOR OWNER RETENTION AS PART OF THE OVERALL UTP CATEGORY 6 (OR ABOVE AS MANDATED BY PROJECT SPECIFICATIONS) COPPER DATA CABLE INSTALLATION.

h. UPON COMPLETION OF ALL CABLING INSTALLATIONS, THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED TECHNOLOGY CONTRACTOR SHALL CONDUCT TESTING OF ALL OTHER INTERIOR INFRASTRUCTURE TECHNOLOGY SYSTEMS COPPER CABLES INCLUDING YET NOT LIMITED TO TELEPHONE, COAXIAL, AND SECURITY LOW VOLTAGE CABLES INSTALLED DURING OR IN ADDITION TO INTERIOR INFRASTRUCTURE UTP CATEGORY 6 CABLE INSTALLATIONS. TESTING SHALL INCLUDE PROPER CABLE LOCATION IDENTIFICATION, VERIFICATION OF CABLE CONTINUITY AND VERIFICATION OF PROPER PAIR SEQUENCING AND IN ADDITION AS A MINIMUM THE USE OF TYPICAL OHM METER TEST EQUIPMENT IN ADDITION TO IDENTIFICATION AND ELIMINATION OF ANY AND ALL SHORTS, OPENS, GROUNDS AND WHERE APPLICABLE AND NECESSARY SHALL CONDUCT CABLE INSULATION TESTS ACCOMPLISHED WITH THE USE OF MEGGER TEST EQUIPMENT FOR TELEPHONE, COAXIAL, AND SECURITY LOW VOLTAGE CABLES INSTALLED. ALL TESTING SHALL BE AS REQUIRED BY SDOC DIVISION 27 STANDARDS AND SPECIFICATIONS AND ALL CABLE AND COMPONENT SPECIFIC MANUFACTURER'S WARRANTY PROGRAMS.

i. PRIOR TO SUBSTANTIAL COMPLETION, THE GENERAL CONTRACTOR SHALL ENSURE THE SELECTED TECHNOLOGY CONTRACTOR INITIALLY PROVIDES IN WRITTEN FORMAT A COPY OF ALL CABLE TEST RESULTS TO AND FOR REVIEW BY ENGINEER.

j. AFTER ALL CABLE TEST RESULTS ARE RECEIVED AND REVIEWED BY THE ENGINEER A TEN PERCENT RE-TEST IS SCHEDULED AND CONDUCTED WITH A TECHNOLOGY CONTRACTOR GENERATED AND PROVIDED PAPER COPY.

k. AT SUBSTANTIAL COMPLETION, THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE PROJECT ENGINEER AND SELECTED TECHNOLOGY CONTRACTOR PARTICIPATE IN A TEN PERCENT RETEST OF ALL UTP CATEGORY 6 COPPER DATA AND SINGLE MODE AND MULTIMODE FIBER OPTIC CABLE INSTALLED WITH THE OWNER FOR VERIFICATION OF INITIALLY DOCUMENTED TEST RESULTS TO INSURE ALL CABLING IS WITHIN ALL DESIRED PARAMETERS AS DOCUMENTED.

l. AT SUBSTANTIAL COMPLETION, TEN PERCENT OF ALL TEST RESULTS ARE RETESTED AND VERIFIED AS PASSED, APPROVED AND ACCEPTED BY THE PROJECT ENGINEER WITH ALL IDENTIFIED EXCEPTIONS ADDRESSED. A COPY OF THE FINAL TEST RESULT DOCUMENTATION AND THE TECHNOLOGY CONTRACTOR SHALL FURNISH THE FINAL CABLE TEST RESULTS TO THE PROJECT ENGINEER AS A CLEAN SET OF REFRESHED PAPER AND ELECTRONIC TEST RESULT COPIES FOR ALL CABLING INSTALLED. WITH ALL CABLING RE-TESTS COMPLETE AND ALL RESULTS REVIEWED AND ACCEPTED BY THE ENGINEER THE FINAL PASSED TEST RESULTS FOR ALL INSTALLED CABLES SHALL BE SUBMITTED BY THE PROJECT ENGINEER TO THE OWNER IN BOTH PAPER AND ELECTRONIC FORMAT FOR RETENTION AT CLOSEOUT OF PROJECT.
8. **FLOOR BOX TRANSITION POINT “TP” CABINETS:**

    a. FOR ALL LOCATIONS INDICATED ON THE TECHNOLOGY SYSTEMS “T” SHEETS THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL / TECHNOLOGY CONTRACTOR PROVIDES AND Installs GEL FILLED FLOODED OUTSIDE PLANT DIRECT BURY CATEGORY 6 UTP (OR ABOVE AS DEMANDED BY PROJECT SPECIFICATIONS) COPPER DATA CABLES FOR TERMINATION AT ALL BUILDING SLAB FLOOR BOX AND EMT STUB OUT LOCATIONS AS FOLLOWS:

    i. CONTRACTOR SHALL INSTALL FLOOR BOX TRANSITION POINT “TP” CABINETS. CABINETS SHALL BE METALLIC NEMA 1 RATED HINGED-COVER MINIMUM 12” W x 12” L x 6”D WHICH SHALL BE INSTALLED ABOVE CEILING IN THE DIRECT VICINITY WITHIN THREE TO FIVE FEET OF EACH FLOOR BOX EMT STUB UP LOCATION.

    ii. OUTSIDE PLANT DIRECT BURY GEL FILLED FLOODED CATEGORY 6 UTP COPPER DATA CABLES OF THE SAME MANUFACTURER AS THE SITE APPROVED CATEGORY 6 UTP COPPER DATA CABLE INFRASTRUCTURE BEING INSTALLED. THESE CABLES SHALL BE INSTALLED FROM THE FLOOR BOX THROUGH AN EMT CONDUIT PATHWAY TOREAMED AND BUSHED STUB OUT LOCATIONS ABOVE CEILING AND SHALL TERMINATE ON THE INTERIOR OF EACH INSTALLED TRANSITION POINT “TP” CABINET TO 144 PAIR CATEGORY 6 TYPE 110 PUNCH-DOWN BLOCKS OF THE SAME MANUFACTURER AS THE SITE APPROVED CATEGORY 6 UTP COPPER DATA CABLE INFRASTRUCTURE BEING INSTALLED FOR THAT NEW CONSTRUCTION SITE. A MINIMUM FIVE (5) FOOT SERVICE SLACK SHALL BE INSTALLED FOR ALL GEL FILLED FLOODED CATEGORY 6 UTP DATA CABLE AT ALL NEMA 1 TRANSITION POINT “TP” CABINET LOCATIONS.

    iii. ALL GEL FILLED FLOODED CATEGORY 6 UTP COPPER DATA CABLES SHALL BE TRANSITIONED AT THE 144 PAIR CATEGORY 6 TYPE 110 PUNCH-DOWN BLOCKS TO LIKE FOR LIKE INDIVIDUAL INDOOR CATEGORY 6 UTP COPPER DATA CABLES AT EACH TRANSITION POINT “TP” CABINET AND FROM THAT LOCATION AND SHALL CONTINUE TO THE RESPECTIVE MDF AND IDF CLOSET AND TERMINATE ON CATEGORY 6 PATCH PANEL LOCATIONS AS INDOOR PVC JACKETED CATEGORY 6 UTP COPPER DATA CABLES.

    iv. ALL TERMINATION, TESTING, SUPPORTS, LABELING, COLOR SCHEMES ETC. AND WARRANTY REQUIREMENTS APPLY AS SPECIFIED FOR ALL SDOC DATA CABLE INSTALLATIONS. WHEN THE CEILING TILES ARE CLOSED ALL TRANSITION POINT “TP” CABINET LOCATIONS SHALL BE MARKED WITH A TYPWRITTED INDELIBLE ID LABEL INDICATING “TP#?” ON THE CEILING TILE GRID AT THE IMMEDIATE LOCATION OF THE POINT OF TRANSITION POINT “TP” CABINET ABOVE CEILING.

9. **WIRELESS ACCESS POINT TRANSITION POINT “TP” CABINETS:**

    a. FOR ALL LOCATIONS INDICATED ON THE TECHNOLOGY SYSTEMS “T” SHEETS THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL / TECHNOLOGY CONTRACTOR PROVIDES AND Installs WIRELESS ACCESS POINT INDOOR CATEGORY 6 COPPER DATA CABLE TRANSITION POINT “TP” CABINET LOCATIONS FOR FUTURE SDoc DATA CABLE INSTALLATION DROPS INTENDED TO BE WIRELESS ACCESS POINT DATA DROPS AS FOLLOWS:

    i. CONTRACTOR SHALL INSTALL WIRELESS ACCESS POINT TRANSITION POINT “TP” CABINETS. CABINETS SHALL BE METALLIC NEMA 1 RATED HINGED-COVER MINIMUM 12” W x 12” L x 6”D.

    ii. CONTRACTOR SHALL PROVIDE, INSTALL, TERMINATE, TEST, WARRANTY AND LABEL ON ALL TERMINATING ENDS A PRE-DETERMINED NUMBER OF HOMERUN INSTALLED INDOOR CATEGORY 6 COPPER DATA CABLES WHICH SHALL BE INSTALLED FROM EACH RESPECTIVE DESIGNATED LOCAL MDF AND IDF CLOSET PATCH PANEL PORT LOCATION IN DESIGNATED CAB QUANTITIES TO INSTALLED TRANSITION POINT “TP” CABINETS AT PRESERMINED LOCATIONS IN THE FIELD WHERE EACH CABLE SHALL TERMINATE ON THE INTERIOR OF EACH TRANSITION POINT “TP” CABINET TO 144 PAIR CATEGORY 6 TYPE 110 PUNCH-DOWN BLOCKS OF THE SAME MANUFACTURER AS THE SITE APPROVED CATEGORY 6 UTP COPPER DATA CABLE INFRASTRUCTURE BEING INSTALLED FOR THAT NEW CONSTRUCTION SITE.

    iii. CONTRACTOR SHALL INSURE A FIVE (5) FOOT SERVICE SLACK IS INSTALLED AT ALL WIRELESS ACCESS POINT TRANSITION POINT “TP” CABINET LOCATIONS FOR ALL CATEGORY 6 CABLING INSTALLED.

    iv. ALL CATEGORY 6 DATA CABLES INSTALLED AT EACH RESPECTIVE WIRELESS ACCESS POINT TRANSITION POINT “TP” CABINET IN THE FIELD LOCATION SHALL INITIALLY
10. WIRELESS ACCESS POINT EXTERIOR PENETRATIONS – CONDUIT AND GROUNDING REQUIREMENTS:

a. Exterior Wireless Access Point “WAP” outlet locations shall be installed project specific with a minimum of one “WAP” penetration per exterior wall at all new construction and renovation project buildings.

b. A minimum one (1”) inch interior diameter conduit sleeve shall be installed through each wall penetration, attached to a double gang weatherproof box with cover at the exterior and the sleeve interior shall be secured with pipe bracket interior and installed with bushing on conduit end interior.

c. Seal all penetration locations with U/L approved caulk IAW all fire and building code directives 360 degrees both interior and exterior at each penetration.

d. Minimum one exterior location shall be provided and installed by the project general contractor at each exterior wall for each project with additional locations as determined project specific by qualified SDOC Technology Services Department Representatives during each project design phase.

e. At each Wireless Access Point “WAP” exterior penetration location within twelve (12) inches parallel, the general contractor shall provide and install one (1) U/L approved copper or aluminum minimum six (6) tap ground terminal block, one (1) U/L approved I-Beam Ground Clamp and crimp Connector Kit at the closest building steel location (connection surface shall be tight, clean and metal to metal), one (1) #6 copper stranded green jacketed grounding cable shall be installed from the I-Beam Ground Clamp Crimp Connector to the six tap ground terminal block (no trimming of conductors on the cable is permitted) and the #6 ground cable run shall be secured with EMT pipe straps every two feet in the shortest path possible. See Figure 6A detail in the Division 27 Technology Systems Standards and Specifications Section 27_04_00 Wireless Access Point Systems provided.

11. MDF AND IDF GROUNDING REQUIREMENTS:

a. The general contractor shall provide, supervise and ensure the selected electrical / technology contractor provides and installs a U/L approved solid copper ground bus bar with isolation kit suitably sized to SDOC satisfaction for all locations where plans indicate installation of a telecommunications grounding bus bar (TGBB). In all MDF and IDF locations each section of ladder rack, freestanding rack, all communications cabinets and every pedestal shall be grounded with individual homeruns of minimum #6 AWG copper stranded, insulated green jacketed grounding conductor to each respective TMGBB/TGBB.

b. The MDF TMGBB shall be connected to main site ground per detail on the technology construction plan sheets.

c. Contractor shall connect the TMGBB and all subsequent IDF closet TGBB’s with an individual homerun of one (1) #6 AWG copper stranded, insulated green jacketed ground conductor to the associated clean power panel feeding the communications space in which the bus bar is installed.

d. The TMGBB and all subsequent IDF closet TGBB’s shall be connected to building steel with an individual homerun of one (1) #6 AWG copper stranded, insulated green jacketed conductor per details indicated on the technology construction plan sheets.
e. CONTRACTOR SHALL CONNECT THE TMGBB AND ALL SUBSEQUENT TGBB'S TOGETHER BETWEEN FLOORS ON MULTI-STORY BUILDINGS AND TOGETHER ON THE SAME FLOOR WITH INDIVIDUAL HOMERUNS OF ONE (1) #6 AWG COPPER STRANDED, INSULATED GREEN JACKETED CONDUCTOR IN EACH INSTANCE BETWEEN SPACES WHICH SHALL ALWAYS BE INSTALLED IN A SEPARATE SLEEVE INTENDED SOLELY FOR THE PURPOSE OF TRANSITIONING THE GROUND CABLE. ALL SLEEVES SHALL BE INSTALLED IAW CURRENT NATIONAL ELECTRIC CODE DIRECTIVES. ALL EMT CONDUIT SLEEVES SHALL BE INSTALLED WITH A U/L APPROVE CONNECTOR ON ONE (1) END AT EACH EMT SLEEVE ATTACHED TO A HOMERUN INSTALLED GROUND CONDUCTOR OF THE SAME GAGE CONDUCTOR AS IS INSTALLED IN THE SLEEVE.

f. ALL INTERCOM AND TELEPHONE VOICE TIE CABLES SHALL BE TERMINATED ON 66 BLOCKS ON THE VOICE AND INTERCOM BACKBOARDS IN EACH MDF AND IDF CLOSET LOCATION AND ALL SHIELDED TELEPHONE VOICE TIE CABLE SHIELDS SHALL BE BONDED TO SPACE GROUND USING BULLET BOND CONNECTORS WITH SEPARATOR SHOES WHICH SHALL BE INSTALLED FOR GROUNDING OF THE TELEPHONE FM 89 CABLE SHEATH (SEE DETAIL ON "T" SHEETS) ON IN SDCC DIVISION 27 TECHNOLOGY STANDARDS AND SPECIFICATIONS. INSTALL INDIVIDUAL HOMERUNS OF ONE (1) #6 AWG COPPER STRANDED, INSULATED GREEN JACKETED GROUND CONDUCTOR TO EACH RESPECTIVE TMGBB/TGBB FROM EACH SHIELDED FLOODED VOICE CABLE AND FROM EACH 66 BLOCK MGB GROUND RAIL.

g. ALL GEL FILLED FLOODED VOICE CABLES AND ALL SHIELDED INTERCOM CABLES SHALL BE TERMINATED TO 66 BLOCKS WITH "MGB" GROUND RAILS WHICH SHALL BE CONNECTED TO THE MDF TMGBB AND ALL SUBSEQUENT IDF TGBB’S WITH INDIVIDUAL HOMERUN INSTALLATIONS OF #6 AWG COPPER STRANDED, INSULATED GREEN JACKETED CONDUCTOR PER DETAILS INDICATED ON THE TECHNOLOGY CONSTRUCTION PLAN SHEETS.

h. WHEN TERMINATIONS ARE COMPLETE CONTRACTOR SHALL LABEL EACH 66 BLOCK USING SPLICEBLK-CUSTOM BLACK ON WHITE VINYL LABELS APPLIED DIRECTLY ON 66 BLOCKS. PROVIDE TWO (2) MUSHROOM STYLE SPOOLIES FOR CROSS CONNECT MANAGEMENT AT EACH 66 BLOCK INSTALLED.

12. FIRE ALARM AND ELEVATOR TELEPHONE CABLE AND CONNECTIONS:

a. THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL / TECHNOLOGY CONTRACTOR PROVIDES AND INSTALLS ONE (1) NEW 66 BLOCK FOR BOTH FIRE ALARM AND ELEVATOR OUTSIDE TELEPHONE LINE TERMINATIONS.

b. THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL / TECHNOLOGY CONTRACTOR PROVIDES AND INSTALLS ONE (1) CATEGORY 6 CABLE WITHOUT SPLICES HOMERUN TO THE MDF FROM THE MAIN FIRE ALARM PANEL LABELED FIRE ALARM TELEPHONE LINES OF BOTH ENDS OF THE CABLE WITH ALL FOUR (4) PAIRS OF THIS CABLE TERMINATED ON ONE SIDE ONLY ON THE OUTER PINS OF A 66 BLOCK LOCATED IN THE MDF AT THE IMMEDIATE VICINITY OF THE TELEPHONE DEMARC. THE OTHER END OF THE MAIN FIRE ALARM PANEL CABLE WILL EXTEND SUPPORTED IAW DIVISION 27 STANDARDS AND SPECIFICATIONS TO THE ABOVE CEILING LOCATION OF THE MAIN FIRE ALARM PANEL WITH A 10' SERVICE SLACK (TO BE CONNECTED TO THE INSTALLED EQUIPMENT BY OTHERS) WHERE LOCATED (USUALLY IN THE ADMINISTRATIVE AREA). THIS SHALL ALWAYS BE PROVIDED FOR MAIN FIRE ALARM PANEL TELEPHONE CONNECTIONS.

c. FOR EVERY ELEVATOR, THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL / TECHNOLOGY CONTRACTOR PROVIDE AND INSTALL ONE (1) CATEGORY 6 CABLE WITHOUT SPLICES HOMERUN TO THE MDF LABELED ELEVATOR TELEPHONE LINE AND TERMINATE ALL FOUR (4) PAIRS ON ONE SIDE ONLY OF THE SAME NEW 66 BLOCK FOR FIRE ALARM AND ELEVATOR OUTSIDE TELEPHONE LINE TERMINATIONS LOCATED IN THE MDF AT THE IMMEDIATE VICINITY OF THE TELEPHONE DEMARC. THE OTHER END OF EACH ELEVATOR CABLE WILL EXTEND TO EACH ELEVATOR EQUIPMENT ROOM LOCATION AS TELEPHONE CONNECTION FOR THE ELEVATOR WITH A 10' SERVICE SLACK (TO BE CONNECTED TO THE INSTALLED EQUIPMENT BY OTHERS) WHERE LOCATED IN THE ELEVATOR EQUIPMENT ROOM. THIS / THESE CABLE(S) SHALL BE PROVIDED AS ELEVATOR EQUIPMENT TELEPHONE CONNECTIONS.

d. STUBOUTS, SLEEVES AND ACCESS POINTS FOR THE FIRE ALARM PANEL AND ALL ELEVATOR EQUIPMENT ARE NOT THE RESPONSIBILITY OF THE INFORMATION AND TECHNOLOGY SERVICES DEPARTMENT OR THE RESPECTIVE TECHNOLOGY INSTALLATION YET ARE A MANDATE FOR CABLE INSTALLATION WHICH SHALL BE PROVIDED AND INSTALLED BY THE GENERAL CONTRACTOR, THEIR FIRE ALARM SERVICES AND ELEVATOR EQUIPMENT COMPANY CONTRACTORS SEPARATE FROM ANY TECHNOLOGY INSTALLATION DIRECTIVES OR MANDATES FOR THIS PROJECT.
13. AUDIO ENHANCEMENT NOTES:

1. FOR SDOC PROVIDED AND INSTALLED VOICE / AUDIO ENHANCEMENT CLASSROOM SOUND SYSTEMS AUDIO ENHANCEMENT INC. IS THE SDOC BOARD APPROVED SOURCE AND NO OTHERS.

2. THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED CONTRACTOR AUDIO ENHANCEMENT INC. SHALL PROVIDE AND INSTALL ALL VOICE / AUDIO ENHANCEMENT CLASSROOM SOUND SYSTEMS CABLING, FIELD DEVICES, HEAD END EQUIPMENT, ACTIVE AND PASSIVE COMPONENTS AND CONNECTIONS, SHELVING AND SAFETY ANCHORING REQUIRED TO DELIVER A 100% OPERATIONAL AND FULLY FUNCTIONAL CLASSROOM AUDIO ENHANCEMENT SYSTEM AT EACH DESIGNATED CLASSROOM AND ALL OTHER AREAS WHERE REQUIRED BY CONSTRUCTION DOCUMENTS AND PLANS IAW SDOC DIVISION 27 TECHNOLOGY SYSTEMS STANDARDS AND SPECIFICATIONS DETAILS FOR VOICE / AUDIO ENHANCEMENT CLASSROOM SOUND SYSTEMS AS FOLLOWS:

   a. THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL CONTRACTOR SHALL PROVIDE AND INSTALL ALL AUDIO ENHANCEMENT BOXES, EMT CONDUIT STUB OUTS CONSISTING OF ONE AND ONE QUARTER INCH EMT CONDUIT COUPLED TO A 4" W X 4" L X 2.5" D DOUBLE GANG RECEPTACLE BOX AND SDOC SPECIFIED FACEPLATES WITH GROMMETS.

   b. BOXES AND STUBOUTS SHALL BE INSTALLED AT 96" A.F.F.U.O.N. AT LOCATIONS DESIGNATED BY AUTHORIZED SDOC REPRESENTATIVE. EMT CONDUIT SHALL BE STUBBED OUT, REAMED AND BUSHED ABOVE FINISHED CEILING HEIGHT.

   c. THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL / TECHNOLOGY CONTRACTOR PROVIDE AND INSTALL WITHIN TWENTY-FOUR INCHES OF EACH AUDIO ENHANCEMENT STUB OUT ONE GENERAL POWER DUPLEX RECEPTACLE AT 96" A.F.F.U.O.N. AT ALL LOCATIONS DESIGNATED BY AUTHORIZED SDOC REPRESENTATIVE.

14. SMART BOARD OR OTHER INTERACTIVE BOARD AND INTERACTIVE PROJECTOR INSTALLATION NOTES:

1. THERE ARE TWO CONFIGURATION OPTIONS CURRENTLY AVAILABLE FOR INTERACTIVE (SMART) BOARDS AND PROJECTOR INSTALLATIONS IN THE SCHOOL DISTRICT OF OSCEOLA COUNTY. REFER TO PROJECT SPECIFIC CONSTRUCTION TECHNOLOGY PLAN DETAILS AND SDOC DIVISION 27 PROJECT SPECIFICATIONS FOR THE CHOSEN / SELECTED TECHNOLOGY OPTION TO BE INSTALLED FOR EACH PROJECT. OPTION DESCRIPTIONS ARE AS FOLLOWS:

   CONFIGURATION OPTION 1 INTERACTIVE BOARD AND CEILING MOUNT PROJECTOR SYSTEM

   a. GENERAL CONTRACTOR SHALL COORDINATE WITH SDOC MIT DEPARTMENT, SCHEDULE AND MANAGE ALL SMART BOARD INSTALLATIONS USING AN OWNER PROVIDED DESIGNATED TECHNOLOGY SMART BOARD INSTALLER FOR THE INSTALLATION OF AN OWNER PROVIDED INTERACTIVE SMART BOARD AT THE CENTER OF THE TEACHING WALL. SMART BOARD BOTTOM EDGE HEIGHTS SHALL BE AS DESIGNATED FOR EACH GRADE LEVEL FOR WHICH INTENDED AS IS INDICATED IN SDOC DIVISION 27 TECHNOLOGY SYSTEMS STANDARDS AND SPECIFICATIONS SECTION 27_10_00 DETAILS.

   b. GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL / TECHNOLOGY SYSTEMS CONTRACTOR SHALL PROVIDE AND INSTALL ALL PIECES AND PARTS REQUIRED FOR A CEILING MOUNTED PROJECTOR PLATE ASSEMBLY "PJ" INSTALLED IN A CEILING GRID CENTERED ON THE SMART BOARD AT TEN FEET DISTANCE AT ALL LOCATIONS.

   c. GENERAL CONTRACTOR SHALL COORDINATE WITH SDOC MIT DEPARTMENT, SCHEDULE AND MANAGE THE INSTALLATION OF OWNER PROVIDED PROJECTORS USING AN OWNER PROVIDED DESIGNATED TECHNOLOGY PROJECTOR INSTALLER FOR PROJECTOR INSTALLATION ON THE GENERAL CONTRACTOR PROVIDED AND INSTALLED PROJECTOR PLATE ASSEMBLY "PJ" AT EACH LOCATION CENTERED ON THE TEACHING WALL.

   d. GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL CONTRACTOR SHALL PROVIDE AND INSTALL ALL SMART BOARD "SB" AND TEACHER STATION “TS” OUTLET BOXES AND EMT CONDUIT STUB OUTS WHICH SHALL BE INSTALLED AT EIGHTEEN INCHES A.F.F. WITH AN INTERCONNECTING HORIZONTAL 11/4 INCH EMT CONDUIT INSTALLED BETWEEN THE "SB" AND "TS" OUTLET BOXES AT ALL LOCATIONS.

   e. NOTE: DUE TO USB CABLE LIMITATIONS, THE DISTANCE BETWEEN THE “STSB” OUTLET BOX STUB OUT AND THE “TS” OUTLET BOX STUB OUT ABOVE CEILING SHALL BE NO MORE THAN TWELVE (12) FEET DISTANCE HORIZONTAL AT ALL INSTALLATION LOCATIONS WITH NO EXCEPTIONS.
f. **IT SHALL BE THE RESPONSIBILITY OF THE PROJECT ARCHITECT, ENGINEER AND GENERAL CONTRACTOR TO INSURE THAT THE “SB” OUTLET SHALL ALWAYS BE ORIENTED ON THE TEACHING WALL TO THE BOTTOM RIGHT HAND CORNER AT EVERY SMART BOARD LOCATION.**

g. **THE TEACHER STATION “TS” AND SMART BOARD “SB” OUTLET FACEPLATE SHALL BE A GENERAL CONTRACTOR PROVIDED AND INSTALLED FACEPLATE ASSEMBLY WHICH SHALL BE A PASS & SEYMOUR DOUBLE GANG STAINLESS STEEL FACEPLATE WITH DUAL ROCKER PANEL HOLES PASS & SEYMOUR PART NUMBER# SSJ262.** The left rocker panel on each stainless steel faceplate shall be installed with a MM ELECTRONICS DECORA CABLE PASS THROUGH MM ELECTRONICS PART NUMBER# 50-7405 on this configuration at all locations.

h. **THE “TS” OUTLET BOX SHALL BE INSTALLED WITH A VERTICAL 11/4 INCH EMT CONDUIT STUB OUT INSTALLED (REAMED AND BUSHED) TO ABOVE CEILING AT ALL LOCATIONS.**

i. **REFER TO SDOC DIVISION 27 STANDARDS AND SPECIFICATIONS SECTION 27.10.00 FOR IN-DEPTH DETAILS, FIGURES AND INSTALLATION SPECIFICS FOR THIS SDOC SELECTED PROJECT OPTION.**

**CONFIGURATION OPTION 2 WALL MOUNT INTERACTIVE PROJECTOR SYSTEM –**

a. **GENERAL CONTRACTOR SHALL COORDINATE WITH SDOC MIT DEPARTMENT AND SHALL SCHEDULE AND MANAGE ALL SDOC MIT DEPARTMENT PURCHASED AND PROVIDED WALL MOUNTED SHORT THROW PROJECTOR ARM “STPJ” ASSEMBLY INSTALLATIONS INSTALLED BY SDOC MIT DEPARTMENT CONTRACTED AND DESIGNATED TECHNOLOGY WALL MOUNTED SHORT THROW PROJECTOR ARM “STPJ” ASSEMBLY INSTALLERS FOR THE INSTALLATION OF ALL WALL MOUNTED SHORT THROW PROJECTOR ARM “STPJ” ASSEMBLIES.**

b. **EACH WALL MOUNTED SHORT THROW PROJECTOR ARM “STPJ” ASSEMBLY SHALL BE POSITIONED AT THE CENTER OF THE “USEABLE” TEACHING WALL AREA ABOVE GENERAL CONTRACTOR PROVIDED AREA ESTABLISHED FOR THE INSTALLATION OF GENERAL CONTRACTOR PROVIDED FOUR FOOT WIDE BY SIX FOOT LONG BALT “ONLY” MATTE FINISH INTERACTIVE MARKER BOARD PART NUMBER# 2G2KG-26 WITH BRIO TRIM.** Each general contractor provided BALT MARKER BOARD SHALL BE INSTALLED BY SDOC MIT DEPARTMENT CONTRACTED AND DESIGNATED TECHNOLOGY PROJECTOR ARM ASSEMBLY INSTALLERS AND SHALL BE POSITIONED AT THE CENTER OF THE TEACHING WALL. MARKER BOARD BOTTOM EDGE HEIGHTS SHALL BE INSTALLED AS ESTABLISHED FOR EACH GRADE LEVEL INTENDED AND AS THE DETAILS INDICATE ON FIGURE 49 OF THIS SECTION.

c. **GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL CONTRACTOR SHALL PROVIDE AND INSTALL AN ACCEPTABLE 24” x 24” REINFORCEMENT BACKING CENTERED IN THE WALL AT 96 INCHES A.F.F. ABOVE AND CENTERED ON THE INSTALLED MARKER BOARD AT ALL WALL MOUNTED PROJECTOR ARM ASSEMBLY “STPJ” LOCATIONS.**

d. **EACH WALL MOUNTED SHORT THROW PROJECTOR ARM “STPJ” ASSEMBLY SHALL BE MOUNTED AND INSTALLED IN AN AREA BUILT OUT WITH ENGINEER APPROVED AND GENERAL CONTRACTOR PROVIDED AND INSTALLED RE-ENFORCEMENT BACKING WHICH SHALL BE INSTALLED IN THE WALL FOR SUPPORT OF EACH PROJECTOR ASSEMBLY.** **GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL CONTRACTOR SHALL PROVIDE AND INSTALL THE ENGINEER APPROVED AND ACCEPTABLE 24” X 24” (OR ENGINEERED DIMENSIONS) REINFORCEMENT BACKING CENTERED IN THE WALL AT 96 INCHES A.F.F. ABOVE AND CENTERED ON THE INSTALLED MARKER BOARD AT ALL WALL MOUNTED SHORT THROW PROJECTOR ARM ASSEMBLY “STPJ” LOCATIONS.**

e. **GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL CONTRACTOR SHALL PROVIDE AND INSTALL ALL WALL MOUNTED SHORT THROW PROJECTOR ARM ASSEMBLY SMART BOARD “STSB” AND TEACHER STATION “TS” OUTLET BOXES AND EMT CONDUIT STUB OUTS AT ALL LOCATIONS.**

f. **BOTH THE TEACHER STATION “TS” AND SHORT THROW PROJECTOR ARM ASSEMBLY SMART BOARD “STSB” OUTLET FACEPLATE SHALL BE A GENERAL CONTRACTOR PROVIDED AND INSTALLED FACEPLATE ASSEMBLY WHICH SHALL BE A PASS & SEYMOUR DOUBLE GANG STAINLESS STEEL FACEPLATE WITH DUAL ROCKER PANEL HOLES PASS & SEYMOUR PART NUMBER# SSJ262.** **THE LEFT ROCKER PANEL ON EACH STAINLESS STEEL FACEPLATE SHALL BE INSTALLED WITH A MM ELECTRONICS DECORA CABLE PASS THROUGH MM ELECTRONICS PART NUMBER# 50-7405 ON THIS CONFIGURATION AT ALL LOCATIONS.**

g. **THIS INSTALLATION IS INCLUSIVE OF WALL MOUNTED PROJECTOR ARM ASSEMBLY SMART BOARD “STSB” OUTLET INSTALLED AT 96 INCHES A.F.F. ORIENTED PARALELL AND TO THE RIGHT SIDE OF THE WALL MOUNTED PROJECTOR ARM ASSEMBLY “STPJ”.**

h. **ADJACENT AND PARALELL TO ALL “STSB” OUTLETS AT 96 INCHES A.F.F. SHALL BE THE INSTALLATION OF ONE (1) D2 DATA OUTLET ASSEMBLY AND ONE (1) DUPLEX GENERAL POWER OUTLET ASSEMBLY.**
RECEPTACLE (FORMERLY THESE ITEMS WERE INSTALLED ON PROJECTOR PLATE ASSEMBLIES IN OPTION 1).

1. ALL TEACHER STATION "TS" OUTLETs SHALL BE INSTALLED AT EIGHTEEN INCHES A.F.F. ADJACENT AND PARALLELL TO THE TEACHER STATION D4 DATA OUTLET AND DUPLEX CLEAN POWER RECEPTACLE LOCATION IN ALL SPACES.

j. IN THIS CONFIGURATION OPTION BOTH THE TEACHER STATION "TS" OUTLET AND THE SMART BOARD "STSB" OUTLET BOXES SHALL BE INSTALLED COUPLED WITH VERTICAL 1 1/4 INCH EMT CONDUIT STUB OUTS INSTALLED (REAMED AND BUSHED TO ABOVE CEILING).

k. NOTE: DUE TO USB CABLE LIMITATIONS, THE DISTANCE BETWEEN THE "STSB" OUTLET BOX STUB OUT AND THE "TS" OUTLET BOX STUB OUT ABOVE CEILING SHALL BE NO MORE THAN TWELVE (12) FEET DISTANCE HORIZONTAL AT ALL INSTALLATION LOCATIONS WITH NO EXCEPTIONS.

l. NO INTERCONNECTING HORIZONTAL 1 1/4 INCH EMT CONDUIT SHALL BE INSTALLED BETWEEN THE "STSB" AND "TS" OUTLET BOXES AT ANY LOCATIONS IN THIS CONFIGURATION OPTION.

m. REFER TO SDOC DIVISION 27 STANDARDS AND SPECIFICATIONS SECTION 27.10.00 FOR IN-DEPTH DETAILS, FIGURES AND INSTALLATION SPECIFICS FOR SDOC SELECTED PROJECT OPTION.

2. THE SELECTED THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL / TECHNOLOGY SYSTEMS CONTRACTOR PROVIDES AND INSTALLS ALL SMART BOARD (SB OR STSB AND TS) EMT CONDUIT, DOUBLE GANG RECEPTACLE BOXES AND FACEPLATE CONFIGURATIONS AS SPECIFIED AND ASSOCIATED WITH EACH SPECIFIED SMART BOARD AND CEILING MOUNT PROJECTOR SYSTEM OR WALL MOUNT PROJECTOR AND MARKER BOARD SYSTEM INSTALLATION AS SELECTED AND IDENTIFIED ON ALL CONSTRUCTION TECHNOLOGY "T" SHEETS.

3. CABLING AND CONNECTIONS TO BE INSTALLED BY OTHERS AS SPECIFIED IN SDOC DIVISION 27 TECHNOLOGY SYSTEMS STANDARDS AND SPECIFICATIONS AND TECHNOLOGY SYSTEMS "T" SHEET CONSTRUCTION DETAILS.

15. HAND HELD RADIO MASTER UNIT STATION NOTES:

1. THIS "RMU" SYMBOL AND THE ASSOCIATED STATION REQUIREMENTS ARE ONLY INTENDED FOR INSERTION ON PLANS FOR NEW CONSTRUCTION LOCATIONS REQUIRING A NEW RADIO MASTER UNIT OR DURING RENOVATION PROJECTS REQUIRING RELOCATION OF AN Existing RADIO MASTER UNIT TO A NEW SPACE LOCATION AT EXISTING CAMPUS LOCATIONS.

2. HANDHELD RADIO MASTER UNIT "RMU" - WHEN INSERTED ON TECHNOLOGY SYSTEMS "T" SHEET PLANS THIS "RMU" SYMBOL DENOTES INSTALLATION LOCATION FOR A RADIO MASTER UNIT STATION WHICH REQUIRES AT 48 INCHES A.F.F. THE INSTALLATION OF CONDUIT STUB OUT FOR COAXIAL ANTENNA CABLING, GROUNDING BLOCK AND #6 GROUND CABLE TO LOCAL TGBB, DUPLEX GENERAL POWER RECEPTACLE AND FIXED SHELVING IN PREPARATION FOR HOUSING OF A FUTURE RADIO MASTER UNIT INSTALLATION PROVIDED AND INSTALLED BY OTHERS.

3. REFER TO SDOC DIVISION 27 TECHNOLOGY SYSTEMS STANDARDS AND SPECIFICATIONS FOR IN-DEPTH DETAILS AND INSTALLATION SPECIFICS.

4. WHEN A HANDHELD RADIO MASTER UNIT STATION INSTALLATION IS REQUIRED THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL CONTRACTOR PROVIDES AND INSTALLS ONE SINGLE GANG EMT BOX COUPLED TO A ONE (1) INCH EMT CONDUIT REAMED / BUSHED AND STUBBED OUT ABOVE CEILING AND SEALED WITH APPROPRIATE CAULK AROUND THE OUTER EMT CONDUIT SURFACE AT THE WALL PENETRATION LOCATION WHERE CONNECTIONS ARE INTENDED FOR A HAND HELD RADIO MASTER UNIT STATION LOCATION AS A FEED THROUGH FOR FUTURE CABLING, CONNECTIONS AND FACEPLATES TO BE INSTALLED BY OTHERS AS SDOC CONTRACTED.

5. SINGLE GANG RECEPTACLE BOX SHALL BE INSTALLED AT 48" A.F.F.U.O.N. LOCATIONS TO BE DESIGNATED BY AUTHORIZED SDOC REPRESENTATIVE.

6. THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL CONTRACTOR PROVIDES AND INSTALLS ADJACENT AND PARALLELL WITHIN TWENTY-FOUR INCHES OF THE HAND HELD RADIO MASTER UNIT STUB OUT BOX ONE (1) GENERAL POWER DUPLEX RECEPTACLE AND ONE (1) TWO INCH GROUNDING BLOCK WITH #6 GROUND CABLE (APPROPRIATELY SLEEVED TO ABOVE CEILING, SUPPORTED ABOVE CEILING AND STRAPPED TO TERMINATION LOCATION BELOW CEILING) TO LOCAL TGBB AT 48" A.F.F.U.O.N. LOCATION TO BE DETERMINED BY AUTHORIZED SDOC REPRESENTATIVES.
16. INTERCOM SYSTEM NOTES:

**ANALOG INTERCOM SYSTEMS INSTALLATION SPECIFICS**

1. THE PROJECT ARCHITECT, ENGINEER AND THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE ALL HEAD END EQUIPMENT, FIELD DEVICES, CABLING, SUPPORTS, PARTS, PIECES AND LABOR RELATED TO ALL ANALOG INTERCOM SYSTEMS INSTALLATIONS SHALL BE PERFORMED BY SDOC SELECTED INTERCOM CONTRACTOR. CONSULT INFORMATION AND TECHNOLOGY SERVICES DEPARTMENT TECHNOLOGY CONSTRUCTION PROJECT MANAGERS FOR INFORMATION ON SELECTED INTERCOM CONTRACTOR.

2. THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL / TECHNOLOGY / INTERCOM CONTRACTOR SHALL PROVIDE, HOMERUN INSTALL, SUPPORT, TERMINATE, TEST, LABEL AND SURGE PROTECT AND WARRANTY ALL ANALOG INTERCOM SYSTEMS INDIVIDUAL HOMERUN COPPER WEST PENN AQC369 (OR SDOC APPROVED EQUIVALENT) BACKBONE INTERCOM CABLES WHICH SHALL BE INSTALLED AS EXTERIOR COPPER BACKBONE CABLES TO FEED INTERCOM SIGNALING TO ALL INDIVIDUAL BUILDING INTERIOR STATION CALL BUTTONS, VOLUME CONTROLS, SPEAKERS AND HORNS HAVING NO ASSOCIATED CALL BUTTON OR VOLUME CONTROLS AND INDIVIDUAL SPEAKER GROUPS WITH CROSSCONNECT ACCOMPLISHED ON 66 BLOCK INSTALLATIONS IN THE MDF AND ALL SUBSEQUENT IDF CLOSET LOCATION (MAXIMUM OF 5 SPEAKERS/HORNS PER WEST PENN AQC369 CABLE) CAMPUS WIDE.

3. THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED INTERCOM CONTRACTOR SHALL PROVIDE, HOMERUN INSTALL, SUPPORT, TERMINATE, TEST, LABEL AND SURGE PROTECT AND WARRANTY ALL INDIVIDUAL WEST PENN AQC369 CABLES INSTALLED AS EXTERIOR BACKBONE CABLES FROM THE MDF TO EACH SUBSEQUENT IDF CLOSET THROUGH ALL ASSOCIATED PATHWAY VAULTS, MANHOLES, IN GROUND, ABOVE GROUND WALL MOUNTED AND ABOVE GROUND PEDESTAL MOUNTED FULL BOXES. ALL TERMINATIONS SHALL OCCUR IN THE MDF AND ALL SUBSEQUENT IDF CLOSETS U.O.N. AND ONLY ON SDOC DESIGNATED INTERCOM WALL FIELD VOICE AND DATA BACKBOARDS IN THESE CLOSET LOCATIONS. CONSULT CONFORMED CONSTRUCTION PLANS FOR SPECIFIC IDENTIFIED INTERCOM VOICE AND DATA BACKBOARD WALL SPACE AREAS AT EACH LOCATION.

4. THE PROJECT ARCHITECT, ENGINEER AND THE GENERAL CONTRACTOR SHALL ENSURE TWENTY PERCENT SPARE WEST PENN AQC369 BACKBONE INTERCOM CABLES ARE DESIGNED INTO EACH BUILDING INSTALLATION AND ARE INSTALLED, TERMINATED, TESTED, LABELED AND WARRANTED AT BOTH THE MDF AND EACH SUBSEQUENT IDF CAMPUS WIDE BY THE INTERCOM CONTRACTOR.

**IP DIGITAL INTERCOM SYSTEMS INSTALLATION SPECIFICS**

5. THE PROJECT ARCHITECT, ENGINEER AND THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE ALL MASTER IP GATEWAY UNIT HEAD END EQUIPMENT, REMOTE IP GATEWAY FIELD UNITS, FIELD DEVICES, CABLING, SUPPORTS, PARTS, PIECES AND LABOR RELATED TO ALL IP DIGITAL BASED INTERCOM SYSTEMS INSTALLATIONS SHALL BE PERFORMED BY SDOC SELECTED INTERCOM CONTRACTOR. CONSULT INFORMATION AND TECHNOLOGY SERVICES DEPARTMENT TECHNOLOGY CONSTRUCTION PROJECT MANAGERS FOR INFORMATION ON SELECTED INTERCOM CONTRACTOR.

6. THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL / TECHNOLOGY / INTERCOM CONTRACTOR SHALL PROVIDE AND INSTALL FIBER OPTIC EXTERIOR BACKBONE CABLE FROM THE MDF TO ALL SUBSEQUENT IDF CLOSET LOCATIONS IN EACH BUILDING CAMPUS WIDE FOR AMONG OTHER USES THE CONNECTIONS FOR THE INTERCOM SYSTEM ELECTRONICS INSTALLED AT ALL MDF AND ALL SUBSEQUENT IDF CLOSET LOCATIONS TO FEED INTERCOM SIGNALING TO ALL INDIVIDUAL BUILDING INTERIOR STATION CALL BUTTONS, VOLUME CONTROLS, SPEAKERS AND HORNS HAVING NO ASSOCIATED CALL BUTTON OR VOLUME CONTROLS AND INDIVIDUAL SPEAKER GROUPS WITH CROSSCONNECT ACCOMPLISHED ON 66 BLOCK INSTALLATIONS IN THE MDF AND ALL SUBSEQUENT IDF CLOSET LOCATIONS (MAXIMUM OF 5 SPEAKERS/HORNS PER WEST PENN AQC369 CABLE) CAMPUS WIDE.

7. TWO (2) STRANDS OF EACH INSTALLED TECHNOLOGY SYSTEMS FIBER OPTIC BACKBONE CABLE SHALL BE RESERVED AS INTERCOM CONNECTIONS FOR REMOTE IP GATEWAY FIELD UNITS WHERE SELECTED AND INSTALLED IN ALL DESIGNATED IDF CLOSETS.

8. IN THE EVENT (EXISTING RENOVATION SITES ETC.) THERE ARE INSUFFICIENT SPARE FIBER OPTIC BACKBONE CABLE STRANDS AVAILABLE FOR INTERCOM BACKBONE CONNECTIONS THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL / TECHNOLOGY / INTERCOM CONTRACTOR SHALL PROVIDE, HOMERUN INSTALL, SUPPORT, TERMINATE, TEST, LABEL AND WARRANT A NEW HOMERUN 50 MICRON MULTIMODE FIBER OPTIC CABLE WITH SUFFICIENT STRANDS AS DETERMINED BY SDOC INFORMATION AND TECHNOLOGY DEPARTMENT TECHNOLOGY CONSTRUCTION PROJECT MANAGERS TO ACCOMMODATE THE IP INTERCOM GATEWAY INSTALLATION. THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED INTERCOM CONTRACTOR (AS CONTRACTED BY GENERAL CONTRACTOR OR AS PROJECT CONTRACT DICTATES CONTRACTED TO SDOC) ENSURE ALL FIBER OPTIC CABLE SHALL BE PROVIDED, INSTALLED, TERMINATED, TESTED, LABELED AND WARRANTED IN THE
9. The general contractor shall provide, supervise and ensure the selected electrical/technology/intercom contractor shall provide all copper and fiber optic patch cords utilized for IP based intercom main/master unit and remote IP based intercom unit installation, initiate all connections and install each pair of these two (2) strands of fiber optic backbone cable to each remote IP gateway field unit installed at each designated IDF closet location and provide connections and install the far end of each of these selected two (2) strands for each IDF closet at the MDF location to the master IP gateway unit head end equipment.

10. IP based intercom system backbone cabling exceptions: At IP digital intercom installations special project specific circumstances may still exist that dictate exceptions requiring the specified installation of AQC 369 (or SDOC approved equivalent) copper intercom backbone cable runs. Examples are cost prohibitive installation of fiber optic cable and remote gateway intercom feeds at portable classroom intercom locations. Installation of copper backbone cables beyond the initial and main fiber optic backbone cable strands utilized for IP based intercom backbone include instances where smaller local intercom station runs are designed for installation on project campus stand alone buildings such as sport club houses, press boxes, ticket booths, portable installations etc. for these exceptions AQC 369 (or SDOC approved equivalent) copper intercom backbone cables shall be designed and installed from the nearest local MDF or IDF building closet where an IP based intercom main/master gateway unit or a remote IP gateway unit is installed. It shall be the responsibility of the site specific architect and project engineer to identify all such locations where AQC 369 or AQC 355 copper intercom backbone cabling is required and address all specific needs with SDOC technology construction project managers to identify the proper cable and counts for these installations at each site.

Analog and digital intercom systems cabling and field device installation specifics:

11. The general contractor shall provide, supervise and ensure the selected intercom contractor shall provide, homerun install, support, terminate, test, label and warranty each individual interior station cable in each building installed from the MDF and all subsequent IDF closet locations to feed intercom signaling to all individual building interior field device station call buttons, volume controls, speakers and horns having no associated call button or volume controls and individual speaker groups with crossconnect accomplished on 66 block installations in the MDF and all subsequent IDF closet locations (maximum of 5 speakers/horns per west penn AQC369 cable) as designed campus wide shall be individual homerun copper west penn 355 cables (or SDOC approved equivalent). All terminations shall occur only on SDOC designated intercom wall field voice and data backboards. Consult conformed construction plans for specific identified intercom voice and data backboard wall space areas at each location.

12. The general contractor shall provide, supervise and ensure the selected intercom contractor shall provide, support, install, terminate, test, label and warranty one (1) Copper west penn 291 cable (or SDOC approved equivalent) homerun without splices from each field device station call button or volume control to space speakers installed in classrooms and all associated spaces.

13. The general contractor shall provide, supervise and ensure the selected intercom contractor shall provide, install, terminate, test, label and warranty one (1) copper west penn AQC291 cable (or SDOC approved equivalent) from the MDF to each/all field device station speakers/horns having no associated call button or volume control with crossconnect in each IDF (maximum of 5 speakers/horns per cable).

14. The general contractor shall provide, supervise and ensure the selected intercom contractor shall provide, support, install, terminate, test, label, program, adjust and warranty all analog and IP digital installations inclusive of all applicable intercom headend components including yet not limited to one (1) atomic to master clock synchronization system assembly at the intercom headend inclusive of all programming, field cabling connections, surge suppression, supports, sleeving, and stubouts.

15. Where specified for installation the general contractor shall provide, supervise and ensure the intercom contractor shall provide, install, terminate, test, label the cabling, connections, programming and warranty of one (1) turnkey fully operable synchronized sixteen inch analog intercom clock system synchronized with the installed intercom headend inclusive of all cabling, clocks and components in each classroom, and as designated on conformed plans in office spaces, common areas, reception, dining room, kitchen, data entry, teacher lounge, and multipurpose areas campus wide. All synchronized
CLOCKS SHALL BE INSTALLED AT 96 INCHES ABOVE FINISHED FLOOR UNLESS OTHERWISE NOTED OR REQUIRED IAW PROJECT SPECIFIC DESIGN SPECIFICATIONS.

16. THE GENERAL CONTRACTOR SHALL PROVIDE AND INSTALL ALL INTERCOM SYCHRONIZED CLOCK EMT STUB OUT AND OUTLET BOX LOCATIONS AS INDICATED ON TECHNOLOGY “T” SHEET PLANS WHICH SHALL BE SINGLE GANG EMT BOXES INSTALLED AT 96 INCHES A.F.F. (OR SIX INCHES BELOW FINISHED CEILING) WHICH SHALL ROUTINELY BE INSTALLED ABOVE SPACE DOOR ENTRANCE OR IAW PROJECT SPECIFIC DESIGN SPECIFICATIONS. INTERCOM SYCHRONIZED CLOCK OUTLET BOX SHALL BE COUPLED TO ONE (1) ½ INCH EMT CONDUIT WHICH SHALL VERTICALLY STUB OUT REAMED AND BUSHED ABOVE CEILING IN THE DIRECT VICINITY OF A “J” HOOK SUPPORT SYSTEM OR WHERE SDOC APPROVED CABLE TRAY IS LOCATED FOR TRANSITION ABOVE DROP CEILING. A SECOND SECTION OF ¼ INCH EMT CONDUIT SHALL BE COUPLED FROM THE INTERCOM SYCHRONIZED CLOCK OUTLET BOX AND VERTICALLY EXTEND DOWNWARD AND COUPLE TO A CALL BUTTON / VOLUME CONTROL SINGLE GANG EMT OUTLET BOX LOCATION INSTALLED AT 48 INCHES A.F.F.

17. WHERE PROJECT SPECIFICATIONS PRECLUDE INSTALLATION OF SYCHRONIZED INTERCOM CLOCKS THE GENERAL CONTRACTOR SHALL STILL PROVIDE AND INSTALL ALL INTERCOM SYCHRONIZED CLOCK EMT STUB OUT AND OUTLET BOX LOCATIONS COUPLED TO EACH INTERCOM CALL BUTTON AND VOLUME CONTROL EMT STUB OUT AND OUTLET BOX LOCATION AND IN THE ABSENCE OF AN INSTALLED INTERCOM CLOCK SYSTEM SHALL PROVIDE AND INSTALL A BLANK SINGLE GANG STAINLESS STEEL COVER AT EACH LOCATION.

18. TECHNOLOGY SYSTEMS CONDUIT ROUTING NOTES:

1. THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL / TECHNOLOGY CONTRACTOR SHALL PROVIDE AND INSTALL ALL EMT, RIGID, AND PVC CONDUITS WHICH SHALL BE USED FOR ALL SPECIFIED CONDUIT INSTALLATIONS ABOVE AND BELOW GRADE.

2. ALL BURIED CONDUITS SHALL BE A MINIMUM OF 24” BELOW GRADE (TO THE TOP OF EACH CONDUIT). A MINIMUM SEPARATION OF ONE (1) FOOT/TWELVE (12) INCHES SHALL BE MAINTAINED BETWEEN ALL POWER CONDUITS AND ALL TECHNOLOGY SYSTEMS CONDUITS. FIRE ALARM CONDUIT AND CABLING SHALL NOT BE INSTALLED IN THE SAME TECHNOLOGY SYSTEMS CONDUITS, PULLBOXES, HAND HOLES, MANHOLES AND VAULT PATHWAYS AS TECHNOLOGY SYSTEMS CABLES.

3. THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL / TECHNOLOGY CONTRACTOR SHALL PROVIDE AND INSTALL A MINIMUM 24” AGGREGATE GRAVEL BASE IN THE FLOOR OF EACH COMMUNICATIONS VAULT OR MANHOLE AND A MINIMUM 6” AGGREGATE GRAVEL BASE IN THE FLOOR OF EACH COMMUNICATIONS PULL BOX AND HAND HOLE.

4. THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL / TECHNOLOGY CONTRACTOR SHALL PROVIDE, INSTALL AND ENSURE ALL CONDUIT ENTRY PENETRATION POINTS ON THE INTERIOR OF ALL BUILDING MDF AND IDF CLOSETS SHALL BE PROPERLY SEALED AND PACKED TO PREVENT GASES, RODENT AND INSECT INTRUSION.

5. THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL / TECHNOLOGY CONTRACTOR SHALL PROVIDE AND INSTALL ALL MANHOLES, VAULTS, FULL BOXES AND HAND HOLES WHICH SHALL HAVE TRAFFIC RATED COVERS MINIMUM 20,000 LBS RATED. ALL INSTALLATIONS SHALL BE IAW SDOC DIVISION 27 TECHNOLOGY SYSTEMS STANDARDS AND SPECIFICATIONS SECTION 27_02_00.

6. THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL / TECHNOLOGY CONTRACTOR SHALL PROVIDE AND INSTALL CABLE SUPPORTS IN THE FORM OF ADEQUATELY SIZED AND ADEQUATE COUNTS OF “J” HOOKS AND VELCRO WRAPS OF APPROPRIATE DURABILITY, WHICH SHALL BE SECURELY AND PERMANENTLY ANCHORED OR MANUFACTURER RECOMMENDED SUPPORTS OR A COMBINATION OF BOTH FOR ALL MANHOLES, VAULTS, FULL BOXES AND HAND HOLES.

7. ALL TECHNOLOGY SYSTEMS CABLES TRANSITIONING THROUGH MANHOLES, VAULTS, FULL BOXES AND HAND HOLES SHALL BE ADEQUATELY AND APPROPRIATELY SECURED AND SUPPORTED OFF THE FLOOR OF ALL SUCH PATHWAYS TO THE SATISFACTION OF SDOC INFORMATION AND TECHNOLOGY SERVICES DEPARTMENT TECHNOLOGY CONSTRUCTION PROJECT MANAGERS.

19. INTRUSION DETECTION SECURITY NOTES:

1. THE PROJECT ARCHITECT, ENGINEER AND THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE ALL INTRUSION DETECTION HEAD END MAIN PANEL EQUIPMENT, ZONE EXPANDER PANELS, DMP KEYPADS AND ALL ASSOCIATED COMPONENTS, FIELD DEVICES, CABLE, SUPPORTS, SLEEVING, PARTS, PIECES, PROGRAMMING AND LABOR RELATED TO ALL INTRUSION DETECTION SYSTEMS INSTALLATIONS SHALL BE PERFORMED BY SDOC PRE-APPROVED TRAINED PROFESSIONAL TECHNICIANS CURRENTLY CERTIFIED AND QUALIFIED AS DIGITAL MONITORING PRODUCTS “DMP” INSTALLERS “ONLY” FOR EVERY INTRUSION DETECTION TECHNOLOGY SYSTEM. CONSULT INFORMATION AND TECHNOLOGY SERVICES DEPARTMENT TECHNOLOGY CONSTRUCTION PROJECT MANAGERS PRIOR TO SELECTION OF PROSPECTIVE INTRUSION DETECTION CONTRACTORS TO ENSURE SDOC VERIFICATION OF ALL REQUIRED CREDENTIALS.
2. FOR ALL INSTALLATIONS OF SECURITY SYSTEMS BACKBONE CABLEING RUN OUTDOOR BETWEEN BUILDINGS AND BELOW SLABS THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL / TECHNOLOGY / DMP AUTHORIZED CONTRACTOR SHALL PROVIDE, HOMERUN INSTALL WITHOUT SPLICES, SUPPORT, SLEEVE, TERMINATE, TEST, LABEL AND WARRANTY IAW SDCC DIVISION 27 TECHNOLOGY SYSTEMS STANDARDS AND SPECIFICATIONS TWO (2) 18/4 UNSHIELDED WEST PENN AQ244 CABLES FROM THE MAIN "DMP" PANEL LOCATED IN THE MDF TO EACH SUBSEQUENT ZONE EXPANDER PANEL INSTALLED IN EACH IDF CLOSET LOCATION.

3. FOR ALL INTERBUILDING / ABOVE CEILING INSTALLATIONS OF SECURITY SYSTEMS BACKBONE CABLEING THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL / TECHNOLOGY / DMP AUTHORIZED CONTRACTOR SHALL PROVIDE, HOMERUN INSTALL WITHOUT SPLICES, SUPPORT, SLEEVE, TERMINATE, TEST, LABEL AND WARRANTY IAW SDCC DIVISION 27 TECHNOLOGY SYSTEMS STANDARDS AND SPECIFICATIONS TWO (2) 18/4 UNSHIELDED CABLES FROM THE MAIN "DMP" PANEL LOCATED IN THE MDF TO EACH SUBSEQUENT ZONE EXPANDER PANEL INSTALLED IN EACH IDF CLOSET LOCATION.

4. THE CONTRACTOR SHALL MAINTAIN A TEN (10) FOOT SERVICE SLACK ON EACH SECURITY SYSTEMS BACKBONE CABLE TERMINATING END, PROPERLY SUPPORTED, SLEEVED, LABELED, AND TESTED AT ALL POINTS. APPROPRIATE LABELING SCHEME FOR SECURITY BACKBONE CABLES SHALL BE SECBB1 THROUGH SECBB? WHATEVER THE NUMBER OF SECURITY BACKBONE CABLES INDICATED ON CONFORMED CONSTRUCTION PLAN "T" SHEETS FOR INSTALLATION.

5. AT EACH MDF AND ALL SUBSEQUENT IDF CLOSET LOCATIONS ALL SECURITY SYSTEMS BACKBONE CABLE SERVICE SLACK SHALL BE NEATLY INSTALLED, DRESSED AND SUPPORTED BELOW CEILING ON THE VOICE AND DATA BACKBOARD AT ASSIGNED RESPECTIVE SECURITY SYSTEMS COLOR CODED SECTION AND SHALL BE SUPPORTED AT THESE BACKBOARD LOCATIONS WITH MINIMUM THREE (3) "J" HOOKS PLACED AT EQUAL DISTANCES FOR A CIRCULAR TRANSITION THAT SHALL NOT VIOLATE MANUFACTURER'S RECOMMENDED BEND RADIUS SPECIFICATIONS. SERVICE SLACK SHALL BE SECURED WITH VELCRO WRAPS AT ALL "J" HOOKS AS A MINIMUM AND IN BETWEEN TO ELIMINATE AND PREVENT "FANOUT" AS DEEMED NEEDED BY SDCC INFORMATION AND TECHNOLOGY DEPARTMENT CONSTRUCTION PROJECT MANAGERS.

6. FROM THE MAIN "DMP" PANEL LOCATED IN THE MDF FOR THAT BUILDING AND FROM EACH SUBSEQUENT ZONE EXPANDER PANEL INSTALLED IN EACH IDF CLOSET LOCATION FOR EACH BUILDING AND FLOOR IN EACH BUILDING THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL / TECHNOLOGY / DMP AUTHORIZED CONTRACTOR SHALL PROVIDE, HOMERUN INSTALL WITHOUT SPLICES, SUPPORT, SLEEVE, TERMINATE, TEST, LABEL, PROGRAM AND WARRANTY THE FOLLOWING INTRUSION DETECTION FIELD DEVICES AS INDICATED ON CONFORMED CONSTRUCTION PLAN "T" SHEETS FOR INSTALLATION.

a. SDCC SPECIFIED 3/4" FLUSH MOUNTED DOOR CONTACT FIELD DEVICES. MANUFACTURER SHALL BE GE SENTR O 1078C "ONLY". (TYPICAL ALL DOOR CONTACTS). DOOR CONTACT FIELD DEVICES SHALL BE INSTALLED AT EACH IN WALL DOOR FRAME WITH 22/2 UNSHIELDED CABLE AT ALL EXTERIOR DOORS AND OTHER PROJECT SPECIFIC LOCATIONS IDENTIFIED AS REQUIRED. ITSD APPROPRIATE LABELING SCHEME FOR DOOR CONTACT FIELD DEVICES SHALL BE DC1 THROUGH DC? WHATEVER CONSECUTIVE NUMBER OF DOOR CONTACT FIELD DEVICES ARE ON ASSOCIATED PLAN. THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL CONTRACTOR SHALL PROVIDE AND INSTALL APPROPRIATLY SIZED PRE-DRILLED HOLES IN ALL DOOR FRAME LOCATIONS DRILLED TO ADEQUATELY SEAT ALL ¾ INCH DOOR CONTACT FIELD DEVICES AND SHALL PROVIDE AND INSTALL ALL DOUBLE GANG EMT BOXES AND ¾ INCH EMT CONDUIT COUPLED FROM EACH DOOR FRAME TO ALL DOUBLE GANG EMT BOXES INSTALLED AT ACCESSABLE LOCATIONS ABOVE CEILING AT ALL DESIGNATED KEYPAD FIELD DEVICE LOCATIONS. ALL DOUBLE GANG EMT BOXES SHALL BE INSTALLED WITH A COUPLER FOR PASSTHROUGH OF FIELD DEVICE CABLE.

b. AT PRE-EXISTING “RETROFIT ONLY” SITE LOCATIONS FOR INSTANCES “ONLY” WHERE DOOR FRAMES ARE CURRENTLY INSTALLED AND THEREFORE NOT PRE-DRILLED THESE APPLICABLE LOCATIONS “ONLY” REQUIRE THAT THE GENERAL CONTRACTOR IN LIEU OF ¾ INCH FLUSH MOUNT DOOR CONTACT FIELD DEVICES SHALL PRE-INSTALL AND PRE-WIRE A GE SENTR O 2500 SERIES CONTACT ASSEMBLY PART NUMBER 250SA-L FIELD DEVICE. INSTALLED ABOVE CEILING TO DOUBLE GANG EMT BOXES WHICH SHALL BE INSTALLED WITH A COUPLER FOR PASSTHROUGH AND CONNCETION OF 250SA-L FIELD DEVICE CABLING INSTALLED IAW SDCC DIVISION 27 TECHNOLOGY SYSTEMS STANDARDS AND SPECIFICATIONS (TYPICAL ALL PRE-EXISTING DOOR LOCATIONS).

c. SDCC SPECIFIED MOTION SENSOR FIELD DEVICES SHALL BE ROKONET 115FC OR ROKONET 150T AS APPLICATION DICTATES (TYPICAL ALL MOTION SENSOR LOCATIONS) AND SHALL BE INSTALLED WITH 22/4 UNSHIELDED CABLE TO EACH MOTION SENSOR FIELD DEVICE INSTALLED AT EACH SPACE LOCATION IDENTIFIED AS REQUIRED. CEILING MOUNTED MOTION SENSOR FIELD DEVICES SHALL BE SUPPORTED WITH CEILING GRID SUPPORTS AND MOUNTING PLATE. WALL MOUNTED MOTION SENSOR FIELD DEVICES SHALL BE INSTALLED WITH SINGLE GANG EMT BOXES INSTALLED AT 96 INCHES A.F.F. OR 6 INCHES BELOW INSTALLED CEILING HEIGHT AND SHALL BE COUPLED TO ¾ INCH EMT CONDUIT Stubbed OUT ABOVE CEILING REAMED AND BUSHED FOR FIELD DEVICE CABLE.
PASSTHRough. ITSD APPROPRIATE LABELING SCHEME FOR MOTION SENSORS SHALL BE MS1 THROUGH MS? WHATEVER THE NUMBER OF SENSORS ARE ON ASSOCIATED PLAN.

d. SDOC SPECIFIED STROBE AND SIREN FIELD DEVICE MANUFACTURER SHALL BE ELK 150 RT SIREN WITH ELK SL1 BLUE STROBE LIGHT (TYPICAL ALL SIREN AND STROBE ASSEMBLIES). STROBE AND SIREN FIELD DEVICES SHALL BE INSTALLED AT SDOC DESIGNATED EXTERIOR LOCATION(S) PER CONSTRUCTION PLAN WITH 18/2 UNSHIELDED CABLE AT ALL EXTERIOR SIREN AND STROBE ASSEMBLY LOCATION SPECIFIED AS REQUIRED. ALL INTERIOR TO EXTERIOR PENETRATIONS SHALL BE IAW SDOC DETAILS FOR WALL PENETRATIONS FOR FIELD DEVICE CABLEING. ITSD APPROPRIATE LABELING SCHEME FOR STROBE AND SIRENS SHALL BE SS1 THROUGH SS? WHATEVER THE NUMBER OF STROBES AND SIRENS ARE ON ASSOCIATED PLAN.

e. SDOC SPECIFIED KEYPAD FIELD DEVICES SHALL BE DMP 690 “ONLY” AT ALL DESIGNATED KEYPAD FIELD DEVICE LOCATIONS (TYPICAL ALL KEYPAD LOCATIONS) AND SHALL BE INSTALLED WITH 22/4 UNSHIELDED CABLE TO EACH KEYPAD FIELD DEVICE INSTALLED AT EACH SPACE LOCATION IDENTIFIED AS REQUIRED. ITSD APPROPRIATE LABELING SCHEME FOR KEYPAD FIELD DEVICES SHALL BE KP1 THROUGH KP? WHATEVER THE NUMBER OF KEYPAD FIELD DEVICES ARE ON ASSOCIATED PLAN. THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL CONTRACTOR SHALL PROVIDE AND INSTALL 4” x 4” DOUBLE GANG EMT BOXES AND 3/4” EMT CONDUIT STUB OUTS TO ACCESSABLE ABOVE CEILING LOCATIONS AT ALL DESIGNATED KEYPAD FIELD DEVICE LOCATIONS.

7. ALL INSTALLED INTRUSION DETECTION SYSTEM BACKBONE AND BUILDING FIELD DEVICE CABLE SHALL BE PROPERLY SUPPORTED, SLEEVED AND LABELED END TO END IAW ALL APPLICABLE SECTIONS OF SDOC DIVISION 27 TECHNOLOGY SYSTEMS STANDARDS AND SPECIFICATIONS. ALL INTRUSION DETECTION SYSTEM CABLES SHALL BE NEATLY DRESSED AND SUPPORTED, HOMERUN INSTALLED WITHOUT SPLICES BETWEEN THE ORIGINATING MDF AND ALL SUBSEQUENT IDF CLOSET LOCATIONS AND BETWEEN EACH FIELD DEVICE AND EACH RESPECTIVE MDF AND IDF PANEL. EACH FIELD DEVICE CABLE SHALL HAVE TEN (10) FEET OF SERVICE SLACK NEATLY INSTALLED DRESSED AND SUPPORTED IAW SDOC DIVISION 27 TECHNOLOGY SYSTEMS STANDARDS AND SPECIFICATIONS AT THE DEVICE TERMINATING END AND SECURED WITH TEN (10) FEET OF SERVICE SLACK AT ALL MDF AND IDF PANEL LOCATIONS.

8. THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED DMP AUTHORIZED INSTALLER/CONTRACTOR SHALL PROVIDE, INSTALL, TERMINATE ALL CABLING, TEST, LABEL, PROGRAM AND WARRANTY ONE (1) EACH CONTROL PANEL – (DMP-DIGITAL MONITORING PRODUCTS) DMP XR550NL “ONLY”. (L – ON THE END OF 500NL MEANS “LARGE” CABINET/ENCLOSURE) ALL CABLES SHALL BE LABELED ON BOTH ENDS WITH TYPEWRITTEN LABELS AND THE DOOR OF EACH PANEL SHALL BE LABELED WITH A TYPEWRITTEN CARD INDICATING ALL ZONES. CONSULT SDOC ITSD FOR APPROPRIATE LABELING SCHEME.

9. THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED DMP AUTHORIZED INSTALLER/CONTRACTOR PROVIDE AND INSTALL ONE (1) EACH – DMP ZONE EXPANDER “ONLY” – MINIMUM ONE (1) EACH AT ALL IDF AND MDF LOCATIONS AT ALL LOCATIONS WHICH HAVE ZONE EXPANDERS (PART NUMBERS ARE: 714-4 FOUR ZONE, 714-8 EIGHT ZONE AND 714-16 SIXTEEN ZONE EXPANDERS) INSTALLED. EACH ZONE EXPANDER SHALL BE APPROPRIATELY SIZED TO COVER ONE (1) ZONE FOR EACH DEVICE FED FROM THAT IDF OR MDF LOCATION AND ALLOWING TWO (2) SPARE ZONES ON EACH INSTALLED PANEL AT COMPLETION OF INSTALLATION.

10. THE MAIN PANEL AND EACH ZONE EXPANDER PANEL INSTALLED SHALL BE GROUNDED WITH ONE HOMERUN #6 COPPER STRANDED GREEN JACKETED GROUND CABLE INSTALLED METAL TO METAL FASTENED WITH SDOC APPROVED U/L COMPLIANT COMPONENTS AND FASTENERS FROM THE INTERIOR OF THE PANEL PASSING THROUGH A COUPLING DEVICE TO THE SPACE TELECOMMUNICATIONS GROUNDING BUS BAR AND FASTENED TO THE BUS BAR WITH SDOC APPROVED U/L COMPLIANT COMPONENTS AND FASTENERS.

11. EACH IDF AND MDF SHALL HAVE AN AUXILIARY POWER SUPPLY WITH BATTERY BACKUP INSTALLED. ALL BATTERY DEVICES INSTALLED SHALL BE LABELED WIGHT DATE OF INSTALLATION. ALL BATTERY BACKUP DEVICE CABLES SHALL BE LABELED ON BOTH ENDS WITH INDELIBLE TYPEWRITTEN LABELS. THE DOOR OF EACH PANEL SHALL BE LABELED WITH A TYPEWRITTEN CARD INDICATING ALL ZONES. ALL PHASES AND COMPONENTS OF EACH INSTALLATION SHALL BE IAW SDOC DIVISION 27 STANDARDS AND SPECIFICATIONS SECTION 27_06_00.

20. IP VIDEO SURVEILLANCE SYSTEM NOTES:

1. THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL / TECHNOLOGY CONTRACTOR SHALL BE RESPONSIBLE TO PROVIDE AND INSTALL, TERMINATE, TEST, LABEL AND WARRANTY ALL VIDEO SURVEILLANCE TECHNOLOGY SYSTEM PATHWAYS AND CABLES IAW ALL APPLICABLE SECTIONS OF THE CURRENT SDOC DIVISION 27 TECHNOLOGY SYSTEMS STANDARDS AND SPECIFICATIONS SECTION 27.07.00.

2. THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL / TECHNOLOGY CONTRACTOR SHALL PROVIDE AND INSTALL ALL WEATHER-PROOF SINGLE AND DOUBLE
DIVISION 27 00 00  
School District of Osceola County 
Technology Standards and Specifications  
ADDENDUM “B” 

GANG EMT BACKBOXES, WEATHER-PROOF COVERS, EMT CONDUIT AND PENETRATIONS AND SLEEVING AT EXTERIOR SURFACES INTO ACCESSIBLE INTERIOR CEILING SPACES, ALL THREE (3) FOOT LIQUIDTIGHT FLEX AND COUPLERS FOR EACH APPLICABLE CAMERA LOCATED ON THE EXTERIOR OF ALL BUILDINGS. ALL INTERIOR AND EXTERIOR EMT OR OTHER CONDUIT SHALL BE INSTALLED, REAMED, BUSHED, SUPPORTED, SLEEVED AND COUPLED TO DESIGNATED EMT OR OTHER BOXES. ALL INTERIOR AND EXTERIOR CONDUIT AND SLEEVES SHALL BE SEALED ON BOTH THE EXTERIOR OF THE CONDUIT AND THE INTERIOR OF ALL CONDUITS PLUGGED WITH REMOVABLE FIRE RETARDANT MATERIAL. ALL MATERIALS SHALL BE U/L APPROVED MATERIALS MANUFACTURED AND INTENDED TO MAINTAIN THE INTEGRITY AND FIRE OR SMOKE RATING OF EACH BARRIER. ALL ITEMS SHALL BE INSTALLED IAW ALL APPLICABLE SECTIONS OF THE CURRENT SDOC DIVISION 27 TECHNOLOGY SYSTEMS STANDARDS AND SPECIFICATIONS SECTION 27.07.00 AND ALL OTHER CODES AND DIRECTIVES AS APPLICABLE.

3. THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL / TECHNOLOGY CONTRACTOR PROVIDE AND INSTALL, TERMINATE, TEST, LABEL AND WARRANTY ALL VIDEO SURVEILLANCE TECHNOLOGY SYSTEM CATEGORY 6 CABLE. ONE (1) CATEGORY 6 CABLE SHALL BE HOMERUN INSTALLED FOR AND AT EACH INTERIOR AND EXTERIOR CAMERA LOCATION. ALL VIDEO SURVEILLANCE CATEGORY 6 CABLES SHALL BE INSTALLED IN STRICT ADHERENCE TO ALL STANDARDS AND SPECIFICATIONS REGARDING AND PERTAINING TO THE INSTALLATION OF CATEGORY 6 UTP CABLING END TO END FROM THE FIELD DEVICE END TO EACH MDF OR IDF SPACE. AT THE FIELD END OF EACH CATEGORY 6 CABLE THE TECHNOLOGY CONTRACTOR SHALL PROVIDE AND INSTALL ONE (1) FEMALE CATEGORY 6 RJ45 MODULE (NOT RJ45 CONNECTORS). AT ALL EXTERIOR CAMERA CATEGORY 6 CABLING INSTALLATION WEATHER-PROOF 4” x 4” BACK BOX LOCATION THE TECHNOLOGY CONTRACTOR SHALL PROVIDE AND INSTALL A MINIMUM SIX (6) INCHES OF SERVICE SLACK INTERIOR TO EACH BOX WITH EACH CATEGORY 6 RJ45 MODULE. ALL VIDEO SURVEILLANCE TECHNOLOGY SYSTEM CABLING SHALL BE INSTALLED WITH M Tournament six (10) FEET SERVICE SLACK AT FIELD DEVICE END ADJACENT TO THE SUIT OUT CONDUIT LOCATION AND WITH TEN (10) FEET SERVICE SLACK ABOVE CEILING IN THE MAIN CATEGORY 6 CABLE BUNDLE AT ALL MDF AND IDF TERMINATING END LOCATIONS.

4. SDOC APPROPRIATE LABELING SCHEME FOR INTERIOR AND EXTERIOR CAMERA CABLES SHALL BE FOR ALL INTERIOR (C2) CAMERAS C2 - 1 THROUGH C2 - ? WHATEVER CONSECUTIVE NUMBER OF INTERIOR (C2) CAMERA CABLES ARE ON ASSOCIATED PLAN AND FOR EXTERIOR (C1) CAMERA CABLES IS C1 - 1 THROUGH C1 - ? WHATSOEVER CONSECUTIVE NUMBER OF EXTERIOR (C1) CAMERA CABLES ARE ON ASSOCIATED PLAN.

5. THE OWNER (SDOC) SHALL PROVIDE, INSTALL, TEST AND ADJUST ALL EXTERIOR VIDEO SURVEILLANCE CAMERAS AT ALL EXTERIOR LOCATIONS INDICATED CAMPUS WIDE. ALL CAMERAS SHALL BE INSTALLED PER MANUFACTURERS RECOMMENDATIONS WITH NO EXCEPTIONS UTILIZING APPROVED OEM MOUNTS AND HARDWARE. EXTERIOR CAMERAS SHALL BE SECURED TO EXTERIOR WALLS WITH TAPCONS OR SDOC APPROVED FASTENING DEVICES ONLY.

6. THE OWNER (SDOC) SHALL PROVIDE, INSTALL, TEST AND ADJUST ALL INTERIOR VIDEO SURVEILLANCE CAMERAS AT ALL INTERIOR LOCATIONS INDICATED CAMPUS WIDE. ALL CAMERAS SHALL BE INSTALLED PER MANUFACTURERS RECOMMENDATIONS WITH NO EXCEPTIONS UTILIZING OWNER APPROVED TWO (2) FOOT METAL PLATES WITH SAFETY LANYARDS FOR CEILING GRID APPLICATIONS AND FOR HARD CEILING LOCATIONS SUPPORT BRACKETS AND HARDWARE AS SDOC APPROVED AND SPECIFIED IN DETAILS CALLED OUT IN SECTION 27.07.00. INTERIOR CAMERAS SHALL BE SECURED TO INTERIOR LOCATIONS WITH SDOC APPROVED FASTENING DEVICES ONLY.

7. FOR ALL HEAD END VIDEO SURVEILLANCE INSTALLATIONS THE SDOC MTSD SHALL PROVIDE, INSTALL AND TEST ALL APC UPS EQUIPMENT APPROPRIATELY SIZED TO MAINTAIN A CONTINUOUS ONE (1) HOUR DURATION UP TIME WITH SNMP MODULE “ONLY”. SDOC ITSD REPRESENTATIVES SHALL BE RESPONSIBLE TO COORDINATE AND SCHEDULE TO BE ON SITE AND WITNESS ALL VIDEO SURVEILLANCE CONNECTIONS, INSTALLATION AND INITIAL POWER UP AND TESTING OF ALL VIDEO SURVEILLANCE ELECTRONICS AND EQUIPMENT TO SDOC PROVIDED APC UPS EQUIPMENT. ALL INSTALLATIONS SHALL BE IAW SDOC DIVISION 27 TECHNOLOGY SYSTEMS STANDARDS AND SPECIFICATIONS SECTION 27.07.00.

21. WIRE MANAGEMENT, FREE STANDING RACKS AND SYSTEMS ENCLOSURES NOTES:

1. THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL / TECHNOLOGY CONTRACTOR PROVIDES AND INSTALLS ALL VERTICAL AND HORIZONTAL WIRE MANAGEMENT EQUIPMENT WHICH SHALL BE CHATSWORTH PRODUCTS, INC. CPI. ALL HORIZONTAL WIRE MANAGEMENT SHALL BE 2 RACK UNITS TALL CPI HORIZONTAL MANAGER PART NUMBER #30130-719. THIS IS A 19” BY 2 RMU MANAGER. THE CPI VERTICAL MANAGER IS PART NUMBER #30164-703. THIS IS A 7’ HIGH BY 3.65” WIDE BY 6” DEEP MANAGER. AS A ROUTINE CHATSWORTH MDF/IDF FREE STANDING TWO (2) POST RACK DIMENSIONS ARE 19” WIDE BY 84” HIGH CPI TWO POST RACK
PART NUMBER #55053-703 IS MOST OFTEN INSTALLED. ALL FREE STANDING TWO POST RACKS SHALL BE INSTALLED WITH CPI RACK BASE INSULATOR KIT PART NUMBER #10650-019 ALL ITEMS SHALL BE BLACK IN COLOR AND SHALL BE SECURED TO THE FLOOR WITH DRILLED HOLES INSERTED WITH LEAD EXPANSION ANCHORS AND BOLTED IN WITH HEAVY DUTY ¼ INCH STEEL ANCHOR BOLTS (TAPCONS ARE NOT ACCEPTABLE FASTENERS TO SECURE ANY FREE STANDING TWO POST RACK). THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL / TECHNOLOGY CONTRACTOR PROVIDES THREE (3) ADDITIONAL SPARE HORIZONTAL WIRE MANAGERS TO OWNER FOR EACH IDF/MDF CLOSET LOCATION IN ADDITION TO THE REQUIRED QUANTITY OF WIRE MANAGERS INDICATED FOR USE ON DETAILS FOR EACH CLOSET RACK OR CABINET.

2. ROUTINE FREE STANDING TWO (2) POST RACK PLACEMENT U.O.N. AND SDOC APPROVED SHALL BE A DISTANCE NOT LESS THAN FORTY EIGHT (48) INCHES FROM THE PHYSICAL REAR EDGE OF THE FOOT OF THE FREE STANDING RACK TO FINISHED VOICE AND DATA BACKBOARD. NOTE: IN INSTANCES WHERE THERE IS A CONCRETE CONDUIT CURB OR LIP BEFORE THE FINISHED VOICE AND DATA BACKBOARD THE MEASUREMENT SHALL NOT BE LESS THAN 48” FROM OUTER EDGE OF THE CONCRETE CURB OR LIP. IF UNCERTAIN CONSULT SDOC TECHNOLOGY CONSTRUCTION PROJECT MANAGER FOR APPROPRIATE FREE STANDING TWO (2) POST RACK PLACEMENT.

3. THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL / TECHNOLOGY CONTRACTOR PROVIDES AND Installs TWELVE (12) INCH WIDE TUBULAR METALLIC LADDER RACK / UNIVERSAL RUNWAY CPI PART NUMBER #10250-712 (BLACK IN COLOR) ABOVE ALL FREESTANDING TWO POST RACKS AS SHOWN ON CONSTRUCTION PLANS AND DETAILS. ALL LADDER RACK OR UNIVERSAL RUNWAY SHALL BE INSTALLED WITH ALL OEM MANUFACTURER AND SDOC SPECIFIED WALL ANGLE SUPPORT KIT CPI PART NUMBER #11421-712, RACK TO RUNWAY PLATE KIT CPI PART NUMBER #10595-712, PROTECTIVE END CAPS (PAIR) CPI PART NUMBER #10642-001 AND AS NEEDED TRIANGULAR SUPPORT CPI PART NUMBER #11312-712 AND JUNCTION SPICE KIT (PAIR) CPI PART NUMBER #16302-001 IN ADDITION TO SDOC APPROVED FASTENERS AND OTHER APPLICABLE PARTS AND PIECES IN ADDITION TO PLACEMENT OF END CAPS AT ALL EXPOSED ENDS.

4. THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL / TECHNOLOGY CONTRACTOR PROVIDE AND INSTALL ALL SYSTEMS ENCLOSURES REGARDLESS OF APPLICATION SUCH AS CAFETERIA OR COVERED PLAY AREA SOUND SYSTEM CABINET ENCLOSURES OR REPLACEMENT IDF CLOSET CABINET ENCLOSURES WHICH U.O.N. SHALL BE CHATS WORTH MEGA-FRAME SERIES ‘M’ CABINET ENCLOSURES “ONLY” DIMENSION 84”H X 39” D X 19”W CPI PART NUMBER #M1540-722. CONTRACTOR SHALL INCLUDE APPROPRIATE CHATS WORTH FAN ASSEMBLIES WITH EACH CABINET UNLESS OTHERWISE NOTED BY AUTHORIZED SDOC REPRESENTATIVES CPI FAN KIT PART NUMBER #12480-701. INSTALLATION OF WALL MOUNT HINGED DOOR CABINET ENCLOSURES ARE NOT ACCEPTABLE. ALL CABINET ENCLOSURES SHALL BE FLOOR MOUNTED AND ANCHORED WITH FOUR (4) REMOVEABLE FRONT, REAR AND SIDE PANELS AND TOP PANEL ASSEMBLY.

5. ALL UNIVERSAL RUNWAY, FREE STANDING TWO POST RACKS AND CABINET ASSEMBLIES SHALL BE SHALL BE GROUNDED WITH ONE HOMERUN #6 COPPER STRANDED GREEN JACKETED GROUND CABLE INSTALLED METAL TO METAL FASTENED WITH SDOC APPROVED U/L COMPLIANT COMPONENTS AND FASTENERS FROM THE FRAME FOR TWO POST RACKS AND UNIVERSAL RUNWAY AND FROM THE INTERIOR OF THE CABINET FRAME (NOT USING ANY THREADED SCREW HOLES INTENDED FOR EQUIPMENT MOUNTING) PASSING THROUGH A COUPLING DEVICE INSTALLED FOR FEED THROUGH ON CABINETS TO THE SPACE TELECOMMUNICATIONS GROUNDING BUS BAR WHERE THE GROUND CABLE SHALL BE FASTENED TO THE BUS BAR WITH SDOC APPROVED U/L COMPLIANT COMPONENTS AND FASTENERS.

6. ALL INSTALLATIONS SHALL BE IAW SDOC DIVISION 27 STANDARDS AND SPECIFICATIONS SECTION 27.02.00 AND OR OTHER SECTIONS WHERE APPLICABLE.

22. MDF AND IDF CLOSET BACKBOARDS:

1. THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL / TECHNOLOGY CONTRACTOR PROVIDES AND Installs ALL MDF/IDF TELECOMMUNICATIONS VOICE AND DATA BACKBOARDS WHICH SHALL BE READY SPEC BACKBOARDS PAINTED WITH FIRE RETARDANT PAINT LIGHT GRAY IN COLOR ON ¾ INCH “AC” GRADE PLYWOOD WITH 2 COATS ON ALL SIDES.

2. ALL READY SPEC BACKBOARDS SHALL BE INSTALLED WITH MANUFACTURER SUPPLIED FASTENERS IN ACCORDANCE WITH MANUFACTURER’S INSTALLATION SPECIFICATIONS.

3. IT SHALL BE THE RESPONSIBILITY OF THE PROJECT ENGINEER TO DETERMINE ADEQUATE QUANTITIES OF READY SPEC BACKBOARD REQUIRED FOR EIGHT FOOT PLYWOOD BORDER 360 DEGREES AROUND THE INTERIOR WALLS OF ALL MDF AND IDF WALL SPACE LOCATIONS WHERE FEASIBLE.

4. ALL WALL SPACE AREA UTILIZED FOR EACH APPROPRIATE SYSTEMS WALLFIELD SECTIONS IN ALL MDF AND IDF LOCATIONS SHALL BE IDENTIFIED DURING THE DESIGN PHASE AND ALL SECTIONS DESIGNATED BY AUTHORIZED SDOC ITS DEPARTMENT REPRESENTATIVES IN COORDINATION WITH THE PROJECT ARCHITECT AND ENGINEER.
5. ALL DESIGNATED WALL FIELD AREAS SHALL BE SEGMENTED AT THE RIGHT AND LEFT SIDE EDGES, TOP AND BOTTOM EDGES OF EACH TECHNOLOGY SYSTEM SECTION BY A FIRE RETARDANT PAINT BORDER CONSISTING OF TWO (2) INCH STRIPING WITH TWO (2) INCH LETTERED STENCILS AT THE RIGHT AND LEFT SIDES, TOP AND BOTTOM EDGES. REFERENCE MDF AND IDF PAINT DETAIL IN DIVISION 27 SECTION 27.00.00 APPENDIX “C” FOR BOTH COLOR STRIPING AND STENCIL DETAILS WHICH SHALL BE PAINTED WITH FIRE RETARDANT PAINT OF COLORS ESTABLISHED BY THE SDOC ITS DEPARTMENT AS SPECIFIC TO EACH DIFFERENT TECHNOLOGY SYSTEM.

6. REFER TO SDOC DIVISION 27 STANDARDS AND SPECIFICATIONS SECTION 27.00.00 APPENDIX “C” COLOR STANDARDS FOR SPECIFICS AND IN-DEPTH DETAIL.

23. **MDF CLOSETS:**

1. THE SDOC ESTABLISHED STANDARD FOR ALL NEWLY CONSTRUCTED AND RETROFITTED MDF CLOSETS IS TWENTY (20) FEET LONG BY TEN (10) FEET WIDE.


3. THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL CONTRACTOR SHALL PROVIDE AND INSTALL TWO (2) 208 VAC NEMA L6-30R RECEPTACLES INSTALLED FOR EVERY THREE (3) FREE STANDING SYSTEMS EQUIPMENT RACKS INSTALLED AT SDOC DESIGNATED LOCATIONS ON THE VOICE AND DATA BACKBOARD. EACH POWER RECEPTACLE SHALL BE DEDICATED, CLEAN POWER. CONTRACTOR SHALL PROVIDE AND INSTALL ONE (1) ADDITIONAL 208 VAC NEMA-L6-30R AT EIGHTY (80) INCHES A.F.F., U.O.N. AT THE SERVER RACK LOCATION. THESE DEDICATED CLEAN POWER RECEPTACLES SHALL BE INSTALLED FOR THE CONNECTION OF MULTI-OULTET SURGE SUPPRESSION DEVICES AND OR UPS TO SUPPORT THE LOCAL NETWORK ELECTRONICS INSTALLED IN THE SPACE.

4. IN ADDITION TO MEETING THE POWER REQUIREMENTS OF THE NETWORK ELECTRONICS THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL CONTRACTOR SHALL PROVIDE AND INSTALL 120 VAC 20-AMP DUPLEX CLEAN POWER RECEPTACLES STRATEGICALLY PLACED EVERY EIGHT (8) FEET MINIMUM OF ONE (1) PER WALL TO ACCOMMODATE THE INSTALLATION OF ANY FUTURE NECESSARY ELECTRONICS. THESE RECEPTACLES SHALL BE INSTALLED AT EIGHTY (80) INCHES A.F.F., U.O.N. TO BE UTILIZED FOR EQUIPMENT SUCH AS TELEPHONE SWITCHES, CATV DISTRIBUTION EQUIPMENT, INTERCOM AMPLIFIERS, ETC. THE DESIGN ENGINEER AND A SCHOOL DISTRICT REPRESENTATIVE SHALL DETERMINE FINAL DESIGN. ALL INSTALLATIONS SHALL BE IAW SDOC DIVISION 27 STANDARDS AND SPECIFICATIONS SECTION 27.02.00 AND OR OTHER SECTIONS WHERE APPLICABLE.

24. **IDF CLOSETS:**

1. THE SDOC ESTABLISHED STANDARD FOR ALL NEWLY CONSTRUCTED AND RETROFITTED IDF CLOSETS IS TEN (10) FEET LONG BY TEN (10) FEET WIDE.


3. THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL CONTRACTOR SHALL PROVIDE AND INSTALL MINIMUM ONE (1) 208 VAC NEMA L6-30R RECEPTACLE INSTALLED AT SDOC DESIGNATED LOCATIONS ON THE VOICE AND DATA BACKBOARD. EACH POWER RECEPTACLE SHALL BE DEDICATED, CLEAN POWER. THESE DEDICATED CLEAN POWER RECEPTACLES SHALL BE INSTALLED FOR THE CONNECTION OF MULTI-OULTET SURGE SUPPRESSION DEVICES AND OR UPS TO SUPPORT THE LOCAL NETWORK ELECTRONICS INSTALLED IN THE SPACE.

4. IN ADDITION TO MEETING THE POWER REQUIREMENTS OF THE NETWORK ELECTRONICS THE GENERAL CONTRACTOR SHALL PROVIDE, SUPERVISE AND ENSURE THE SELECTED ELECTRICAL CONTRACTOR SHALL PROVIDE AND INSTALL 120 VAC 20-AMP DUPLEX CLEAN POWER RECEPTACLES STRATEGICALLY PLACED EVERY EIGHT (8) FEET MINIMUM OF ONE (1) PER WALL TO ACCOMMODATE THE INSTALLATION OF ANY FUTURE NECESSARY ELECTRONICS. THESE RECEPTACLES SHALL BE INSTALLED AT EIGHTY (80) INCHES A.F.F., U.O.N. TO BE UTILIZED FOR EQUIPMENT SUCH AS TELEPHONE SWITCHES, CATV DISTRIBUTION EQUIPMENT, INTERCOM AMPLIFIERS, ETC. THE DESIGN ENGINEER AND A SCHOOL DISTRICT REPRESENTATIVE SHALL DETERMINE FINAL DESIGN. ALL INSTALLATIONS
25. CLEAN AND GENERAL POWER RECEPTACLES:

1. CLEAN POWER RECEPTACLES ALSO REFERRED TO AS COMPUTER OR DATA RECEPTACLES SHALL BE BLACK IN COLOR WITH STAINLESS STEEL FACEPLATES WITH NO EXCEPTIONS.

2. ALL CLEAN POWER RECEPTACLES SHALL BE LABELED BY THE GENERAL CONTRACTOR WITH CONTRACTOR PROVIDED AND INSTALLED TYPEWRITTEN LABELS IAW WITH DIVISION 27 STANDARDS AND SPECIFICATIONS. ALL LABELS SHALL BE ON EACH FACEPLATE WITH THE PANEL NUMBER AND CIRCUIT BREAKER NUMBER FEEDING THAT SPECIFIC CLEAN POWER RECEPTACLE AT ALL LOCATIONS WITH NO EXCEPTION.

3. GENERAL USE POWER RECEPTACLES SHALL BE GRAY OR IVORY IN COLOR WITH STAINLESS STEEL FACEPLATES OR AS DESIGNED AND DICTATED BY THE ARCHITECT AND OR ELECTRICAL ENGINEER.


5. ALL CONSTRUCTION SERVICES DEPARTMENT PROJECT MANAGERS, ALL GENERAL CONTRACTOR SUPERINTENDENTS AND THEIR PROJECT MANAGERS, ALL ELECTRICAL CONTRACTORS AND THEIR TECHNOLOGY SYSTEMS INSTALLATION SUB-CONTRACTORS AND THEIR SUB-CONTRACTORS SHALL BE AWARE OF THE FOLLOWING INFORMATION REGARDING THE PLACEMENT AND INSTALLATION LOCATION OF CLEAN POWER RECEPTACLES AND COMMUNICATION OUTLETS:
   a. NO CLEAN POWER RECEPTACLE AND ASSOCIATED COMMUNICATION OUTLET SHALL BE INSTALLED "WITHIN" FURNITURE CUTOUTS OR COVERED BY THE INSTALLATION OF PERMANENTLY FIXED OR MOVEABLE MODULAR FURNITURE OR CABINETRY. ALL ISSUES ARISING WITH REGARD TO THIS SITUATION SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE PROJECT ENGINEER AND THE SDOC TECHNOLOGY SERVICES DEPARTMENT TECHNOLOGY SYSTEMS CONSTRUCTION PROJECT MANAGERS WHERE IMMEDIATE CORRECTIVE ACTION SHALL BE TAKEN. IN INSTANCES WHERE THIS IS NOT IDENTIFIED AND RESOLVED PRIOR TO THE COUNTER OR FURNITURE BEING INSTALLED AS WELL AS ALL OTHER CIRCUMSTANCES WHERE THIS IS AN ISSUE WHEN IDENTIFIED IT IS MANDATORY THAT PROJECT ENGINEER AND SITE CONSTRUCTION SUPERINTENDENT AND THEIR PROJECT MANAGERS TAKE IMMEDIATE CORRECTIVE ACTION AND IN EACH INSTANCE THE CLEAN POWER RECEPTACLES AND ASSOCIATED COMMUNICATION OUTLETS IN QUESTION SHALL IMMEDIATELY RELOCATED TO AN APPROPRIATE AND USEABLE LOCATION AS APPROVED BY THE PROJECT ARCHITECT, ENGINEER AND SDOC CONSTRUCTION SERVICES DEPARTMENT PROJECT MANAGERS, TECHNOLOGY CONSTRUCTION MANAGER.
   b. CLEAN POWER RECEPTACLES AND ASSOCIATED COMMUNICATION OUTLETS PURPOSLY INTENDED FOR INSTALLATION IN FIXED OR MOVEABLE MODULAR FURNITURE OR CABINETRY SHALL BE WELL ANNOTATATED AS SUCH ON ALL CONSTRUCTION DOCUMENTS, PLANS AND SPECIFICATIONS IN PREPARATION OR THIS PRACTICE SHALL NOT OCCUR. IT IS IMPLIED AND UNDERSTOOD FOR THE INFORMATION OF ALL FACILITIES AND CONSTRUCTION SERVICES DEPARTMENT PROJECT MANAGERS, TECHNOLOGY CONSTRUCTION MANAGERS, ELECTRICAL CONTRACTORS, PROJECT ENGINEERS AND SITE CONSTRUCTION SUPERINTENDENTS AND THEIR PROJECT MANAGERS THAT OTHER THAN THOSE CLEAN POWER RECEPTACLES AND ASSOCIATED COMMUNICATION OUTLETS DESIGNED AND NOTED FOR INSTALLATION IN THIS MANNER NO OTHER CLEAN POWER RECEPTACLES AND ASSOCIATED COMMUNICATION OUTLETS ARE TO BE INSTALLED IN THIS MANNER WITH NO EXCEPTION.
   c. EACH CLASSROOM SHALL HAVE A DEDICATED CLEAN POWER CIRCUIT FOR ALL CLEAN POWER RECEPTACLES.
   d. ALL ADMINISTRATIVE LOCATIONS SHALL HAVE A DEDICATED CLEAN POWER CIRCUIT FOR ALL CLEAN POWER RECEPTACLES AT ALL WORKSTATIONS.
   e. ALL TEACHER WORKROOMS WITH AT LEAST ONE WORKSTATION SHALL HAVE A DEDICATED CLEAN POWER CIRCUIT FOR ALL CLEAN POWER RECEPTACLES.
   f. DEDICATED CLEAN POWER RECEPTACLES SHALL BE PROVIDED AND INSTALLED ADJACENT TO EACH INSTALLED COMMUNICATIONS DATA OUTLET AND SHALL BE INSTALLED PARALELL TO EACH DATA OUTLET AT NOT MORE THAN TWLEVE (12) TO TWENTY-FOUR (24) INCHES OF SEPARATION.
DIVISION 27 00 00
School District of Osceola County
Technology Standards and Specifications
ADDENDUM “B”

g. EACH D1 THROUGH D4 DATA OUTLET INSTALLED SHALL BE INSTALLED WITH A DUPLEX CLEAN POWER RECEPTACLE AT EACH LOCATION.

h. EACH D6 DATA OUTLET SHALL BE INSTALLED WITH A QUAD CLEAN POWER RECEPTACLE AT EACH LOCATION.

i. IN INSTANCES WHERE DATA OUTLET PORT QUANTITIES INCREASE ABOVE SIX (6) PORTS ADDITIONAL QUAD OR DUPLEX RECEPTACLES AS REQUIRED SHALL BE INSTALLED IN INCREMENTS TO ACCOMMODATE THE ADDITIONAL DATA PORT INCREASES USING THE DIRECTIVE GUIDELINES DETAILED IN THIS SECTION.

j. EXCEPTIONS:
   - AUDIO ENHANCEMENT OUTLET POWER RECEPTACLES
   - SMARTBOARD OUTLET POWER RECEPTACLES
   - PROJECTOR PLATE POWER RECEPTACLES
   - SOUND SYSTEM POWER RECEPTACLES

   THESE LOCATIONS REQUIRE GENERAL POWER “ONLY”. THESE RECEPTACLES SHALL NOT BE INSTALLED AS CLEAN POWER RECEPTACLES AND NOT WITH CLEAN POWER CIRCUITS.
SDOC TECHNOLOGY COLOR STANDARD

1) Voice and Data Backboard and Two (2) Inch Border Colors:

All SDOC Voice and Data Backboards in all MDF and IDF closet locations and all other SDOC voice and data backboard locations shall be painted with UL Classified Fire Retardant Latex paint with no exceptions.

All SDOC Voice and Data Backboards in all MDF and IDF closet locations and all other SDOC voice and data backboard locations shall be primarily painted a light gray color of a shade of paint approved by SDOC ITS Department with no exceptions.

All SDOC Voice and Data Backboards in all MDF and IDF closet locations shall be painted with secondary BORDER STRIPING colors and lettering with UL Classified Fire Retardant Latex paint utilizing the SDOC specified color code below for each technology system with a two (2) inch BORDER and two inch stenciled letters of a shade of paint approved by SDOC ITS Department with no exceptions. The colors shall be as follows:

- **Fire Alarm Systems Backboard Two Inch Border - Red**
- **Intrusion and Video Security Systems Backboard Two Inch Border - Orange**
- **HVAC/Auxiliary Systems Backboard Two Inch Border - White**
- **Intercom Systems Backboard Two Inch Border - Blue**
- **Voice and Data cabling Backboard Two Inch Border - Yellow**
• Outside Services fiber optic, telephone and television Provider / Carrier DEMARC Equipment Service Entrance Backboard Two Inch Border - VIOLET or PURPLE (NOTE: THE PURPLE STRIPING BORDER AND STENCILS ARE “ONLY” INSTALLED AT THE MDF LOCATION AS THIS IS THE “ONLY” AREA ESTABLISHED FOR INCOMING OUTSIDE SERVICES PROVIDERS FROM THE STREET. THE PURPLE STRIPING BORDER IS NOT PAINTED ON AT ANY IDF LOCATION.)

• CATV Television Distribution Backboard Two Inch Border – Green (“ONLY” INSTALLED IF SPECIFIED FOR INSTALLATION ON CONFORMED CONSTRUCTION PLAN DOCUMENTS.)

2) VOICE AND DATA BACKBOARD INSTALLATION NOTE:

Insure all VDBB system BORDER STRIPE color locations for ALL VOICE AND DATA BACKBOARDS are seamless and butt to one another at all locations in every communications closet. There shall be no “GAPS” of separation between system backboard BORDERS of differing color systems stripes at any location. This shall be typical for all installations.

The SDOC approved format for the painting of all BORDER STRIPES is available for reference in SAMPLE PICTURES ONE (1) through FOUR (4) below.

3) PATCH CORD / PATCH CABLE COLORS AND ASSOCIATED TECHNOLOGY:

• Yellow and Blue **Patch Cables** - General Network Data and Telephone Communications Patching.
• Orange **Patch Cables** – Security - Intrusion Detection and Video Surveillance Patching.
• Black – VoIP – Voice over IP Telephone Patching.
• Pink – Wireless Access Point Patching.
• Red – Crossover Cable Patching.
• Violet or Purple – Server Patching.
• Green – Intercom Systems, IP Television and Media Retrieval Connection Patching.
• Gray – Printer Patching.
SAMPLE #1 VOICE / DATA BACKBOARD SAMPLE CONFIGURATION “TYPICAL”

WALL FIELD BACKBOARDS FOR TECHNOLOGY SYSTEMS AS INDICATED ON CONSTRUCTION PLANS – CONTRACTOR SHALL PROVIDE AND INSTALL SDOC SPECIFIED “ReadySPEC” MANUFACTURED BACKBOARD WHICH SHALL BE 4’ BY 4’ SECTIONS OF ¾ INCH PLYWOOD 8’ IN HEIGHT AROUND THE ENTIRE PERIMETER OF EACH MDF AND IDF CLOSET. ALL BACKBOARD PAINT COLOR SHALL BE TWO (2) COATS OF LIGHT GRAY FIRE-RETARDANT PAINT WITH A SECONDARY BORDER FIRE-RETARDANT PAINT WHICH SHALL BE 2” BORDER TWO SIDES, TOP AND BOTTOM WITH 2” STENCILS PAINTED TWO SIDES, TOP AND BOTTOM IN 2” STENCILLED LETTERS FOR EACH APPLICABLE SYSTEM. PAINT BORDER AND STENCILS SHALL BE INSTALLED IN DISTINCT COLORS AS SDOC MANDATED AND INDICATED FOR EACH VOICE AND DATA BACKBOARD SECTION.

SAMPLE #1 VOICE / DATA BACKBOARD SAMPLE CONFIGURATION “TYPICAL”
SAMPLE #2 BORDER STRIPE PAINT INSTALLATIONS “TYPICAL”
SAMPLE #3 BORDER STRIPE PAINT INSTALLATIONS “TYPICAL”
SAMPLE #4 BORDER STRIPE PAINT INSTALLATIONS “TYPICAL”
SAMPLE #5 BORDER STRIPE PAINT INSTALLATIONS “TYPICAL”
SDOC TECHNOLOGY VARIANCE SHEET

Technology Standards Variance Request Sheet

To request an exception or change to the School District of Osceola County’s Technology Systems Specified components complete and submit this sheet to the Facilities Planning Project Coordinator for the site specific project. The SDOC Information and Technology Services Department Technology Construction Project Manager will review requests within one (1) five (5) day work week of receipt and respond with approval or denial by contact with the Project Coordinator. Deviation from any School District of Osceola County Technology Standards shall not be acceptable without prior approval of the SDOC ITS department.

Project Coordinator ____________________________
Project involved ______________________________
Date Variance Requested ______________________
Requesting Agency ____________________________

Variance Requested:
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

Reason for Variance Request:
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

SDOC ITSD Approval:
______________________________________________________________________________
______________________________________________________________________________

ITSD Signature: __________________________________________

Date Approved: ____________________________
SDOC Cable Testing and Substantial Inspection and 10% Re-Testing Notice


1.01 Initial Cable Testing:

A. The general contractor shall provide, supervise and ensure the selected technology systems contractor(s) shall test all installations of fiber optic and all UTP copper data and other copper technology systems cables.

B. Upon receipt at project site the project engineer and the general contractor shall ensure the selected technology contractor shall test all optical fiber cabling strands while still on the cable reels. The contracted technology systems contractor shall utilize an OTDR to verify the cable length and to identify and locate any cable defects, splices and connectors including the loss value of each fiber optic strand. All strands of all fiber optic cable shall be tested prior to installation to determine continuity of each strand end to end and shall be determined to be free of defect with documented proof. Technology contractor shall retain the test data and include the record for owner retention at project completion. All fiber optic and copper cables found defective shall be replaced with cabling free of faults prior to installation.

C. Upon completion of backbone fiber optic cable installation of the fiber optic cabling the general contractor shall provide, supervise and ensure the selected technology contractor shall conduct testing of all fiber optic cabling and connectors from one end with an OTDR with launch fibers at both ends for every installed strand.

D. Upon completion of all backbone copper installation the general contractor shall provide, supervise and ensure the selected technology contractor shall conduct testing of all backbone copper cable which shall include proper cable location identification, verification of cable continuity and verification of proper pair sequencing and in addition as a minimum the use of typical ohm meter test equipment for identification and elimination of any and all shorts, opens, grounds and where applicable and necessary shall conduct cable insulation tests accomplished with the use of megger test equipment.
for backbone telephone, coaxial, and security low voltage cables installed. All cable testing shall be as required IAW SDOC Division 27 Technology Systems Standards and Specifications and all cable and component specific manufacturer’s warranty program specifications.

E. Upon completion of installation of the Category 6 cabling infrastructure technology system, the general contractor shall provide, supervise and ensure the selected technology contractor shall conduct testing of all interior infrastructure UTP Category 6 (or above as mandated by project specifications) data copper cable which shall be accomplished as a minimum by typical UTP lanmeter test equipment and all other test equipment required for proper verification as mandated IAW SDOC Division 27 Technology Systems Standards and Specifications and as mandated by manufacturers cabling system warranty program.

F. Each single “WAP” field end device cable shall be Category 6 compliant cable and shall have RJ45 modules installed, terminated, tested, labeled and warranted from module to Category 6 patch panel port in the same manner as all other Category 6 cables installed in the technology UTP category 6 copper data cable system. Cable test results shall be provided by contractor for owner retention as part of the overall UTP Category 6 (or above as mandated by project specifications) copper data cable system installation.

G. Upon completion of all other copper cabling installations the general contractor shall provide, supervise and ensure the selected technology contractor shall conduct testing of all other interior infrastructure technology systems copper cables including yet not limited to telephone, coaxial, and security low voltage cables installed in addition to interior infrastructure UTP Category 6 cable installations. Testing shall include proper cable location identification, verification of cable continuity and verification of proper pair sequencing and in addition as a minimum with the use of typical ohm meter test equipment in addition to identification and elimination of any and all shorts, opens, grounds and where applicable and necessary shall conduct cable insulation tests accomplished with the use of megger test equipment for telephone, coaxial, and security low voltage cables installed. All testing shall be as required as mandated IAW SDOC Division 27 Technology Systems Standards and Specifications and as mandated by manufacturers cabling system warranty programs.

H. Prior to substantial completion the general contractor shall ensure the selected technology contractor initially provides in written format a copy of all cable test results to and for review by the project engineer.

I. After all cable test results are received and reviewed by the engineer at substantial completion a ten percent re-test is scheduled and conducted with the verified accurate technology contractor generated and provided paper test results copy.
1.02 Fiber Optic and Category 6 Copper Cable Ten Percent Re-testing:

A. At substantial completion, the general contractor shall provide, supervise and ensure the project engineer and selected technology contractor participate in a ten percent retest of all UTP Category 6 copper data and single mode and multimode fiber optic cable installed with the owner for verification of initially documented test results to insure all cabling is within all desired parameters as documented. The contractor provided paper copy shall be utilized by the project engineer and SDOC Information and Technology Systems Construction Project Manager during 10% re-testing for random test comparisons.

B. During substantial completion ten percent of all test results are re-tested and verified as passed, approved and accepted by the project engineer with all identified exceptions addressed and corrected on the final test result documentation. Upon completion of ten percent re-test the technology contractor shall furnish the final test results to the project engineer as a clean set of refreshed paper and electronic test result copies for all cabling installed. With all cabling re-tests complete and all results reviewed and accepted by the engineer the final passed test results for all fiber optic and copper cable infrastructure shall be submitted by the project engineer to the owner in both written paper and electronic format for retention at closeout of project.

C. Prior to commencement of the ten percent re-test the technology contractor shall be responsible to have on site and operationally ready the following items:

- Fiber optic test equipment including OTDR and Field Strength Meters
- UTP LAN Meter testers
- Multimeters
- Other test equipment as necessary

D. Only test equipment utilized for initial actual testing is authorized to be utilized for the ten percent re-test as well.

E. All test equipment utilized for initial actual testing and for on-site ten percent re-test for inspection shall in preparation be on site and pre-tested the same day for functionality and appropriate battery life in order to be prepared on the day of inspection.
F. All test equipment utilized for initial actual testing and for on-site ten percent re-test for inspection shall be currently calibrated with calibration stickers on the equipment where calibration of equipment is applicable.

G. For initial actual testing and for on-site ten percent re-test for inspection, all contractors shall provide and utilize test equipment only having current calibration stickers with legible permanent dates posted within current applicable specified calibration periods. All test equipment utilized shall have a legible calibration sticker affixed in place.

H. During the entirety of the project from the beginning of construction phase to the final completion phase all test equipment shall be produced upon request for SDOC inspection prior to use and all equipment having calibration found expired, missing and or with the appearance of being altered shall be rejected and metered testing shall only commence when appropriately calibrated and labeled test equipment is on site and approved for use by SDOC Information and Technology Services Department Construction Project Managers.

I. For the technology systems re-test and inspection the technology contractor shall be responsible to have on site and operationally ready the following items:

- All needed tools and any keys required for access to spaces, electrical panels and all other spaces or equipment.
- Flashlights, ladders or other tools for inspection.

J. With the SDOC ITS Department Technology Systems Construction Project Manager as witness the project engineer shall be responsible to conduct a minimum ten per-cent re-test with specified test equipment of the following technology cable systems:

- All installed and terminated fiber optic cables
- All installed and terminated Category 6 copper cables
- All other site fiber optic and copper cables both backbone and supporting infrastructure cables
K. With the SDOC ITS Department Technology Systems Construction Project Manager as witness the project engineer shall be responsible to conduct a walkthrough inspection of all MDF and IDF spaces and random locations campus wide to identify any outstanding issues for correction and completion including but not limited to the following:

- Labeling of all cabling, patch panels and field data outlets, power receptacles and any other labeling issue identified to SDOC specifications and satisfaction.
- Appropriate and adequate grounding of all installed technology systems, freestanding racks, ladder racks, technology and sound system cabinets and any other grounding system identified to SDOC specifications and satisfaction.
- Isolation kits and pads including washers and inserts installed on all freestanding racks to SDOC specifications and satisfaction.
- Freestanding racks and cabinets installed, fastened and secured properly with SDOC approved hardware at proper distances and locations to SDOC specifications and satisfaction. All voice and data backboards fastened and secured properly with SDOC approved hardware.
- Space cleanliness of all spaces and especially in all MDF and IDF spaces including neatness and routing of cables for technology installation, dust and debris free status of all cabling, patch panels, freestanding racks, ladder racks, all equipment, hardware and components. All voice and data backboards smudge and dirt free with clean fresh paint and painted with appropriate SDOC specified color border striping and stencils.
- Other issues and items as SDOC identified for completion and correction.

L. Technology Contractor and project engineer shall be responsible to schedule adequate time and be prepared for a thorough walkthrough inspection of the MDF and all IDF spaces, random offices, classrooms and above ceiling for observations as selected by SDOC ITS Department Technology Systems Construction Project Manager during the on-site inspection.
M. Project engineer shall receive, review, approve and insure the technology systems contractor shall address and correct all test results for both the fiber optic and all copper cabling installed for the project as a whole.

N. When any and all issues identified by the project engineer are addressed and corrected by the technology contractor to the satisfaction of the project engineer and the owner (SDOC) the final “clean and corrected” test results copy shall be provided in the requested formats by the project engineer to the owner (SDOC) for retention.
A. All contractors for all SDOC projects shall at a minimum provide and install the appropriate UL approved fire rated wall and floor penetration materials for all technology installation sleeving penetrating fire and smoke rated walls and floors. All applicable penetration installations shall be indicated on technology systems plans and installations and shall be installed in full compliance with the following detail as well as in full compliance with all details and notes generated by project architects and engineers.

Introduction:

The intent of this document is to assist architects, certified designers, professional engineers and Registered Communications Distribution Designers (RCDD) in the preparation of School District of Osceola County, Florida (SDOC) conformed telecommunications/technology documents in the appropriate format that shall accompany a complete set of SDOC conformed telecommunications plans and specifications for new construction, retrofit, major/minor renovation technology projects and all other construction projects including projects where existing technology has the potential to be affected under the governing jurisdiction of the School District of Osceola County, Florida.

Further, this document shall be considered the standard by which all low voltage telecommunications/technology infrastructure and equipment shall be installed district wide. Regardless of the scope of project the application of this technology document shall be mandatory and all information complied with and utilized with strict adherence regardless the supervising department or authority managing the specific SDOC installation with no exception.

Recommended substitutions or alterations to any portion of this document or deviation from any of these established standards and specifications shall in all instances require prior approval obtained through the SDOC Information and Technology Services Department (ITSD) Authorized Representatives with no exception.
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Glossary of Abbreviations:

A/C – Air Conditioning
A/E – Audio Enhancement
A.F.F. – Above Finished Floor
BICSI – Building Industry Consulting Service International
CATV – Cable Television
CB – Intercom Call Button
CCTV – Closed Circuit Television
CK - Intercom Clock
CSD – Construction Services Department
CTED – Career and Technical Education Department
DATA DROP – One single data cable and module and port termination at a remote patch panel location
DATA OUTLET – D1, D2, D4, D6 or other data station
DATA PORT – One single data cable and module and port termination at a remote patch panel location
DVR – Digital Video Recorder
ESD – Electro Static Discharge
GC – General Contractor
HVAC – Heating Ventilation and Air Conditioning
IDF – Intermediate Distribution Frame
IDS – Intrusion Detection System
ISD – Information Services Department
ITSD – Information and Technology Services Department

LIU – Light Interconnect Unit

MDF – Main Distribution Frame

MITD – Media and Informational Technology Department

OAC – Owner, Architect and Contractor

P.O.S. – Point Of Sale

PJ – Ceiling Mount Projector Assembly

RCDD - Registered Communications Distribution Designer

RJ45 CONNECTOR – End of a patch cord to be inserted into a RJ45 module

RJ45 MODULE – Single port to connect with patch cord to an electronic device (same as data jack)

SB – Smart Board Outlet

SDOC – School District of Osceola County

STPJ – Short Throw Projector Assembly

STSB – Short Throw Projector Outlet

TBD – To be determined / decided

TGBB – Telecommunications Grounding Bus Bar

TMGBB – Telecommunications Main Grounding Bus Bar

TS – Teacher Station Outlet

U.O.N. – Unless otherwise noted

VC – Volume Control

VDBB – Voice and Data Backboard

VSS – Video Surveillance System

WAP – Wireless Access Point Data Drop
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DESIGN REQUIREMENTS


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1.01 SUMMARY:

A. Communication technologies are a critical element in the design of all new, renovated and retrofitted building projects. Whether it be voice, data, and video transmission, security and fire alarm systems, audio/visual systems, or other communications technologies it is important that a team of experienced professionals be involved in the design of these complex systems.

B. The Structured Cabling Plant and Premise Distribution System is the media pathway and foundation for enabling operability and functionality of all other format and aspects of Information Technology for SDOC’s community of instructional staff and students as well as administrative and professional support staff.

C. In order to maximize network functionality and minimize labor and material costs it is essential that a common set of technology installation standards be established with strict guidelines for compliance. To achieve compliance the SDOC MTSD has established a format and policy for reference to be utilized by which these codes and standards are defined, detailed and monitored for adherence. All SDOC MTSD Personnel and the Technology Construction Project Manager(s) or designated authorized representatives are overall charged with this responsibility.

D. Specific technology notes for all Project Architect(s), Engineer(s) Construction Services Department Project Manager(s) and all other applicable personnel associated with input for Technology Project Designs:

1. Technology and Clean Power Designers shall verify that all applicable portions of the SDOC Approved Standards and Specifications are incorporated into each technology project design plan and drawing, project conformed documents, and ultimately adhered to in all aspects of project construction.

2. Requests for recommended substitutions, alterations or deviation from any portion of these SDOC approved and established standards and specifications in all instances shall require prior approval through the SDOC MTSD Technology Construction Project Manager or a designated authorized MTSD representative.

3. Requests for variances from these standards shall be submitted in writing to the SDOC MTSD Technology Construction Project Manager or their approved representative, using the MTSD Variance Request Sheet located in Appendix “D” of this document.

4. For all SDOC projects it shall be the responsibility of the project site specific architect, engineer and general contractor to schedule a meeting allowing reasonable time for input and incorporation of SDOC MTSD technology plan design requirements and project specific specifications prior to design of initial technology plans. Reasonable review time for SDOC MTSD is determined to be a
minimum one (1) and preferably two (2) weeks. This time shall be to insure the incorporation and update of all applicable SDOC Technology plan formats required by SDOC for each project.

5. The SDOC Symbols, Color Codes, Details and all other directives contained and provided in the SDOC Division 27 Standards and Specifications shall be the only format acceptable for incorporation and use on the conformed documents and plans for all SDOC Technology Projects whether a pure or partial technology project.

6. Note that symbols, details and directives can change or be deleted from project to project due to changes in SDOC selected technology and procedure. It is imperative and the responsibility of the project site specific architect, engineer and general contractor to meet with SDOC MTSD Personnel on every new construction and other technology projects to insure all technology design criteria remains current and accurate even on construction of like or similar projects.

7. By virtue of the fact that the SDOC Symbols, Color Codes, Details and all other criteria are the routine format familiar to SDOC Personnel, their technology and security contractors and others relating to SDOC technology systems this shall be the only acceptable format for plan design of Conformed Technology documentation and plans without exception.

8. The format for all SDOC conformed technology plan sheets shall be identified as “T” for Technology Systems Sheets. Examples: Sheet T101 BUILDING 1 FIRST FLOOR PLAN UNIT A SYSTEMS or Sheet T201 SYSTEMS DETAILS shall be a technology sheet for the conformed plans.

9. The format for all conformed technology electrical plan sheets shall be identified as “TE” for Technology Electrical Sheets. Examples: Sheet TE101 BUILDING 1 FIRST FLOOR PLAN UNIT A CLEAN POWER or Sheet TE201 PANEL SCHEDULES CLEAN POWER shall be a technology electrical sheet for the conformed plans. See Figure 1 – SDOC Technology Sheet Identification “Typical”.

10. The format for all Elementary, Middle, and High school classroom and classroom lab configurations is detailed below in Figure 1A through 1F – SDOC Standard Classroom Technology Configuration “Typical”.

Figure 1 – SDOC Technology Sheet Identification “Typical”
Figure 1A – Standard Elementary School Classroom Technology Configuration “Typical”

Figure 1B – Standard Elementary School Lab Classroom Technology Configuration “Typical”
Figure 1C – Standard Middle School Classroom Technology Configuration “Typical”

Figure 1D – Standard Middle School Lab Classroom Technology Configuration “Typical”
Figure 1E – Standard High School Classroom Technology Configuration “Typical”

Figure 1F – Standard High School Lab Classroom Technology Configuration “Typical”
1.02 Technology Installation Contractor Requirements:

A. SDOC MTSD has a list of Technology Continuing Service Contractors recommended for selection that are pre-screened and pre-qualified.

B. If the General Contractor and/or Electrical Contractor exercises selection of an alternative technology systems installation contractor that intended prospective selected alternate contractor shall be qualified and certified in all respects and further shall meet all valid and current certification requirements for one of the following three (3) technology manufacturer’s: COMPLETE CLOSED PANDUIT, ORTRONICS or AMP/TYCO SOLUTION.

C. Further prospective contractor shall submit documentation to SDOC MTSD satisfying the requirements of the district that the proposed contractor is in fact certified and authorized as an installing agent/company to offer one of the selected technology manufacturer’s either COMPLETE CLOSED PANDUIT, ORTRONICS or AMP/TYCO SOLUTION. Product warranty shall be for a minimum fifteen years from date of installation acceptance for properly registered and approved projects in Florida.

D. SDOC reserves the right to reject the proposed selected technology systems installation contractor if that contractor does not meet SDOC specified qualification requirements.

E. The selected Technology Systems Installation Contractor shall also possess a current State of Florida Low Voltage License acceptable to SDOC for the technology systems being installed.

Special Note: For more in-depth contractor specific information regarding Technology Installation Contractor Requirements refer to Section 270100 Contractor Qualifications.

1.03 Pre-Contract / Pre-Construction Site Surveys:

A. With regard to any new construction at any existing SDOC site it shall be the responsibility of the contracted site specific architect, project engineer and general contractor to conduct a thorough inspection prior to obligation in order to identify all potential issues related to the construction contract.

B. During bid design phase it is the responsibility of the site specific architect, project engineer and general contractor to insure all aspects of the scope of their project are identified to include all area components of pre-existing SDOC technologies installed regardless of project scope and to obtain SDOC approval for removal and restoration of all pre-existing SDOC technologies installed.

C. Special Note: For more in-depth contractor specific information regarding pre-contract site surveys refer to Section 270100 Design and Planning Phase.
1.04 Incidental / Accidental Damages to SDOC Technologies by the Contractor:

A. Oversight or omission on the part of the contracted architect, project engineer and general contractor to properly identify and make provisions for removal and restoration of these pre-existing installed SDOC technologies shall be the responsibility of the contractor at their expense to restore or replace all affected portions of installed technology systems to the satisfaction of SDOC.

B. Regardless the circumstance it shall be the responsibility of the contracted site specific architect, project engineer and general contractor to restore or replace to like new or pre-existing condition any pre-existing installation of SDOC technology systems either demolished, replaced, rerouted, relocated or adversely effected in any way by virtue of ongoing construction regardless of oversight or omission at no expense to SDOC.

C. SDOC will not accept any request to provide parts or labor. However, SDOC will provide assistance in identifying and monitoring the repairs and to provide technical specifications for replacement or assistance to identify the affected cabling and hardware path end to end for applicable repair or replacement by the contractor of these pre-existing and installed SDOC technologies.

D. The contractor shall be liable for all damages to SDOC Technology Systems and it shall be the sole responsibility and contractor's burden alone to bear the cost associated with any restoration, matching or upgrade in all respects for all affected pre-existing cabling, hardware, pair and strand counts, connectors, connections and other affected components to pre-existing or new condition to the complete satisfaction of SDOC including installation and testing by SDOC approved technology contractors in the restoration of these pre-existing technology systems.

E. Acceptance of any SDOC contract for construction regardless of application or relation to installed SDOC technologies implies consent to acceptance of these terms and agreement for full compliance.

F. Special Note: For more in-depth contractor specific information regarding incidental / accidental damages to SDOC Technologies by the contractor refer to Section 270100 Design and Planning Phase.

1.05 Telecommunications Projects Eligibility Requirements:

A. All projects designed by a consulting architect/engineer, shall have the telecommunications infrastructure designed by a qualified consultant team. Such a team shall include an electrical engineer and a Registered Communications Distribution Designer (RCDD).

B. The Premise Distribution System shall be installed by a qualified communications contractor. This infrastructure shall include all pathways, cabling, terminations, testing, and communication space construction related to the telecommunications systems.

C. As a minimum the contractor shall provide these technology installation services in accordance with the standards and specifications as provided by the School District of Osceola County’s Media and Technology Services Department (SDOC MTSD).
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D. Designers and Contractors shall be required to develop construction schedules that allow adequate time for SDOC MTSD to complete installation and testing of final provisioning work prior to Substantial Completion and the Owner's occupancy of each and all portions of each project.

E. General Contractors, their associated contractors and sub-contractors shall be required to allow SDOC Personnel equal access to the jobsite to install, inspect, document and complete all tasks related to technology systems for effective completion of the project concurrent with other aspects of construction underway by the General Contractor.

1.06 Codes, Standards and Specifications:

A. All applicable SDOC technologies shall be installed in accordance with all applicable codes, standards and specifications set forth in the latest ratified prescribed version of NEC, NESC, NFPA, ANSI/TIA/EIA Telecommunications Infrastructure Standards, FCC, IEEE and BICSI’S Telecommunications Distribution Methods Manual as listed below as a minimum. These codes, standards and specifications are to be referenced in design of all technology and telecommunications systems.

B. SDOC MTSD promotes the use of widely accepted industry standards in deploying the district’s technology and telecommunications infrastructure.

C. Employees of the district, consultants and technology contractors contracted on behalf of the district shall have a working knowledge of these established codes, standards and specifications prior to performing work for the district and shall adhere to all SDOC preferred standards and practices while deploying technology and telecommunications infrastructure.

D. District employees, consultants and technology contractors shall contact the designated MTSD Representatives for clarification and interpretation of all codes, standards and specifications.

   • ANSI/TIA/EIA-568-B.1.2.3 Commercial Building Telecommunications Cabling Standard
   • ANSI/TIA/EIA-569-A Commercial Building Standard for Telecommunications Pathways and Spaces
   • ANSI/TIA/EIA-606-A Administration Standard for the Telecommunications Infrastructure See Appendix 1 for the current UF Labeling standard based on ANSI/TIA/EIA-606-A
   • ANSI/TIA/EIA-607 Commercial Building Grounding and Bonding Requirements for Telecommunications
   • ANSI/TIA/EIA-758 Customer-Owned Outside Plant Telecommunications Cabling Standard

E. Information and these standards can be obtained through BISCI at www.bicsi.com as well as www.tiaonline.org.

F. The design team shall include the resources required to develop a comprehensive and complete scope of work inclusive of all required project related technology systems and components. The design team shall include a Professional Engineer (PE) and Registered Communications Distribution Designer (RCDD).
G. It shall be the responsibility of the Architect and Project Engineer to ensure that Appendix “A” SDOC - Technology Master Symbols and Appendix “B” - SDOC “General Notes” are included on all Systems Detail Sheets.

H. The SDOC Technology Master Symbols are to be utilized on all technology designs for all SDOC Technology Systems Projects and shall appear on all SDOC Technology Plans. These symbols are mandatory by virtue of the fact that they are familiar to all SDOC Technology personnel, technology and security related contractors.

I. The SDOC Conformed Documents “General Notes” shall be included on all technology designs for all SDOC Technology Systems. These General Notes are mandatory by virtue of the fact that they highlight and define key information on parts and material critical to each technology installation and aid in clarification of project specific responsibilities that otherwise might be overlooked or assumed.

J. The architect and project engineer shall coordinate with SDOC MTSD as required to resolve potential issues regarding other utilities, landscaping, etc. and shall specify and detail all work described as “to be accomplished by others" in all conformed construction documents to ensure that no blind areas exist between all technology contractors scope of work and the scope of work “to be accomplished by others”.

K. Technology specific project installations shall only be performed by an SDOC MTSD approved contractor meeting all SDOC MTSD specified qualifications as outlined in SDOC Technology Standards and Specifications Section 270100.

1.07 Existing Renovations / Retrofit Sites:

A. At existing renovation / retrofit sites the General Contractor shall be responsible to relocate, adjust, re-route, repair and or replace all existing Technology Systems Cable runs, established pathways, components and devices found to have their normal functions impeded, encroached upon based on SDOC Standards and Specifications or to have caused these existing technology systems components and cabling to be damaged or to be out of tolerance and specification in the established area and vicinity of construction to SDOC satisfaction. In accordance with (I AW) all set and established SDOC Division 27 Technology Standards and Specifications with no exception.

B. At existing renovation / retrofit sites the General Contractor shall be responsible to remove, replace, install, label, program, test, adjust and return to normal operating condition all existing SDOC Specified DMP Security Panels including as applicable the Main DMP Security Panel and all DMP Zone Expander Panels, established cable runs, established pathways, supports, sleeving, hardware, components and devices to include all DMP Keypads, motion sensors, door contacts and strobe/horn assemblies found to have their normal functions impeded, encroached upon based on SDOC Standards and Specifications or to have caused these existing technology systems components and cabling to be damaged or to be out of tolerance and specification in the established area and vicinity of construction to SDOC satisfaction. All installations are IAW all set and established SDOC Division 27 Technology Standards and Specifications with no exception. DMP Equipment shall require the General Contractor provide a DMP Certified Technology Contractor to perform all work on these specific items. Further
the General Contractor shall provide to SDOC Construction Project Manager’s proof prior to utilization in writing of the DMP Certification of the DMP Security Contractor to be utilized. All reinstalled security devices found to be defective shall be replaced at no additional cost to the School District of Osceola County. Damaged cabling shall be replaced end to end for each instance. No splicing of technology systems cabling is approved or acceptable.

C. At existing renovation / retrofit sites the General Contractor shall be responsible to remove, replace, install, label, program, test, adjust and return to normal operating condition all existing Video Surveillance Security System components including as applicable SDOC Specified DVR(s) and all video surveillance interior and or exterior established cable runs, established pathways, supports, sleeving, hardware, components and devices to include all interior and or exterior cameras and component assemblies found to have their normal functions impeded, encroached upon based on SDOC Standards and Specifications or to have caused these existing technology systems components and cabling to be damaged or to be out of tolerance and specification in the established area and vicinity of construction to SDOC satisfaction. All installations are IAW all set and established SDOC Division 27 Technology Standards and Specifications with no exception. Further the General Contractor shall provide to SDOC Construction Project Manager’s proof prior to utilization in writing for all cabling installations of the RCDD Certification of the Technology Contractor to perform all work on these specific items to be utilized. All reinstalled security camera devices found to be defective shall be replaced at no additional cost to the School District of Osceola County. Damaged cabling shall be replaced end to end for each instance. No splicing of technology systems cabling is approved or acceptable.

D. At existing renovation / retrofit sites the General Contractor shall be responsible to remove, replace, install, label, program, test, adjust and return to normal operating condition all existing Wireless Access Point System components including as applicable SDOC Specified Electronic Access Point Devices and all established cable runs, established pathways, supports, sleeving, hardware, components and devices to include all interior and or exterior wireless access point and component assemblies found to have their normal functions impeded, encroached upon based on SDOC Standards and Specifications or to have caused these existing technology systems components and cabling to be damaged or to be out of tolerance and specification in the established area and vicinity of construction to SDOC satisfaction. All installations are IAW all set and established SDOC Division 27 Technology Standards and Specifications with no exception. Further the General Contractor shall provide to SDOC Construction Project Manager’s proof prior to utilization in writing for all data cabling installations of Manufacturer’s Installation and minimum fifteen year Warranty Certification for only one of the following three (3) Manufactured Solutions: COMPLETE CLOSED PANDUIT, ORTRONICS or AMP/TYCO SOLUTION. In addition to provision of RCDD Certification of the Technology Contractor to perform all work on these specific items to be utilized. All reinstalled wireless access point devices found to be defective shall be replaced at no additional cost to the School District of Osceola County. Damaged cabling shall be replaced end to end for each instance. No splicing of technology systems cabling is approved or acceptable.
1.08 Bid Documents:

A. It is expected that the result of collaboration between district representatives and contracted professionals shall be the creation by the design team of a bid-quality conformed Technology BID Document that contains all commonly accepted and standard language of the telecommunications industry.

B. These Technology BID Documents and all Project BID Documents in which technology is included as a portion of the project shall include a complete set of current and appropriate SDOC Specifications which have been specifically tailored, formatted and detailed by and for the School District of Osceola County, Florida “ONLY” as the Division 27 CSI Master Format as well as Telecommunications Sheets (a.k.a. T-Sheets) and Telecommunications Electrical Sheets (a.k.a. TE-Sheets).
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DESIGN REQUIREMENTS

Part 2 of 2

Overall List of “Routine” Technology Requirements
For Reference and Technology Systems Project Incorporation
By All Architects, Engineers and General Contractors

1.01 INTRODUCTION:

The following is an informational “reference” segment to be used as a guide by all SDOC contracted architects, engineers and general contractors during SDOC technology systems design and construction installation. This guide is to be referenced in conjunction with the in-depth components and installation procedures and practices as detailed in all technology sections of the current version of the SDOC Division 27 Technology Standards and Specifications.

This “reference” segment is not to be construed as the all-inclusive scope of work for any specific technology project installation. This is only an informational “reference” segment to be used as a base guide for an understanding of SDOC technology systems design and installation requirements and expectations developed primarily for all new construction, retrofits and renovations and can apply for reference in technology systems design and installation requirements regarding moves additions and changes as well.

All major SDOC technology systems areas are briefly represented in this “reference” segment with the minimal standard base design and installation norm requirements and expectations detailed for these technology systems installations to insure the minimal SDOC technology systems requirements and demands are identified and are the same format for every technology project and shall be incorporated the same way at the onset of technology design on every project regardless the size, scope or complexity.

Stated herein are the base technology systems norms to be addressed for all new SDOC technology systems installations. Notwithstanding during the design process the SDOC governing authorities shall however, always reserve the right at their discretion during project technology systems design review to effect changes based on current technology systems component and industry developments including the need to revise, increase, decrease, replace, upgrade or delete any specific SDOC technology system design norm in part or in whole for any given planned technology system and installation.
The SDOC Division 27 Technology Standards and Specifications shall always be one of the major comprehensive sources of detailed technology design and installation information utilized for technology systems design in combination with the input of all qualified SDOC Departmental Representatives including the SDOC Information and Technology Services Department and SDOC Media and Instructional Technology Department Directors and their authorized representatives and the SDOC Information and technology Services Department Technology Construction Project Managers for a complete SDOC technology systems installation understanding and successful cooperative effort for each project.

This “reference” segment is provided to accelerate the learning curve and assist the process of understanding for those project architects, engineers and general contractors unfamiliar with the SDOC Information and Technology Services Department and SDOC Media and Instructional Technology Department exacting and stringent Division 27 technology Standards and Specifications requirements, details, practices and expectations demanded to be built in to the technology design for all SDOC technology projects or technology aspects and concerns with regard to these and all other SDOC construction projects in general and this “reference” segment is provided as a starting point from which to base all current and future technology construction design and documentation for SDOC projects in a format that will at the front end be acceptable to the SDOC Information and Technology Services Department and Media and Instructional Technology Department with regard to all technology systems and technology projects.

In this “reference” segment are the defined minimal SDOC technology requirements for all technology projects regardless whether the technology aspect is the major or minor construction project concern to insure that all technology systems needs of the district are adequately, thoroughly and comprehensively addressed during the design phase to the exacting standards, specifications and expectations of the SDOC Information and Technology Services Department and SDOC Media and Instructional Technology Departments and that these design needs are adhered to and in strict compliance with all SDOC Division 27 Technology Specifications detailed and stated with regard to technology systems installations.

In depth language for each technology system is provided at the beginning of the SDOC Division 27 Technology Standards and Specifications in order that an upfront clearly defined, thoroughly conveyed, understanding for all areas be established regarding the expectations of the SDOC Information and Technology Services Department and SDOC Media and Instructional Technology Department with regard to the major technology systems specifics that are required by these departments to be exactingly accomplished under technology design and installation construction for all technology related projects at all phases and for the most part by whom.

With that said, provided herein is the “BASE” beginning of technology scope of sorts (as a minimum) to be referenced for the major technology systems with project specific requirements and expectations to be provided and accomplished with defined details on aspects covered under the construction budget costs for most projects which shall be accomplished as a responsibility of the project architect and engineer in design, specifications and management of the technology systems detailed for the project and ultimately by the general contractor on the physical technology systems installation aspects of the project with oversight from the architect and engineer during the construction phases for technology systems detailed.
Also covered, (excluding network electronics costs) are defined details on aspects of technology components and fixtures routinely required and expected to be provided and accomplished under SDOC departmental areas regarding furniture fixtures and equipment (FF & E) budgets for technology systems detailed as the responsibility of the SDOC Information and Technology Services Department and SDOC Media and Instructional Technology Departments.

1.02 MINIMAL “STANDARD” SDOC TECHNOLOGY REQUIREMENTS:

Following is the listed majority of the “BASE” standard technology needs required for most new construction projects with details on the routine areas of responsibility accomplished under construction budget by the project architect, engineer and general contractor and those responsibilities that normally fall (yet not always) under the SDOC Information and Technology Services Department and SDOC Media and Instructional Technology Departments for all phases of most technology projects or technology related aspects of other construction projects:

- All SDOC technology systems designs shall utilize the SDOC Division 27 Technology Standards and Specifications Master Symbols Section 27-00-00 Appendix “A” for all technology sheets. The Master Symbols detail shall be incorporated on the construction plan sheets in an SDOC “FAMILIAR” format.

- All SDOC technology systems designs shall utilize the SDOC Division 27 Technology Standards and Specifications General Notes Section 27-00-00 Appendix “B” for all technology sheets. A General Notes Section shall be incorporated on the construction plan sheets in an SDOC “FAMILIAR” format with deletion of SDOC approved omissions for those areas not project specific and with additional SDOC approved language for amplification of subjects that require technology systems installation project specific coverage where needed.

- All SDOC technology systems designs shall utilize SDOC “FAMILIAR” approved project specific technology details as required based on either SDOC Division 27 Technology Standards and Specifications section details or as developed and designed by the engineer and SDOC approved as “FAMILIAR” technology systems details for installation on Technology Systems “T” Sheets for technology system installation amplification purposes in the format as included in the attached “SAMPLE” SYSTEMS DETAILS “T” Sheets.

- All SDOC Division 27 Technology Standards and Specifications project plan specifications documents shall be dated current versions and shall be SDOC “FAMILIAR” Division 27 Specifications familiar in language, thorough and detailed with complete coverage of all SDOC technology systems installation intentions, expectations and equipment “call outs” with omissions only approved where said omission has received prior written approval of SDOC authorized and qualified representatives. The use or implementation of the technology systems standards and specifications of any other school district in whole or in part is unacceptable and shall not be permitted.
• SDOC Division 27 Technology Standards and Specifications most recent posted version can always be found at [http://www.osceola.k12.fl.us/depts./IMC/Index.asp](http://www.osceola.k12.fl.us/depts./IMC/Index.asp) or by requesting the current version of Division 27 Technology Standards and Specifications in all applicable sections by contacting the Information and Technology Services Department Construction Project Management Supervisor at 407-518-2950 immediately for clarification of in-depth installation detail.

Specific SDOC designated technology systems installation needs expected to be covered under the construction process by the general contractor are:

• **NOTE:** All SDOC technology systems designs and installation requirements to be accomplished by the general contractor shall include the installation of SDOC designated quantities and sizes of technology systems backbone conduit to SDOC designated MDF and IDF locations built to exacting SDOC sizes and specifications and installed and populated with SDOC designated technology systems cabling as SDOC specified for backbone between exterior buildings and with SDOC specified interior infrastructure technology systems cabling inclusive of all technology systems devices, supports, sleeving and penetrations and U/L compliant sealing for all technology systems devices both interior and exterior to each building and all spaces within each building.

**Technology Systems Backbone Pathways, Conduits, Sleeves, Communications Vaults and Communications Pull Boxes (reference in-depth detail in SDOC Division 27 Technology Standards and Specifications PREMISE DISTRIBUTION SYSTEM AND CABLING INSTALLATIONS Section 27-02-00) –**

• For new campus new construction technology backbone cabling pathway locations:

  o During the design phase, the project architect and engineer shall insure with the input of qualified SDOC technology representatives that SDOC approved adequate pathways shall be installed and available for all SDOC designated technology systems backbone cabling end to end from the MDF to all IDF locations and from all buildings to all new communications vaults and technology systems backbone conduit shall be designed and constructed with adequate head room for current and future expansion purposes with no exception.

  o The project architect and engineer shall design with input from designated and qualified SDOC Technology Representatives and the project general contractor shall provide and install SDOC designated minimum two (2) four inch conduits for the installation of technology systems backbone cabling “ONLY” ([and no other trade cabling such as HVAC or Fire Alarm cabling](http://www.osceola.k12.fl.us/depts./IMC/Index.asp)) homerun from each new SDOC designated building IDF location to the SDOC designated MDF location through a network of SDOC specified traffic rated communications vaults with spring loaded steel lids strategically placed where SDOC approved about the exterior of the campus buildings at not more than two hundred feet distance between vaults.
o All SDOC designated and specified traffic rated communications vaults shall be installed with heavy duty technology cable supports to dress and support all technology systems backbone cable installed. No technology systems cabling shall be permitted to lay unsupported in the floor of any communications vaults with no exception. **There shall be no other trade related cabling such as HVAC or Fire Alarm cabling** installed in SDOC designated technology systems backbone conduits or traffic rated technology communications vaults.

o All newly installed SDOC designated technology systems backbone four inch conduits shall be installed with three 11/4 inch innerducts in each new four inch conduit. Each 11/4 inch innerduct that is vacant shall be installed complete with pull string and shall be plugged with appropriate innerduct plugs. Any and all “spare” / vacant conduits (not just four inch conduits but all vacant conduits in every IDF and MDF space) shall by the general contractor, electrical contractor and technology contractor be verified open and unobstructed end to end, provided and installed with mule tape or pull string as appropriate and shall be provided and installed on each and all ends especially in all IDF and MDF spaces interior with UL approved HILTI Brand Fire Stopping Plugs CFS-PL 4 and or of the appropriate width (or SDOC approved equal) for each SDOC designated technology systems backbone conduit. Further each conduit shall be installed from all new SDOC designated IDF locations to SDOC designated new spring loaded steel lid communications vault locations with matching pairs of conduits throughout ultimately to the MDF closet location.

o All newly installed SDOC designated technology systems backbone four inch conduits shall be installed from all new SDOC designated building IDF locations to SDOC designated new spring loaded steel lid communications vault locations with matching pairs of conduits throughout ultimately to the MDF closet location.

o For all multilevel buildings each floor shall be designed and installed with its own SDOC designated separate and individual complete and functional SDOC designated IDF communications closet IAW SDOC Division 27 Technology Standards and Specifications which shall be installed with SDOC designated minimum two (2) four inch sleeves between floors for the installation of separate homerun installations of backbone technology cabling from the SDOC designated MDF to each SDOC designated IDF communications closet installed on each floor of each building. Separate sleeving shall be installed for all SDOC designated telecommunications ground bus bar tie cabling which shall also be individually grounded IAW NEC Requirements.
At all new construction, existing campus and other existing district sites all new building construction shall be engineered to include minimum two (2) four inch conduits for technology cabling installation to each new building IDF and each new four inch conduit shall be installed with three (3) 1-1/4" inch inner-ducts from the new construction IDF to the MDF which shall be provided and installed by the general contractor, electrical contractor and technology systems contractor.

All new construction shall include contractor provided and installed communication ground vaults designed with adequate SDOC specified communication ground vaults of quantities installed to insure not more than 200 foot distance between installed communication ground vaults is exceeded and with SDOC specified numbers of four inch technology systems conduit and innerduct runs feeding from the MDF to all building IDF Spaces.

In the event there is no underground pathway installed at existing campus and other district sites for new building construction a new underground vault and conduit pathway shall be engineered and designed by the project architect and project engineer and provided and installed by the general contractor, electrical contractor and technology systems contractor inclusive of new four inch conduits installed with three (3) new 1-1/4" inch inner-ducts in each four inch conduit and an SDOC approved vault system that shall complete a pathway from the new construction building(s) to the existing campus MDF to establish a minimum underground pathway on which to build a future underground technology system campus wide with a future planning event.

Where needed for a complete pathway between the new building(s) IDF locations to the existing campus MDF the project architect and project engineer shall engineer and design and the general contractor, electrical contractor and technology systems contractor shall provide and install four inch conduits and innerduct where needed by cutting the existing MDF slab and installing at the MDF a sufficient number of four inch conduits and innerduct to provide a complete pathway for the future underground requirements for all new building(s) being constructed as well as conduit for the future design of a complete campus underground conduit system to be designed with the thought in mind to provide all needed conduits at the existing campus MDF with a one (1) time only renovation of the MDF conduit system that will not have to be repeated at a later date.

At all existing campus and other district sites all new additions of any variety of technology systems backbone cabling shall be installed in 1-1/4" inch inner-ducts. In the instance where there are no innerducts installed the contracted general contractor, electrical contractor and technology systems contractor shall provide and install the required number of 1-1/4" inch innerducts. In the event the fill capacity of the existing conduit system is either blocked / obstructed, at maximum fill or would be exceeded by new additional backbone cabling installation or the addition of new innerduct thus precluding the installation of a new innerduct pathway the general contractor, electrical contractor and technology systems contractor shall in this event be required to provide and install a new conduit pathway of sufficient size and quantities of conduits and innerduct to provide 25% future expansion inclusive of the required number of 11/4 inch innerducts for each four inch conduit to permit all backbone cable projects to be installed in new innerduct.
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- **FIRE ALARM SYSTEMS NOTE OF PARTICULAR EXCEPTION:**
  - Fire Alarm Systems backbone cables and conduit specifications by virtue of their critical functionality are specialty items not part of routine Technology Systems cabling in functionality.
  - Fire Alarm Systems specialty cabling, conduits and pathway requirements and specifications are defined and detailed by residential expertise located in both the SDOC Fire Alarm Division of the SDOC Maintenance Department and SDOC Code Compliance or others as assigned, not by the Information and Technology Services Department.
  - Fire Alarm Systems are installed and maintained with differing specialty parameters and operational functionality critical to the safety and well-being of building occupants and as such require a complete and separate isolated pathway separate to the exposure of routine operations performed in and around standard technology systems cabling.
  - Fire Alarm Systems by virtue of their critical specialty functionality shall be installed in complete separate and isolated fire alarm systems “QUAZITE” or other pull boxes as specified by others with specialty conduit pathways which are not and shall not be designed to comingle and remain in contact with any portion of standard technology systems conduit, technology systems vaults, technology systems pathways or technology systems supports outdoor or indoor with no exception.
  - Due the critical specialty operability required of Fire Alarm Systems installation in rugged environments of prolonged exposure could cause potential future damage when exposed to routine day to day trafficking that can occur during technology maintenance and cabling installations regarding standard technology systems cabling and conduit systems. Such environments are not conducive to prolonged specialty reliability and operability and as such a separated and isolated installation pathway for Fire Alarm Systems is required.

- **Existing campus new construction or renovation technology backbone Pathways, Conduits, Sleeves, Communications Vaults and Communications Pull Box Locations:**
  - For existing site new construction situations the project architect and engineer shall design with input from designated and qualified SDOC Representatives and the project general contractor shall provide and install SDOC designated minimum two (2) four inch Technology Systems Backbone conduits from all new construction building IDF locations to the existing campus MDF location.
All newly installed four inch SDOC designated Technology Systems Backbone conduits shall be installed with three 11/4 inch innerducts in each new four inch conduit. Each 11/4 inch innerduct that is vacant shall be installed complete with pull string and shall be plugged with appropriate innerduct plugs. Each SDOC designated Technology Systems Backbone conduit shall be sealed around the conduit opening at all locations with U/L approved fire and smoke rated fill materials installed by general contractor verified certified minimum level 1 fire stopping sealant installation technicians to prevent potential future intrusion of water, gasses, insects and rodents to interior communications space locations.

All newly installed SDOC designated four inch Technology Systems Backbone conduits shall be installed from all new building IDF locations to the local existing installed communications vault location (where these vaults exist).

For all new multilevel buildings being constructed each floor shall be designed by the project architect and engineer and provided and installed by the project general contractor with its own SDOC designated separate and individual complete and functional communications closets with minimum two (2) four inch Technology Systems Backbone conduits to be installed for each new construction building IDF location. Each IDF on each floor shall also be installed with SDOC designated minimum two (2) four inch sleeves between floors for the installation of separate homerun installations of SDOC designated backbone technology cabling from the MDF to each IDF communications closet installed on each floor of each building. Separate sleevng shall also be installed for all SDOC designated telecommunications ground bus bar tie cabling which shall also be individually grounded on each floor IAW NEC Requirements.

For existing campus sites, during the design phase, the project architect and engineer shall verify and establish all installed SDOC designated pathways. The project architect and engineer shall ensure an adequate open pathway exists and is available for all SDOC designated technology systems backbone cabling from existing communications vaults.

For existing campus sites in instances where it is identified by the project architect and engineer with the assistance of qualified SDOC technology representatives that there are no SDOC designated communications vaults or vault and where the required amounts and sizes of existing spare conduit do not exist or are found by SDOC Authorized and Qualified Representatives to be inadequate for end to end SDOC designated technology systems backbone cabling installations there shall be the requirement that the architect and engineer include in the design (an under the construction project costs) the installation of adequate SDOC designated and specified sizes and quantities of conduits and SDOC designated and specified traffic rated communications vaults with spring loaded steel lids strategically placed IWA SDOC Division 27 Standards and
Specifications to insure a proper SDOC designated pathway end to end from the new building IDF location homerun to the existing Campus MDF location with no exception.

- No SDOC designated technology systems cabling shall be permitted to lay in the floor of any communications vaults with no exception. At both new construction and existing new construction sites, all technology SDOC designated and specified traffic rated communications vaults shall be installed with SDOC designated heavy duty cable supports to dress and support all SDOC designated technology systems backbone cable installed.

- **There shall be no other trade related cabling such as HVAC or Fire Alarm cabling** installed in SDOC designated technology systems backbone conduits, innerducts or traffic rated SDOC designated technology communications vaults. All trades shall request and have designed their own cable pathways. Negligence by others in other departments in their design phase and opportunity is not acceptable as an excuse to utilize technology pathways.

SDOC Designated Technology Systems and Cabling (reference in-depth detail in SDOC Division 27 Technology Standards and Specifications PREMISE DISTRIBUTION SYSTEM AND CABLELING INSTALLATIONS Section 27-02-00) –

- **NOTE:** FOR ALL NEW CONSTRUCTION BUILDING(S), EXISTING SITE NEW CONSTRUCTION BUILDING(S) AND ALL NEW INSTALLATIONS OF ALL FIBER OPTIC AND COPPER TECHNOLOGY SYSTEMS BACKBONE CABLING INSTALLATIONS BETWEEN EXISTING BUILDINGS INSTALLED BY THE CONTRACTED GENERAL CONTRACTOR, ELECTRICAL CONTRACTOR AND TECHNOLOGY SYSTEMS CONTRACTOR ALL FIBER OPTIC AND COPPER TECHNOLOGY SYSTEMS BACKBONE CABLING BETWEEN BUILDINGS SHALL BE PROVIDED AND INSTALLED IN CONTRACTOR PROVIDED AND INSTALLED CONDUIT AND INNERDUCT FOR MANAGEABILITY AS WELL AS PROTECTION.

- ALL FIBER OPTIC TECHNOLOGY SYSTEMS BACKBONE CABLING INSTALLATIONS SHALL BE INSTALLED IN THE CONTRACTED GENERAL CONTRACTOR, ELECTRICAL CONTRACTOR AND TECHNOLOGY SYSTEMS CONTRACTOR PROVIDED AND INSTALLED IN INNERDUCT FROM THE CONDUIT SERVICE ENTRANCE INTO EACH BUILDING FOR THE ENTIRE RUN THROUGH THE OVERHEAD / CEILING CAVITY TO THE INTERIOR OF EACH IDF AND MDF SPACE.

- WHERE THE INNERDUCT(S) ENTER THE MDF AND EACH IDF SPACE THROUGH THE CEILING CAVITY IT SHALL ENTER THROUGH GENERAL CONTRACTOR, ELECTRICAL CONTRACTOR AND TECHNOLOGY SYSTEMS CONTRACTOR PROVIDED AND INSTALLED FOUR INCH CONDUIT SLEEVES.
The major SDOC designated technology systems installed are:

- Network / Data Fiber Optic and Copper Cable Systems - SDOC Division 27 Technology Standards and Specifications Section 27-02-00 PREMISE DISTRIBUTION SYSTEM AND CABLELING INSTALLATIONS

- Voice Copper Cable Systems - SDOC Division 27 Technology Standards and Specifications Section 27-02-00 PREMISE DISTRIBUTION SYSTEM AND CABLELING INSTALLATIONS

- Security / Intrusion Detection Head End, Device and Copper Cabling Systems - SDOC Division 27 Technology Standards and Specifications Section 27-06-00 INTRUSION DETECTION SYSTEM

- Security / Video Surveillance Head End, Device and Copper Cabling Systems - SDOC Division 27 Technology Standards and Specifications Section 27-07-00 VIDEO SURVEILLANCE SYSTEM

- Intercom Head End, Device and Fiber Optic and Copper Cabling Systems - SDOC Division 27 Technology Standards and Specifications Section 27-08-00 INTERCOM SYSTEM REQUIREMENTS

- Audio / Visual Sound Head End, Device and Copper Cabling Systems - SDOC Division 27 Technology Standards and Specifications Section 27-09-00 SOUND SYSTEM REQUIREMENTS

- Interactive / Smart Board and Projector Plate Head End, Device and Copper Cabling Systems - SDOC Division 27 Technology Standards and Specifications Section 27-10-00 SDOC INTERACTIVE BOARD AND CEILING MOUNT PROJECTOR INFRASTRUCTURE

- Voice / Audio Enhancement Head End, Device and Copper Cabling Systems - SDOC Division 27 Technology Standards and Specifications Section 27-11-00 AUDIO ENHANCEMENT INFRASTRUCTURE. NOTE: AUDIO ENHANCEMENT INC. IS THE “ONLY” SDOC BOARD APPROVED SOURCE AND NO OTHERS

- Other Technology Systems as SDOC Designated and Specified
For all new construction fiber optic and copper technology systems backbone cable installations and for all new additions of fiber optic and copper technology systems backbone cables installed at existing campus and other sites all backbone cable shall be installed from the campus MDF to each campus IDF space in UL approved (Riser or Plenum Rated as installation situational application specifics deem necessary) Corrugated Conduit Innerduct of sufficient quantities with regard to all fill applications. All new innerduct shall be provided and installed by the general contractor, electrical contractor and the technology systems contractor for each specific project under the construction budget.

Under the construction budget the project architect and engineer shall be responsible to design each system installation with input from designated and qualified SDOC Representatives. Under the construction budget the project general contractor shall be responsible using an SDOC approved certified and verified technology systems contractor to provide, homerun Install, support, terminate, test, label and warranty the following SDOC designated technology systems cabling inclusive of those specified head end components and all field devices that are designated as tasks and project responsibilities of the general contractor under the construction project budget:

- **Network / Data System Multimode Fiber Optic Backbone Cable – (Unless otherwise SDOC specified)** Inclusive of all pathways, pieces, parts, supports, and labor homerun install without splices one (1) new twenty-four (24) strand 50 micron tight buffered “ONLY” multimode fiber optic backbone cable terminated on both ends IAW SDOC Division 27 Standards and Specifications with "SC" connectors in new SDOC designated OCC “ONLY” fiber optic LIU Trays on both the SDOC designated IDF and MDF ends in locations to be determined in the SDOC designated free standing two post rack locations at both the new SDOC designated IDF (s) and the MDF both interior and or exterior to the new building (s) where SDOC specified.

- **Network Systems Single Mode Fiber Optic Backbone Cable - (Unless otherwise SDOC specified)** Inclusive of all pathways, pieces, parts, supports and labor homerun install without splices one (1) new twelve (12) strand tight buffered “ONLY” single mode fiber optic backbone cable terminated on both ends IAW SDOC Division 27 Standards and Specifications with "SC" connectors in new SDOC designated OCC “ONLY” fiber optic LIU Trays on both the SDOC designated IDF and MDF ends in locations to be determined in the SDOC designated free standing two post rack locations at both the new SDOC designated IDF (s) and the MDF both interior and or exterior to the new building (s) where SDOC specified.

- **Voice / Telephone Systems - (Unless otherwise SDOC specified)** Inclusive of all pathways, pieces, parts, supports and labor homerun install without splices one (1) SDOC designated new 25 pair shielded flooded PE 89 voice backbone cable. All SDOC designated PE89 voice cable shields shall be grounded on all ends at the point of termination at both the new SDOC
designated IDF (s) and the MDF both interior and or exterior to the new building (s) where SDOC specified IAW SDOC Division 27 Standards and Specifications at the SDOC designated voice wall fields.

- **Security / Intrusion Detection Systems - (Unless otherwise SDOC specified)** Under the construction budget the project architect and engineer shall be responsible to design each system installation with input from designated and qualified SDOC Representatives. Under the construction budget the project general contractor shall be responsible using an SDOC approved and verified certified and qualified technology systems cabling contractor to provide, install, terminate, test, label and warranty all SDOC designated intrusion detection security field device cabling both interior and exterior inclusive of all pieces, parts, cabling, supports, stub outs, sleeves and pathways both interior and or exterior at all new and or existing building (s) where SDOC specified.

- **NOTE:** Cabling installation by the project general contractor using an SDOC approved and verified certified and qualified technology systems cabling contractor shall only be end to end from SDOC designated field devices to SDOC designated IDF and from IDF Closet to MDF Closet with no equipment or device connections made by the technology systems cabling contractor at cable ends at any location. **All FINAL cabling connections to SDOC designated head end main panel, zone expander panels and all field devices shall “ONLY” be accomplished by the project general contractor provided SDOC approved and verified certified and qualified “DMP” intrusion detection security systems contractor.** The technology systems cabling contractor shall only install the SDOC designated cable and **SHALL IN NO CIRCUMSTANCE COMPLETE FINAL CONNECTIONS TO ANY SDOC DESIGNATED EQUIPMENT OR DEVICE.**

- Under the construction budget the project architect and engineer shall be responsible to design each system installation with input from designated and qualified SDOC Representatives. Under the construction budget the project general contractor shall be responsible using an SDOC approved and verified certified and qualified technology systems cabling contractor to provide install, test, label and warranty all SDOC designated intrusion detection security backbone cabling inclusive of all pieces, parts, supports and labor homerun installed without splices two (2) SDOC designated new WESTPENN AQ244 unshielded security backbone cables for all new installations for below slab installations between SDOC designated IDF and MDF building locations.

- For above ceiling installations of SDOC designated intrusion detection security backbone cable between SDOC designated IDF and MDF building locations the project general contractor shall be responsible using an SDOC approved and verified certified and qualified technology systems
cabling contractor to provide install, support, test, label and warranty two (2) 18/4 unshielded SDOC designated cables for backbone cabling.

- **NOTE:** Whether the SDOC designated intrusion detection security backbone cables are of the underground or overhead variety the project general contractor shall be responsible to provide the complete cabling installation(s) using a qualified technology systems cabling contractor to provide the complete provisioning of all SDOC designated required equipment and “ALL” installation terminations using a **qualified “DMP” intrusion detection security systems contractor** on the new SDOC designated IDF end(s) at new contractor provided, installed, terminated, labeled, programmed and tested SDOC designated DMP Zone Expander Panels and on the SDOC designated MDF end to the existing (or new where applicable) SDOC designated main DMP XR500NL panel.

- All SDOC designated intrusion detection systems field device cabling and all building SDOC designated IDF backbone cabling shall be terminated only by the project general contractor provided SDOC approved and verified certified and qualified “DMP” intrusion detection security systems contractor on the new SDOC designated IDF end to new contractor provided, installed, terminated, labeled, programmed and tested SDOC designated DMP Zone Expander Panels and on the SDOC designated MDF end the new SDOC designated backbone cabling shall be provided, installed, terminated, labeled, programmed and tested at the new or existing SDOC designated main DMP XR500NL panel.

- The project engineer shall be responsible to determine and specify input to the DMP certified intrusion detection security contractor for the project regarding sufficient SDOC designated zone expander panels installed to enable two (2) spare open ports to be available for growth and expansion when installation is complete installed and programmed at the SDOC designated DMP XR500NL panel in the SDOC designated MDF at all new and existing intrusion detection security system SDOC designated locations and installations.

- The project general contractor shall be responsible using the SDOC approved and verified certified and qualified “DMP” intrusion detection security systems contractor to provide, install, terminate, test, label, activate, program and warranty all SDOC designated intrusion detection field devices pieces and parts both interior and or exterior at all new and or existing building(s) where SDOC specified.

- **Under the construction budget all SDOC designated intrusion detection installations shall be designed by the project architect and engineer with input from designated and qualified SDOC Representatives and the project general contractor shall be responsible to provide, manage and accomplish each installation using SDOC approved Certified DMP Intrusion Detection Security Technicians IAW SDOC**
Division 27 Standards and Specifications. All work shall include the provision, installation, labeling, testing, programming training and warranty of any needed SDOC designated head end parts and services required to support all devices and cabling IAW construction documents and plans.

- **Security / Video Surveillance Systems – (Unless otherwise SDOC specified)** Under the construction budget the project architect and engineer shall be responsible to design each system installation with input from designated and qualified SDOC Representatives. Under the construction budget the project general contractor shall be responsible using an SDOC approved and verified certified and qualified “SALIENT” Video Surveillance Security systems contractor to provide the installation, activation, programming and warranty for all SDOC specified video surveillance camera devices pieces and parts inclusive of all pieces, parts, supports and labor for physical camera installations both interior and or exterior at all new and or existing building(s) where SDOC specified.

- Under the construction budget the project architect and engineer shall be responsible to design each system installation with input from designated and qualified SDOC Representatives. Under the construction budget the project general contractor shall be responsible using an SDOC approved and verified certified and qualified technology systems cabling contractor to provide, install, terminate, test, label and warranty all SDOC designated video surveillance camera cabling both interior and exterior inclusive of all pieces, parts, supports, stub outs and pathways both interior and or exterior at all new and or existing building(s) where SDOC specified.

- **NOTE:** Cabling installation by the project general contractor using an SDOC approved and verified certified and qualified technology systems cabling contractor shall only be end to end from each SDOC designated IDF and MDF Closet patch panel and the data connectors at the field devices with no head end equipment or field device connections made by the technology systems cabling contractor at cable ends at any location. **All FINAL cabling connections to SDOC designated head end NVR or DVR location and all field devices shall “ONLY” be accomplished by the project general contractor provided SDOC approved and verified certified and qualified “SALIENT” Video Surveillance Security systems contractor.** The technology systems cabling contractor shall only install the cable and **SHALL IN NO CIRCUMSTANCE COMPLETE FINAL CONNECTIONS TO ANY EQUIPMENT OR DEVICE.**

- Under the construction budget all SDOC designated video surveillance camera installations shall be provided, managed and accomplished by the project shall be designed by the project architect and engineer with input from designated and qualified SDOC Representatives. Under the construction budget the project general contractor shall be responsible to provide, manage and accomplish each installation
using SDOC approved Certified SALIENT Video Surveillance Security System Certified Technicians IAW SDOC Division 27 Standards and Specifications. All work shall include the provision, installation, labeling, testing, programming training and warranty of any and all needed camera pieces and parts, licenses and services required to activate and support all devices IAW SDOC Division 27 Standards and Specifications and construction documents and plans.

- **Intercom Systems – (Unless otherwise SDOC specified)** Under the construction budget the project architect and engineer shall be responsible to design each system installation with input from designated and qualified SDOC Representatives. Under the construction budget the project general contractor shall be responsible using an SDOC approved and verified certified and qualified intercom systems contractor to provide, install, terminate, test, label and warranty all SDOC designated intercom field devices and their cabling installed without splices both interior and exterior inclusive of all pieces, parts, supports, stub outs and pathways, SDOC designated intercom backbone cabling inclusive of all pieces, parts, supports and labor homerun installed without splices from each campus SDOC designated IDF to the SDOC designated campus MDF, SDOC designated intercom head end components and installation, activation, programming and warranty for all SDOC specified intercom devices pieces and parts inclusive of all pieces, parts, supports and labor for all SDOC designated intercom installations both interior and or exterior at all new and or existing building(s) where SDOC specified.

- Under the construction budget the project architect and engineer shall be responsible to design each system installation with input from designated and qualified SDOC Representatives. Under the construction budget the project general contractor shall be responsible using an SDOC approved and verified certified and qualified intercom contractor to provide and insure sufficient spare ports to enable 20% growth and expansion at the SDOC designated intercom head end location based on the number of intercom circuits installed and in sufficient spare quantities of WESTPENN AQC369 or SDOC approved equal intercom backbone cables at each new SDOC designated building IDF location(s) to enable 20% growth and expansion when installation construction has been completed.

- General contractor shall be responsible using an SDOC approved and verified certified and qualified intercom contractor to provide, install, terminate, test, label, activate, program and warranty all SDOC designated intercom field devices pieces and parts, cabling, supports, stub outs and pathways for all SDOC designated building infrastructure intercom cabling interior and or exterior for all SDOC designated IDF building locations and the SDOC designated intercom contractor shall be the only authorized technology trade technicians to make any and all final head end cabling connections without exception.
NOTE: For all construction sites the general contractor shall be responsible to provide, manage and insure that the SDOC designated intercom contractor shall provide and install, terminate, test, label, activate, program and warranty any and all SDOC designated head end equipment, components and devices, pieces and parts, cabling, supports, stub outs, sleeving and pathways required to deliver a 100% operational and fully functioning intercom system at the new construction site.

NOTE: For existing new construction and renovation sites at existing campus locations the general contractor shall be responsible to provide, manage and insure the SDOC designated intercom contractor where required shall provide and install, terminate, test, label, activate, program and warranty any and all “ADDITIONAL” SDOC designated head end parts with regard to additional head end intercom circuits, clock operation, call button and volume control functionality head end components, all call capability and emergency signal operational head end functionality when these items are lacking and deficient with an existing intercom head end system and when the need arises the general contractor shall insure the 100% operability and functionality of all new devices during new construction installation if it is determined that the new installation components and field devices shall not be fully functional without these “ADDITIONAL” intercom head end components are installed / made operational regarding required intercom repairs, upgrades or additional components to support proper operation of all new intercom device installations to support the full operability of all newly installed SDOC designated intercom devices in order to make all new construction components installed fully functional at all new construction and renovation sites.

All SDOC designated intercom installations shall be provided, procured and managed by the general contractor and accomplished by the SDOC approved certified intercom technicians IAW SDOC Division 27 Standards and Specifications. All work shall include the provision, installation, termination, testing, labeling, programming training and warranty of all needed head end parts and services required to support the full 100% functionality of all new intercom devices and cabling installed IAW new construction documents and plans.

Audio / Visual Non-Classroom Related Sound Systems – (Unless otherwise SDOC specified) Under the construction budget the project architect and engineer shall be responsible to design all auditorium, cafeteria, covered play, gymnasium, multipurpose room, press box and all other non-classroom related sound system installations with input from designated and qualified SDOC Representatives. Under the construction budget the project general contractor shall be responsible using an SDOC approved and verified certified and qualified
audio / visual non-classroom related sound systems contractor to provide, install, terminate, test, label and warranty all SDOC designated sound system field devices and their cabling installed without splices both interior and exterior inclusive of all pieces, parts, supports, stub outs and pathways, SDOC designated head end components and installation, activation, programming, testing, adjustments, training and warranty for all SDOC specified audio / visual sound systems devices pieces and parts inclusive of all materials and labor for all installations both interior and or exterior at all SDOC designated new and or existing building(s) where SDOC specified.

- **NOTE:** The general contractor shall be responsible to insure that the audio / visual non-classroom related sound systems contractor shall provide and install, terminate, test, label, activate, program and warranty any and all SDOC designated head end equipment, components and field devices, pieces and parts, cabling, supports, stub outs and pathways required to deliver a 100% operational and fully functioning SDOC designated audio / visual non-classroom related sound system(s) at the new construction site inclusive of SDOC designated head end intercom and fire alarm cutout circuits for emergency signal operational functionality at all designated new construction and renovation sites.

- All audio / visual non-classroom related sound systems installations shall be provided, procured and managed by the general contractor using SDOC approved certified and qualified audio / visual non-classroom related sound systems technicians IAW SDOC Division 27 Standards and Specifications. All work shall include the provision, installation, termination, testing, labeling, programming, training and warranty of all needed SDOC designated head end parts and services required to support all SDOC designated devices and cabling IAW construction documents and plans.

- **Voice / Audio Enhancement Classroom Sound Systems** – **NOTE:** AUDIO ENHANCEMENT INC. IS THE SDOC BOARD APPROVED SOURCE AND NO OTHERS for SDOC provided and installed Voice / Audio Enhancement Classroom Sound Systems. Under the construction budget the project architect and engineer shall be responsible to design each system installation with input from designated and qualified SDOC Representatives. Under the construction budget the project general contractor shall be responsible using an SDOC approved and verified certified and qualified audio / visual classroom sound systems contractor to provide and install all SDOC designated devices, pieces and parts, cabling, and supports inclusive of contractor services to install, terminate, test, label, activate, program, adjust and warranty all SDOC designated Voice / Audio Enhancement Classroom Sound Systems required to deliver a 100% operational and fully functioning classroom audio enhancement solution at all new and or existing SDOC designated building(s), classrooms and other areas where SDOC specified.
Under the construction budget the project architect and engineer shall be responsible to design each system installation with input from designated and qualified SDOC Representatives. Under the construction budget the project general contractor shall be responsible to provide and install all SDOC designated Voice / Audio Enhancement classroom stub outs and general power duplex receptacle locations, the project general contractor shall be responsible to schedule all SDOC designated Voice / Audio Enhancement Classroom Sound Systems installations, the project general contractor shall be responsible to coordinate the schedule and manage the SDOC designated Voice / Audio Enhancement Sound Systems Contractor during their provision, installation, termination, labeling, testing, adjustments, programming, training and warranty of all needed head end parts and services required to support all devices and cabling at each SDOC designated location IAW construction documents and plans.

- Interactive / Smart Board and Projector Plate Systems – The SDOC Media and Instructional Technology Department shall purchase through FF&E budget (unless otherwise noted) all physical SDOC designated Interactive / Smart Boards and the physical SDOC designated projectors.

- Under the construction budget the project architect and engineer shall be responsible to design each system installation with input from designated and qualified SDOC Representatives. Under the construction budget the project general contractor shall be responsible to provide and install all SDOC designated smart board station and teacher station outlet stub outs at the teaching wall and the project general contractor shall be responsible using an SDOC approved and verified certified and qualified technology systems cabling contractor to provide and install all SDOC designated ceiling mounted projector plate assemblies inclusive of all associated SDOC designated projector plate mounting and safety hardware, all projector plate functional parts, pieces and components to include:
  - SDOC designated Projector Plate and Projector mount assembly and all associated mounting and safety hardware (IAW SDOC Division 27 Technology Standards and Specifications and Manufacturer’s Installation Instructions and Specifications) - As detailed in SDOC Division 27 Technology Standards and Specifications Section 27-10-00.
  - SDOC designated Dual Audio Visual Extender Kit and Category 5 patch cables for each projector plate assembly and each teacher station outlet location (IAW SDOC Division 27 Technology Standards and Specifications and Manufacturer’s Installation Instructions and Specifications) - As detailed in SDOC Division 27 Technology Standards and Specifications Section 27-10-00.
- SDOC designated general power duplex receptacle for each SDOC designated projector plate assembly - As detailed in SDOC Division 27 Technology Standards and Specifications Section 27-10-00.

- SDOC designated D2 Data outlet installed, terminated, tested, labeled and warrantied with the existing installed data copper infrastructure system being installed for each SDOC designated projector plate assembly - As detailed in SDOC Division 27 Technology Standards and Specifications Section 27-10-00.

- The SDOC Media and Instructional Technology Department shall purchase through FF&E budget (unless otherwise noted) all contractor services to couple all physical SDOC designated smart boards and the physical SDOC designated projectors to general contractor installed SDOC designated smart board station and teacher station outlet stub outs and SDOC designated projector plate assemblies.

- The SDOC Media and Instructional Technology Department shall purchase through FF&E budget (unless otherwise noted) all contractor services to install all physical SDOC designated smart board and physical SDOC designated projector hardware and component devices, pieces and parts, patch cables, and supports to enable them to test, label, activate, program, adjust and warranty all physical SDOC designated smart boards and physical SDOC designated projectors required to deliver a 100% operational and fully functioning SDOC designated classroom interactive board solution at all new and or existing SDOC designated building (s), classrooms and other areas where SDOC specified.

- Under the construction budget the project general contractor shall schedule all SDOC designated physical smart board and physical SDOC designated projector system installations. The project general contractor shall coordinate the schedule with qualified SDOC Representatives and the SDOC Media and Instructional Technology Department Director and the project general contractor shall manage the SDOC designated smart board and SDOC designated projector system contractor during their provision, installation, termination, labeling, testing, adjustments, programming, training and warranty of all SDOC designated head end parts and services required to support all SDOC designated devices and cabling at each location IAW construction documents and plans.

- SDOC designated Network / Data Category Six System – Under the construction budget the project architect and engineer shall be responsible to design each system installation with input from designated and qualified SDOC Representatives. Under the construction budget the project general contractor using an SDOC approved and verified certified and qualified technology systems cabling contractor (IAW SDOC Division 27 Technology Standards and Specifications) shall provide, install, terminate, test, label and warranty all
installation technology pieces and parts and supports and all SDOC specified cabling, stub outs, sleeving and pathways for all SDOC designated Category Six infrastructure cabling and components installations inclusive of all patch panels, D1 through D6 or other project specific data outlets inclusive of SDOC designated wireless access points, SDOC designated transition point cabinets and SDOC designated camera cabling locations and or other locations regarding HVAC, Fire Alarm device locations, all locations for all devices both interior and exterior inclusive of all penetrations and sleeving throughout each and every SDOC designated building IAW Division 27 Technology Standards and Specifications in whole.

- Under the construction budget the project general contractor shall be responsible with input from designated and qualified SDOC Representatives provide, procure and manage All SDOC designated Category Six copper data installations using SDOC designated current Certified technology systems cabling contractor installation technicians representing of one (1) of the following three (3) SDOC designated data cabling manufacturers and their product solutions: PANDUIT – ORTRONICS- AMP/TYCO. The technology cabling installation contractor shall have a current certified resident BICSI RCDD on the technology contractor’s staff and payroll and the technology cabling installation shall be a complete integral SDOC designated warranted cabling solution as detailed IAW SDOC Division 27 Technology Standards and Specifications.

- All work shall include the provision, installation, termination, testing, labeling, training and warranty of all SDOC designated cabling parts pieces and services at all locations and to support all SDOC designated devices and cabling IAW SDOC Division 27 Technology Standards and Specifications and construction documents and plans.

- Under the construction budget the project architect and engineer shall be responsible to design each system installation with input from designated and qualified SDOC Representatives. Under the construction budget the project general contractor shall be responsible to provide, install, terminate, test, label and warranty all SDOC designated installation pieces and parts and supports, and all SDOC designated cabling, pieces and parts, stub outs and pathways for all SDOC designated clean power receptacles for support of all SDOC designated technology data outlet locations installed at the same height and within 12 to 24 inches of each SDOC designated data outlet. For D1 to D4 data outlet locations a duplex clean power receptacle shall be installed. For all D6 Data outlet locations a quad clean power receptacle shall be installed. All SDOC designated clean power receptacles shall be labeled with Panel Number and Circuit Breaker Numbers on each outlet faceplate.
Communication Closet Grounding Requirements – Under the construction budget the project architect and engineer shall be responsible to design each system installation with input from designated and qualified SDOC Representatives. Under the construction budget the project general contractor shall be responsible to provide and install, terminate test and label all SDOC designated grounding cabling, sleeving and bus bar devices inclusive of all NEC and U/L compliant pieces and parts at all SDOC designated IDF and MDF locations IAW NEC and U/L directives and SDOC Division 27 Technology Standards and Specifications.

NOTE: All interior and exterior fire and smoke rated technology systems cabling conduit or manufactured fire stopping device penetrations, conduit stub outs and conduit or manufactured fire stopping device sleeving shall be sealed 360 degrees around the openings at both interior and exterior wall locations and on the inner portion of all fire and smoke rated conduit or manufactured penetrations, stub outs and conduit or manufactured sleeving at all locations shall be filled with removable U/L approved fire stopping and smoke rated fill materials installed by general contractor verified certified minimum level 1 fire stopping sealant installation technicians IAW Division 27 Technology Standards and Specifications.

NOTE: Regarding those wall penetration locations identified which are not installed in fire and smoke rated wall locations and will not require U/L approved fire stopping and smoke rated fill materials these locations shall still be sealed both exterior and interior. It shall be the responsibility of the project general contractor to insure all of these locations as well are sealed 360 degrees around the openings at both interior and exterior wall locations with a U/L approved non-flammable caulk or other SDOC approved sealant and sealed on the inner portion of all conduit or manufactured penetrations, stub outs and conduit or manufactured sleeving at all locations with removable U/L approved non-flammable fill materials.

All technology construction related installation designs and specifications for SDOC Designated MDF and IDF locations shall be inclusive of all details, processes and procedures for all technology systems. All SDOC technology systems build out information for all communications closets shall be complete to SDOC specifications, error and omission free SDOC designs utilized, installed, detailed and formatted as is expressly outlined in depth for all areas and aspects in the current version of SDOC Division 27 Technology Standards and Specifications inclusive of all applicable sections with no exception.

All SDOC technology construction installation designs and specifications shall incorporate all SDOC designated technology related details and design aspects of the SDOC designated MDF and all IDF communications closets regarding closet size, design, layout and the installations of voice and data backboards, free standing two post racks and ladder racks and their mounting
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hardware and components, ground cabling, grounding bus bars and UL required equipment, power receptacles types and sizes and heights, lengths and locations, all technology wall field configurations with color designated paint stencils and striping and all breakout / build out areas for intercom, voice and data, security to include intrusion detection and video surveillance cabling and the HVAC cooling configurations in addition to all sleeving, ceilings, conduits, U/L compliant sealing, flooring and the entrance / opening to the outside of the MDF / IDF spaces for all doors which shall either be oversized or double door configurations as SDOC specified and written during design and as conveyed to the design team both verbally and in the written format of the SDOC Division 27 Technology Standards and Specifications.

1.03 CONCLUSION:

This “BASE” scope of technology systems infrastructure specifics and samples is not to be construed as the all-inclusive scope of work for any technology systems project installation.

This is an introductory informational segment submitted as a base guide to the norm regarding the scope of technology systems infrastructure specifics generated as a guide to provide a beginning understanding to clarify and reduce confusion for “first time” SDOC architects and engineers and as a reference for veteran SDOC contracted trade professionals unfamiliar with the “standard” SDOC demands, requirements and expectations regarding overall SDOC technology project design and installation that shall be adhered to as defined in the in-depth sections of SDOC Division 27 Technology Standards and Specifications as established for Osceola County School District technology installations. Specific requirements for each and every project require in-depth discuss with the authorized SDOC ITS and MIT Department Representatives to insure there are no changes required to the norm or standard.

If the information provided appears not to have sufficient detail for a clear understanding of “standard” SDOC project technology specifics for a base SDOC design or regarding SDOC technology installation expectations for upfront planning for SDOC technology systems projects in any area please contact the Information and Technology Services Department Construction Project Management Supervisor at 407-518-2950 for immediate clarification and also reference the current posted version of Division 27 Technology Standards and Specifications in all applicable sections for in-depth installation detail.

END.

Below are sample details included as amplifying information. These sample details are available from the Information and Technology Services Department Construction Project Management Supervisor individually in PDF format if required.
“SAMPLE DETAIL 1”
“SAMPLE DETAIL 2”

BUILDING MDF AND IDF RACK BUILDCUT DESIGN DETAIL SHALL BE THE RESPONSIBILITY OF THE
PROJECT ARCHITECT AND ENGINEER INCORPORATING THE INPUT OF COMBINED ITS DEPARTMENT
AUTHORIZED PERSONNEL.

NOTE: IDF LOCATION CONFIGURATIONS DIFFER SIGNIFICANTLY FROM MDF CONFIGURATIONS.
CONSULT SDOC DIVISION 27 TECHNOLOGY STANDARDS AND SPECIFICATIONS FOR IN-DEPTH DETAIL
AS WELL AS CONSULTING ITS DEPARTMENT AUTHORIZED PERSONNEL FOR CLARIFICATION WHERE
REQUIRED.

BUILDING MDF Registers BUILDOUT “SAMPLE” DETAIL

NOTE: IDF LOCATION CONFIGURATIONS DIFFER SIGNIFICANTLY. REFER TO DETAILS SPECIFIC TO MDF
LOCATION FOR MDF DESIGN AND DETAILS SPECIFIC TO IDF LOCATION FOR IDF DESIGN.

“SAMPLE DETAIL 2”

RACK BUILD OUT DETAIL

NOTE:

DESIGN BY THE ARCHITECT AND ENGINEER AND INSTALLATION BY THE GENERAL CONTRACTOR
SHALL ALWAYS INSURE THERE ARE A MINIMUM OF 48 INCHES CLEARANCE FOR EGRESS BEHIND AND IN
FRONT OF EACH FREESTANDING TWO POST RACK AS MEASURED FROM THE FURTHEST EDGE OF
THE FRONT AND REAR FEET OF EACH ASSEMBLED RACK TO THE FINISHED
VOICE AND DATA BACKBOARDS WALLS IN THE SPACE.
“SAMPLE DETAIL 3”
"SAMPLE DETAIL 4"

**BACKBOARD NOTES:**

1. All backboards in all MDF and IDF locations shall be A-C grade plywood, painted all sides with UL classified fire retardant latex paint.

2. Backboards field color shall be light gray in color. Secondary border striping - striping and lettering colors shall be as identified above, and per the SDOC Division 27 specifications. All colors shall be approved by SDOC ITS Department.

3. All backboards shall be installed as indicated per the DWG. Installation shall be seamless and butt to one another at all locations. There shall be no gaps/separation between any backboards.

4. Reference specifications for additional materials, and installation requirements.

**LOW VOLTAGE SYSTEMS BACKBOARD DETAIL**

"SAMPLE DETAIL 4"
**“SAMPLE DETAIL 5”**

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**IDF ROOM**

“COMM”

BUILDING MDF AND IDF RACK BUILDOUT DESIGN DETAIL SHALL BE THE RESPONSIBILITY OF THE PROJECT ARCHITECT AND ENGINEER INCORPORATING THE INPUT OF COMBINED ITS DEPARTMENT AUTHORIZED PERSONNEL. NOTE: IDF CONFIGURATIONS DIFFER SIGNIFICANTLY FROM MDF CONFIGURATIONS. CONSULT DIVISION 27 TECHNOLOGY STANDARDS AND SPECIFICATIONS FOR IN-DEPTH DETAIL AS WELL AS CONSULTING ITS DEPARTMENT AUTHORIZED PERSONNEL.

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**“SAMPLE DETAIL 5”**
“SAMPLE DETAIL 6”

IDF ROOM
“COMM”

BUILDING MDF AND IDF RACK BUILDOUT DESIGN DETAIL SHALL BE THE RESPONSIBILITY OF THE PROJECT ARCHITECT AND ENGINEER INCORPORATING THE INPUT OF COMBINED ITS DEPARTMENT AUTHORIZED PERSONNEL.

NOTE: IDF CONFIGURATIONS DIFFER SIGNIFICANTLY FROM MDF CONFIGURATIONS. CONSULT DIVISION 27 TECHNOLOGY STANDARDS AND SPECIFICATIONS FOR IN-DEPTH DETAIL AS WELL AS CONSULTING ITS DEPARTMENT AUTHORIZED PERSONNEL.

“SAMPLE DETAIL 6”
"SAMPLE DETAIL 7"

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"SAMPLE DETAIL 7"

NOTE:

RACK BUILD OUT DETAIL

DESIGN BY THE ARCHITECT AND ENGINEER AND INSTALLATION BY THE GENERAL CONTRACTOR SHALL ALWAYS INSURE THERE ARE A MINIMUM OF 48 INCHES CLEARANCE FOR EGRESS BEHIND AND IN FRONT OF EACH FREESTANDING TWO POST RACK AS MEASURED FROM THE FURTHEST EDGE OF THE FRONT AND REAR FEET OF EACH ASSEMBLED RACK TO THE FINISHED VOICE AND DATA BACKBOARDS WALLS IN THE SPACE.

IDF ROOM "SAMPLE" VOICE/DATA RACK ELEVATION

"SAMPLE DETAIL 7"
“SAMPLE DETAIL 8”
“SAMPLE DETAIL 9”
“SAMPLE DETAIL 10”
“SAMPLE DETAIL 11”
“SAMPLE DETAIL 12”
“SAMPLE DETAIL 13”
GENERAL TECHNOLOGY PROJECT REQUIREMENTS


General Technology Project Requirements - Table of Contents:

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1.01 SUMMARY:

A. All technology systems project installations consist of six (6) phases as follows:

1. Design/Planning Phase
2. BID/Quoting Phase
3. Construction Phase
4. Substantial Inspection Phase
5. Final Inspection Phase
6. Close Out/Documentation Phase

B. Each phase includes multiple tasks and requirements for project completion to insure the integrity of the technology project.

1. Design and Planning Phase:

a. The site specific project architect, engineer and general contractor shall contact and interact with SDOC ITS Department Technology Representatives for assistance and recommendations regarding the design of all affected technology systems for any new construction, renovation, or retrofit projects. In-depth contractor requirements can be referenced in Section 270200.

b. It is the responsibility of the SDOC ITS Department to review and coordinate with all associated departments all technology project plans and provide input for changes and additions or revisions and update applicable information regarding the technology systems associated with the plan design for all Construction Services Department projects regarding new construction, renovations and retrofits.

c. SDOC MTS Department shall direct purchase technology systems equipment as indicated for voice, video, data, security and other technology systems.

d. Still, in the interest of the district the SDOC ITS Department shall retain the right and option following proper protocol regarding inclusion into construction projects to modify this chosen policy and instead dictate through conformed plans and documents that the General Contractor shall provide and install selected SDOC specified technology systems equipment inclusive of all aspects of installation and testing and the General Contractor shall submit a fully functional and operational system when determined to be more prudent and cost effective.

e. Additionally, in instances where the General Contractor is now installing SDOC ITS Department specified technology systems the SDOC ITS Department shall maintain the flexibility to insure that as technology changes and SDOC specified components require upgrade or change due to obsolete or discontinued components and or devices said changes and upgrades are accepted for
inclusion and update on conformed plans and documents as needed by SDOC Representatives in the interest of the school district.

f. For all technology projects of new construction, renovation, retrofits it shall be the responsibility of the SDOC ITS Department to assist in the management, the design and installation of technology systems projects from conception to completion including the needs and inputs of all associated SDOC departments and campus locations and to monitor each installation through all phases to insure a quality end product.

g. For those technology related projects accomplished directly by district support personnel and their contracted contractors it shall be the responsibility of the SDOC ITS Department to directly manage the design and installation of technology systems projects from conception to completion including the needs and inputs of all associated SDOC departments and campus locations and to monitor each installation through all phases to insure a quality end product.

h. Prior to project contract and construction it shall be the responsibility of the site specific project architect, engineer and general contractor at any existing contracted SDOC site to identify and document and preserve the condition of all existing technology systems cabling and components both interior and exterior within the vicinity of the contracted areas regardless of whether the contracted scope is directly, in-directly or not at all related to the installed technology systems in the vicinity of the project.

i. On all existing construction sites project architect, engineer and general contractor shall also contact SDOC ITS Department Technology Representative to procure an SDOC approved technology systems or as applicable SDOC approved security contractor to remove, store and reinstall any technology or security systems cabling and or components subject to potential damage or demolition with regard to construction, construction demolition and or construction excavations both interior and exterior during the timeframe of the project.

j. It shall be the responsibility of the site specific project architect, engineer and general contractor with no expense or obligation to assist from any SDOC Department to repair or replace in part or in whole any demolished or excavated currently existing technology systems during any construction project regardless the scope.

k. Further it shall be the SDOC ITSD option to upgrade damaged systems from outdated technology to a modern version of the same technology being replaced including all damaged cabling and or components. In the repair or replacement of demolished or excavated currently existing SDOC technology systems all damaged technology systems shall be replaced with new cabling and components by the contractor at no expense to the complete satisfaction of the SDOC ITS Department.
1. **Current SDOC Technology Systems Include:**

   1. Network Electronics and VOIP Systems. SECTION 27.03.00
   2. Wireless Access Point Systems. SECTION 27.04.00
   3. Uninterruptible Power Supply Systems. SECTION 27.05.00
   4. Intrusion Detection Systems. SECTION 27.06.00
   5. Video Surveillance Systems. SECTION 27.07.00
   6. Intercom Head end Systems. SECTION 27.08.00
   7. Auditorium, Multipurpose and Cafeteria Sound Systems SECTION 27.09.00
   8. Interactive Board and Ceiling Mounted Projector Systems. SECTION 27.10.00
   9. Audio Enhancement or other selected Audio Systems. SECTION 27.11.00
   10. Hand Held Radio Repeater Master Unit Systems. SECTION 27.12.00
   11. Portable Classrooms Technology SECTION 27.13.00
   12. Football Stadium Press Box Sound System and Technology SECTION 27.14.00

2. **BID/Quoting Phase:**

   **A. Initial BID / Quote**

   1. Technology systems contractors submitting for SDOC projects shall provide a complete quote inclusive of a comprehensive breakdown of all labor, equipment and materials necessary to provide a 100% fully operational system that has been SDOC inspected and contractor tested, labeled and warranted with no exceptions. In-depth contractor requirements can be referenced in SECTION 27.02.00.

   **B. Submission of Substitute Alternate Equipment or Components:**

   1. All technology related installations and projects shall be based solely on SDOC specified equipment and systems. The Project Engineer and the SDOC ITSD authorized Representatives shall pre approve any substitute alternate system or component. Otherwise installation shall be denied.
2. Requesting contractors shall submit product information “cut sheets” and where requested sample products with the appropriate documentation to the Project Engineer and the School District Representative who shall make final determination on whether the equipment and or component proposed will provide a precise functional equivalent system to meet or exceed specifications. Contractor shall also be prepared to provide documentation to support the proposed alternate as being an equivalent or superior system.

3. Contractor shall provide adequate information prior to bid date such as specification sheets, working drawings, shop drawings, and demonstration of the alternate substitute system or component. Alternate supplier-contractor must also provide a list to include three installations of a like system to that proposed in operation for a minimum period of two years. SDOC ITSD Representatives retain final authority to approve or deny all alternative systems or components submitted based on findings or in the best interest of the district.

4. Failure to provide the "precise functional equivalent" shall result in the disapproval of the alternate substitute system or component and replacement with SDOC specified manufacturer’s system or component at the sole expense of the installing contractor.

3. Construction Phase:

1. All technology project installations are expected to be of the highest quality whether accomplished within the district or contracted to an outside source. SDOC ITS Department Technology Systems Construction Project Managers throughout the course of each project will assure a quality installation with continual monitoring, inspections and documentation at all phases.

2. SDOC specified manufacturer’s components shall be indicated in conformed plans and scopes of work for use in installation of the building premise wiring and outside plant cabling for technology systems to insure an integral and warranted system for every installation.

3. SDOC MTS Department Technology Systems Construction Project Managers shall be included in all aspects of the construction phase to include Owner Architect Contractor meetings, technology related contractor on-site meetings or any other activities that impact the installation of all technology systems. In-depth contractor requirements can be referenced in SECTION 27.02.00.

4. Substantial Inspection Phase:

1. Upon completion of construction during the Substantial Phase of each project the Project Engineer and the SDOC ITS Department Technology Construction Project Managers shall conduct a Technology Installation 10% Test and Substantial Inspection for all technologies installed. In-depth contractor requirements can be referenced in SECTION 27.02.00.
2. The SDOC ITSD Technology Installation 10% Test and Substantial Inspection shall include a minimum random 10% test of all installed fiber optic and copper cabling, all technology systems installed including but not limited to security, intercom, voice, video, data outlets, smart boards, projectors, audio enhancement, sound systems, and any other technology cabling and devices from head end to field location.

3. A comprehensive inspection of all MDF and IDF spaces and an inspection of classroom and office spaces for technology related issues. All issues shall be documented and submitted to the Project Manager and General Contractor for resolution.

5. Final Inspection Phase:

1. Upon satisfactory correction of all Substantial Inspection Phase identified issues a Final Inspection shall be conducted to insure all issues previously documented have been resolved to SDOC satisfaction. In-depth contractor requirements can be referenced in SECTION 27.02.00.

2. This inspection is repeated as necessary until all open issues are satisfactorily completed for each project with documentation submitted for each inspection determined by SDOC ITSD to be incomplete.

6. Close Out/Documentation Phase:

1. At project completion the contractor shall provide all project documentation required by SDOC ITSD for close out on all Technology Installation projects.

2. Technology Installation Contractors shall ensure all technology systems shall be fully operational to include SDOC inspected and contractor testing and labeling of all installed technology systems cabling, head end components, field devices, hardware, terminations and all other tasks necessary to ensure complete and operational SDOC technology systems. Testing for fiber optic and all copper technology cabling installed shall be conducted with SDOC specified currently calibrated, certified cable test equipment and shall pass all requirements as design and project specified. In-depth contractor requirements can be referenced in SECTION 27.02.00.

3. For Premise Distribution Wiring Systems (PDS) and their outside plant cable installation all copper Category 6 infrastructure wiring, patch panels, RJ45 modules and other related components shall be tested to meet EIA 568A, Category 6 or above requirements and all other project specifications. All UTP cabling and terminations are to be tested with SDOC ITSD approved currently calibrated, certified cable testers and shall pass 350 MHz or above requirements as design and project specified.
4. At project Closeout all Technology Installation Contractors shall provide to the Project Engineer for review and delivery to the SDOC ITSD for retention the following project documentation:

- Shop drawings and as builts.
- A complete and comprehensive set of cabling test results reviewed for all installed Copper and Fiber Optic cabling in both electronic and paper format.
- COMPLETE CLOSED PANDUIT, ORTRONICS or AMP/TYCO SOLUTION PERFORMANCE WARRANTY. Warranty certificate and documentation providing the minimum fifteen year warranty for the installed certified product.
- Intercom Warranty Certificate and documentation providing the minimum established warranty for the installed product.
- Sound Systems Warranty Certificate and documentation providing the minimum established warranty for the installed product.
- Security Systems Warranty Certificate and documentation providing the minimum established warranty for the installed product.
- Audio Enhancement Warranty Certificate and documentation providing the minimum established warranty for the installed product.
- Smart Board Warranty Certificate and documentation providing the minimum established warranty for the installed product.
- Other project documentation as required by contract design and specifications.

5. Only when all items are received and accepted as satisfactory by SDOC ITS Department is the project considered complete and closed out.

6. Upon close out of the project a contractor evaluation shall be developed and submitted by SDOC ITS Department authorized representatives for the retention of the general contractor and the technology contractor(s) as evaluation of their installation.

7. Codes, Standards and Specifications:

1. All work associated with the installation of the PDS and all other systems outlined in this document shall be performed in accordance with, but not limited to the latest ratified version of the following:

   i. National Electrical Code latest ratified
   ii. Florida Dept. of Education, Retrofit for Technology Guidelines
   iii. EIA/TIA 568, 569, 607
   iv. IEEE Standards 802.3, ANSI, NFPA &NESC
   v. EIA/TIA-TSB-36, 40 & EIA/TIA-492
vi. The School District of Osceola County Division 27 Technology Systems Standards and Specifications (latest ratified)

vii. BICSI TDMM
viii. BICSI ITS Installation Manual
ix. BICSI COSP Design Manual
x. BICSI Electronic Safety & Security Reference Manual (ESSDRM)
xi. Underwriters Laboratories
xii. Local Codes and Ordinances

2. Should conflicts exist, the authority having jurisdiction for enforcement shall have responsibility for making interpretations.

1.02 CONTRACTOR QUALIFICATIONS:

A. It is the responsibility of the Architect, Project Engineer, Construction Services Department Project Manager and Media and Technology Services Department Technology Construction Project Manager to ensure that any awarded technology systems contractor has complied in all aspects with all applicable requirements providing substantiating documentation in order to install technology systems in the School District of Osceola County, Florida as established and defined in SDOC Standards and Specifications. The requirements include but are not limited to the following:

1. The selected prospective contractor intended to be awarded any SDOC technology related installation or project shall be qualified and certified in all instance and in all respects as outlined in SDOC Standards and Specifications.

2. The selected prospective contractor shall be required to produce valid and current certification documentation for one of the following three (3) technology PDS (Premise Distribution System) manufacturer’s solutions: COMPLETE CLOSED PANDUIT, ORTRONICS or AMP/TYCO SOLUTION. All cabling, components and solution installation practices shall meet the chosen manufacturer’s installation requirements and shall only utilize selected products from the selected manufacturer and their list of approved partners.

3. Selected prospective contractors shall further submit documentation to SDOC ITS Department satisfying the requirements of the district that the proposed contractor is in fact certified and authorized as an installing agent/company to offer one of the selected technology manufacturer’s either COMPLETE CLOSED PANDUIT, ORTRONICS or AMP/TYCO SOLUTION. Product warranty for a minimum fifteen years from date of installation acceptance for properly registered and approved projects in the State of Florida.
4. In addition all technology project installation contractors shall produce valid and current certification documentation substantiating the statement that a current BICSI RCDD qualified and certified Project Manager is an employee and member of that contractor’s company. The project RCDD shall not be “contracted in” for an SDOC technology project from another technology company or other source and as such shall not be on the payroll of another company. SDOC requires the installing company shall have their own BICSI RCDD who shall be present on site at all SDOC Technology Project installations.

5. These requirements are without exception and shall be met with compliance prior to commencement of any work derived from awarded technology installations or projects regardless of contracting authority whether Construction Services Department General Contractors, SDOC ITS Department or other district department or school administrative representatives to insure integrity and quality of all technology systems at all district locations.

B. The selected Contractor shall produce substantiating evidence they are a licensed, bonded low voltage company with a minimum of (3) three years experience satisfactorily installing the selected technology systems as described in this document.

C. A resume of qualification shall be submitted with the Contractor's bid indicating the following:

1. A list of all completed projects for the past year of similar type and size with contact names and telephone numbers for each.

2. A list of test equipment proposed for use in verifying the installed integrity of metallic cable or fiber optic systems specified for the project. The following is a list of required test equipment necessary for certifying the installation of the Premise Wiring System.

   a) OTDR for Multi Mode Fiber Optics
   b) OTDR for Single Mode Fiber Optics
   c) Light Source Power Meter
   d) Field Strength Meter
   e) TDR for Coax
   f) Volt/Ohm Meter
   g) LAN Cable Certification Meter- 350 MHz

3. A technical resume of experience for the company and name and certification for on-site installation foreman assigned to this project. The project foreman for communications installations shall be a qualified and certified BICSI RCDD. A valid current and up-to-date copy of the RCDD certification is required for consideration and shall be provided to the Project Engineer and School District Representative.
4. All documentation and certifications required of the Project Technology Contractor apply and shall be produced for SDOC regarding any and all Technology Sub-Contractors intended to assist the Technology Contractor in performance of any and all SDOC project work. No technology work shall be contracted in SDOC to technology contractors that do not produce valid current documented proof of qualifications and certifications satisfying SDOC requirements.

5. Previous experience with similar projects for the School District of Osceola County. (If any.)

6. Required installation certification authorizing the installing agent/company to offer one of the selected technology manufacturers COMPLETE CLOSED PANDUIT, ORTRONICS or AMP/TYCO SOLUTION. Product warranty for a minimum fifteen years from date of installation acceptance for properly registered and approved projects in the State of Florida.

7. All items of equipment including wire and cable shall be designed by the manufacturer to function as a complete system and shall be accompanied by the manufacturer's complete service notes and drawings detailing all interconnections.

8. The Technology Contractor shall be an established operated business for at least (3) three years. The Contractor shall be a duly authorized distributor of the equipment supplied with full manufacturer's warranty privileges.

9. Intercom head end equipment, cabling and required intercom components (including but not limited to call buttons, volume controls, clocks, speakers, horns, surge protection, etc…) shall be provided and installed by the SDOC selected primary intercom contractor “ONLY”.

10. The Technology Contractor shall show satisfactory evidence, upon request, that they maintain a fully equipped service organization with a full time staffed office capable of furnishing adequate inspection and service to the system in contracted SDOC specified timeframes. The Contractor shall maintain at this facility the necessary spare parts in the proper proportion as recommended by the manufacturer to maintain and service the equipment being supplied.

11. The Technology Contractor shall be a responsible service and installation provider, showing evidence of properly operating systems in Florida Schools. A list of these schools, including any Osceola County Schools, shall be submitted in the Contractor's bid.
1.03 STORAGE:

A. All Technology Contractors will coordinate with the Project Engineer, School District Representative, and/or the General Contractor in order to properly utilize the available space upon the property for storage.

1.04 PROGRESS MEETINGS:

A. Progress meetings shall be held on the first day of construction and each week thereafter on a predetermined date.

B. This date and time shall be agreeably arranged at the first construction meeting.

C. At this meeting, all technology installation concerns of the Contractor(s), Project Engineer and the School District Representative shall be addressed.

D. At this meeting a review of the conformed specifications and plans shall be completed. Any questions, concerns and verification needed shall be addressed at this time.

1.05 WORK SCHEDULE:

A. Work hours shall be coordinated based on the site specific particulars of each individual project with a combination of the following approving authorities:

- Project Site SDOC Campus Administration
- Project Onsite SDOC Facilities Project Manager
- General Contractor
- ITSD Technology Systems Construction Project Manager

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PART 1 – TECHNOLOGY SYSTEMS CONTRACTOR SPECIFIC REQUIREMENTS

1.01 GENERAL DESCRIPTION OF TECHNOLOGY CONTRACTOR SERVICES

REQUIREMENTS:

A. **SDOC Technology Systems Contractor Common Required Attributes** – SDOC Technology Systems Contractors where ever referred to in this document shall in all instances in the Division 27 Technology Systems Standards and Specifications apply to and include but shall not be limited to any technology related contractor obligated to SDOC by issued purchase order or other contract or as contracted by any General Contractor to perform any technology function, contracted by SDOC Information and Technology Services Department or any other district department, campus or administrative organization within the district to install new, repair or replace existing, test, adjust, program, label, warranty or otherwise interact with SDOC Information and Technology Services Department personnel as a minimum on any technology system or systems for which contracted including but not limited to active or passive components, analog or digital components, interior or exterior components of network and data systems, intercom and associated clock systems, television systems, telephone systems, intrusion detection systems, video surveillance systems, audio enhancement systems, smart board and projector systems, sound and PA systems, hand held radio systems or other SDOC systems deemed technology related for which contracted. Scope of provision shall include end to end installation of any component of the aforementioned technology systems including any and all cabling, supports and support systems, fasteners, conduits, penetrations, installations hardware, software, electronics, electrical, stub outs and boxes, pull boxes, vaults, manholes, pedestals, grounding devices, surge suppression and devices, all communications devices from head end to desktop outlets or any other technology system outlet or device at all locations district wide to the satisfaction of SDOC Technology Services Construction Project Managers or other SDOC Authorized Supervisors.

B. All contractors shall read, understand and comply in all respects with the directives contained in the School District of Osceola County, Florida Division 27 Technology Systems Standards and Specifications as written and modified.

C. All contractors shall understand that the most current version of these Technology Standards and Specifications may be located at the SDOC Website under the Information and Technology Services Department section at (http://www.osceola.k12.fl.us/depts./IMC/Index.asp).

D. All contractors shall further understand that in any question or exception as to the validity of current posted Division 27 Technology Systems Standards and Specifications they may contact the SDOC Information and Technology Services Department for updates and verification. Contact may be established directly with the department at 407-870-4050 to either receive verification or clarification information, or to be provided the most current and up to date version of the standards and specification or both. Points of contact for information shall be directed through the SDOC Information and Technology Services Department to the Technology Construction Project Managers.
E. **Scope of Technology Installations** - SDOC technology installations shall range in scope from single cable runs to campus wide or district wide rollouts as deemed necessary. All SDOC technology project deployment needs shall always be professionally managed by trained and certified project managers in a format approved by SDOC Information and Technology Services Department and provided with adequate service coverage as established in this document and all SDOC technology contracts.

F. **Schedule and Timeline Commitment Requirements** - Many SDOC projects are time sensitive in nature regarding completion it is therefore imperative to the district mission that the accomplishment in all instances of all scheduled SDOC technology installations be completed within the established timeline parameters set for all contracts by the contracted and obligated technology contractor to SDOC satisfaction. The installation requirements and expectations are outlined in the Division 27 Standards and Specifications and as such the selected technology contractor shall by accepting any SDOC technology contract commit to the provision of all resources in the form of labor, equipment, and materials necessary in all circumstances at no additional cost to the Osceola County School District to meet their obligation and to provide the promised and obligated complete, tested and one hundred percent fully functional system despite any omission by the owner within set timelines as committed despite and regardless of any other current commitments within or outside the School District of Osceola County.

G. **SDOC Contractor Performance Requirements and Expectations** - All Technology Systems Contractors shall be School District of Osceola County (SDOC) Information and Technology Services Department (ITSD) approved manufacturer trained, current and maintained qualified, certified, licensed and adequately bonded to SDOC required levels. All Technology Systems Contractors as such shall provide sustained superior professionalism in performance of all assigned tasks or contracted projects and shall demonstrate continued professional technical proficiency in the quality provision and installation of all SDOC contracted technology structured cabling systems and other technology systems cabling projects including end-to-end data, voice and video infrastructure solutions and other cabling installations of a telecommunications nature as SDOC ITSD specified and contracted. As such all Technology Systems Contractors shall agree to remain in compliance with all areas of the Division 27 Technology Systems Standards and Specifications and all contracts and to comply with the following:

1. All Technology Systems Contractor employees on site for SDOC project installations shall be SDOC approved, manufacturer certified trained and qualified technicians skilled and proficient in installation, termination and testing of the structured cabling systems for which they are contracted to install including any data, voice and video component for which they are contracted to SDOC ITSD satisfaction.

2. All Technology Systems Contractor assigned project managers shall be SDOC ITSD approved, certified trained and qualified project managers skilled and proficient in all aspects of telecommunications distribution design for structured cabling systems for which they are contracted to install including any data, voice and video component for which they are contracted.
3. All Technology Systems Contractor assigned project managers shall cooperate fully with all cognizant SDOC Technology Systems Construction Project Managers and Information and Technology Services Department representatives, school district representatives and school administrators while on site at any given project regardless the request or topic of discussion with no exception.

4. All Technology Systems Contractor assigned project managers shall provide regular and realistic updates on the progress of each project as well as a single point of contact for customer support and service around the clock or as set forth and established to the satisfaction of all SDOC Technology Systems Construction Project Managers or other qualified and authorized Information and Technology Services Department Project Managers and Supervisors as assigned.

5. All technology systems contractors agree to attend all SDOC convened and scheduled project progress meetings and impromptu informal meetings to address and resolve all project issues as required with the School District of Osceola County Information and Technology Services Department Technology Systems Construction Project Managers and other representatives as required and requested.

6. All technology systems contractors shall be capable of addressing every aspect of the School District of Osceola County Information and Technology Services Department organization’s telecommunications support needs for all technology systems contracted and defined in the SDOC Division 27 Technology Systems Standards and Specifications.

### 1.02 TECHNOLOGY SYSTEMS CONTRACTOR QUALIFICATION REQUIREMENTS:

**A. Jessica Lunsford Act Requirements** - For work in any form or scope to begin or be accomplished at any School District of Osceola County, Florida location there are mandatory requirements for all contractors, their employees and any sub-contracted employees for any discipline / trade utilized. For any SDOC project all contractor employees in any capacity shall be at a minimum in full compliance with all Osceola County School District directives and all guidelines as well as those of state and federal governing bodies and their requirements established regarding the Jessica Lunsford Act with no exception. Prior to being authorized for work at any School District of Osceola County site all technology systems contractor employees shall be in compliance and shall have completed satisfactory screening and be cleared in all respects through the SDOC process with no exception. Contractors and all contractor employees not in full compliance shall not be permitted access to any School District of Osceola County property at any location at any site until all requirements are satisfied and written proof has been produced by the contractor to the complete satisfaction of authorized SDOC Representatives. Delays resultant from efforts in progress to comply and process new employees is not a valid justification for delay in completion of any contracted School District of Osceola County project.
B. **SDOC Sanctioned Identification Requirements** - All Technology Systems Contractors and their employees on site for SDOC project installations shall check in at the established reception location for every School District of Osceola County site prior to commencement of work and shall present any and all requested and SDOC sanctioned, approved and mandatory required valid and current identification denoting the company from which the Technology Systems Contractor is employed. All Technology Systems Contractors and their employees agree to retain in their possession all required identification and agree to display this visible on their person when on any School District of Osceola County, Florida property. Further, all technology systems contractors and their employees agree to comply in full in acceptance of these terms IAW the SDOC Division 27 Technology Systems Standards and Specifications and all contracts and that, all technology systems contractors and their employees shall present identification for inspection to any school district employee when challenged upon request. In all instances where any Technology Systems Contractor employee cannot produce mandatory identification all technology systems contractors and their employees agree to produce their supervisor and to then be escorted immediately off campus or to Campus Administrative Officials for further disposition. For all such incidents the SDOC Technology Systems Construction Project Manager shall then be notified and shall contact their office supervisors for further notification and potential actions.

C. **SDOC Sanctioned Technology Manufacturer Requirements** - All technology systems contractors agree to comply in full in acceptance of the terms of the SDOC Division 27 Technology Systems Standards and Specifications and all contracts for which obligated shall submit written documented proof as evidence from the manufacturer of either COMPLETE CLOSED PANDUIT, ORTRONICS or AMP/TYCO SOLUTION to SDOC ITSD authorized technology representatives satisfying the requirements of the district that the proposed technology systems contractor in fact retains currently valid certification and is authorized as an installing agent/company to offer one or more of the selected technology manufacturer’s “ONLY” either COMPLETE CLOSED PANDUIT, ORTRONICS or AMP/TYCO SOLUTION. All selections shall provide a product warranty for a minimum fifteen years from date of installation acceptance for properly registered and approved projects in the State of Florida. Further, all technology systems contractors agree to maintain current this documentation throughout the lifespan of all SDOC ITSD Technology Systems contracts. Annual verification of current valid certification shall be requested and required by SDOC for records retention. Failure to comply shall result in the technology systems contractor being ruled ineligible to bid until such time as current and valid written documentation is once again provided and restored to the satisfaction of SDOC Information and Technology Services Department inclusive of all re-verified SDOC requirements for certification. All cabling, components and solution installation practices shall meet as a minimum one of the three SDOC approved and sanctioned manufacturer’s installation requirements and shall only utilize selected products from the selected manufacturer and their written list of approved partners “ONLY”.
D. **Licenses, Bonding and Manufacturer Installation and Warranty Certification Requirements** - All technology systems contractors shall submit to SDOC ITSD written documented proof as evidence that they retain valid and current documentation substantiating that they are a licensed and adequately bonded low voltage company possessing a manufacturer’s certificate of authorization for installation and fifteen year warranty with a minimum duration of three (3) years proven and dependable experience satisfactorily installing at least one of the three SDOC mandated technology systems solutions described as required in the SDOC Division 27 Technology Systems Standards and Specifications. Adequate bonding requirements shall be established, verified and approved by SDOC Purchasing Department “ONLY”. Further, all technology systems contractors in acceptance of any SDOC ITSD contract agree to maintain current this certification and all other required certifications and documentation throughout the life of all established contracts for which obligated. Failure to comply shall result in the technology systems contractor being ruled ineligible to bid until current and valid written documentation is once again provided and restored to the satisfaction of SDOC Information and Technology Services Department. All prospective Technology Systems Contractors shall submit a list of current references for similar installations in the field of education with synopsis of size and scope of project accomplished within the past two (2) calendar years including company name, company address, contact name and current company telephone number for each completed project as reference.

E. **BICSI RCDD AND ITS TECHNICIAN PROJECT MANAGEMENT REQUIREMENTS** - All technology systems contractors shall submit to SDOC ITSD documented written proof as evidence from BICSI that their company retains valid and current certification documentation substantiating that a current BICSI RCDD qualified and certified Project Manager is an employee and member of the staff of that contractor’s company. The project RCDD shall not be “contracted in” for any SDOC technology project from another technology company or other source and as such shall not be on the payroll of another company. SDOC requires the installing company shall have their own BICSI RCDD who shall be present on site at all SDOC technology project installations as a routine and available on demand otherwise when required by SDOC ITSD Technology Systems Construction Project Managers for the purposes of the contracted technology company retaining sole ownership of the entire installation for any project established contracts for which obligated. Further, all technology systems contractors agree to maintain current this certification documentation throughout the lifespan of any SDOC ITSD Technology Systems established contracts for which obligated. Annual verification of current valid certification shall be requested and required by SDOC for records retention. Failure to comply shall result in the technology systems contractor being ruled ineligible to bid until current and valid written documentation is once again provided and restored to the satisfaction of SDOC Information and Technology Services Department with no exception.

F. **RCDD SITE PROJECT MANAGER EXCEPTION** – All technology systems contractors shall be permitted latitude in the potential **limited absence** of the BICSI RCDD Project Manager to provide an SDOC sanctioned approved suitable substitution for the RCDD for interim site project management provided certain qualifications are met. This exception shall be made available in the interest of continuation of SDOC technology installation projects without work stoppage due to the temporary non-availability at the site of the project RCDD as Project Manager for any given installation. These
SDOC sanctioned qualifications are that the “ONLY” SDOC approved substitution shall be a trained, qualified and certified BICSI ITS Technician that shall remain under the strict supervision and responsibility of the technology systems contractor’s assigned BICSI RCDD Project Manager in their absence. SDOC shall also require current written certification as proof of this BICSI certification and qualification and said qualification shall be required by the technology systems contractor to remain current for the life span of any SDOC ITSD Technology Systems established contracts for which obligated. Still, this certified BICSI ITS Technician substitute project manager shall not be considered a permanent replacement at any SDOC technology project installation for the technology systems contractor assigned BICSI RCDD as Project Manager. As such in all other respects and instances the BICSI RCDD is and shall be considered the Project Manager of record for all SDOC technology project installations with no exception. Annual verification of current valid certification shall be required by SDOC for records retention. Failure by the technology systems contractor to produce a certified qualified BICSI ITS Technician as substitute for the BICSI RCDD as Project Manager shall by default require that the technology systems contractor assigned BICSI RCDD remain on site at all times as the Project Manager for all SDOC technology project installations with no exception.

G. **SDOC TECHNOLOGY SYSTEMS CONTRACTOR TECHNOLOGY INSTALLATION PROJECT RESPONSIBILITY** - All technology systems contractors agree in the acceptance of the terms of any SDOC ITSD Technology Systems established contracts for which obligated that they alone are wholly responsible and liable for all aspects of every technology project installation for which contracted. All technology systems contractors agree that Sub Contractors are not authorized for use by the primary technology systems contractor for SDOC technology project installations without prior approval granted in writing by SDOC ITSD. In any SDOC technology systems project for which obligated all technology systems contractors agree they alone are wholly responsible and liable for all aspects of every technology project installation in its entirety as well as for all site personnel to remain in compliance with all clearances and qualification requirements for the project in its entirety as well as for the life span of any SDOC ITSD Technology Systems contract including the clearances and qualifications of any sub technology and sub electrical contractors under the primary technology systems contractor where authorized by SDOC or other SDOC approved sub-contractors they may contract for assistance in any area for all contracted disciplines and trades for SDOC technology project installations.

1.03 **SDOC BIDS, QUOTES, CONTRACTS AND REQUESTS FOR QUOTE REQUIREMENTS:**

A. **SDOC BIDS, QUOTES AND CONTRACTS** - All technology systems contractors agree in acceptance of the terms of any SDOC ITSD Technology Systems BID, quote or contract submitted that they shall be required to present to SDOC a detailed part specific per item technology component price list as well as a labor specific breakdown detailing all labor rates with individual man hours inclusive of all hourly rates for all quotes submitted. All submission details shall be to the complete satisfaction of SDOC Information and Technology Services department representatives.
B. **SDOC ROUTINE REQUESTS FOR QUOTES (RFQ)** – For all SDOC routine requests for quotes (RFQ)’s the SDOC Information and Technology Services Department shall make every effort to provide clear, comprehensive, concise and complete details for each request for quote regarding every submission. Still, as the technology systems contractor it is agreed in acceptance of the terms of any SDOC ITSD Technology Systems contract that it shall be the exclusive responsibility of the technology systems contractor during the review of each requested quote to ensure SDOC is informed and aware of any potential omission or error that could obviously eventually cause the installation to be incomplete in any respect after the purchase order has been processed with SDOC order to proceed with installation issued to the awarded technology systems contractor. No additional work requests or change orders shall be permitted or authorized as a routine SDOC policy.

C. **NOTICE TO ALL CONTRACTORS – THOROUGHLY REVIEW EACH SDOC SCOPE OF WORK DOCUMENT FOR EVERY TECHNOLOGY INSTALLATION PROJECT:** Each scope of work may contain redundant or repetitive information included from previous projects and excerpts from SDOC specifications utilized for past and present projects. Yet, by virtue of necessity new information, new language and updated changes in the selected products, inclusion of new specification procedures, directives and the addition of new products and materials shall be inserted and revised at unscheduled intervals in this scope of work in the interest of the improvement of SDOC ITSD technology systems procedures and project installations. Consequently it is strongly recommended and is the absolute responsibility of each contractor to read all specifications and ensure any change that occurs in the SDOC Standards and Specifications is observed, identified and reflected by all technology systems contractors in order to provide an accurate updated quote and modified materials list reflective and inclusive of changed, added, updated or deleted information and products intended for SDOC ITSD technology installation projects.

1. It shall be agreed by the technology systems contractor in acceptance of the terms of any SDOC ITSD Technology Systems contract that it shall be the responsibility of all Technology Systems Contractors to provide complete, thorough and comprehensive quotes void of exclusion, omission or error for each and all SDOC requests for quote to the complete satisfaction of SDOC. In acceptance of the terms of any SDOC ITSD Technology Systems contract the technology systems contractor agrees to comply with the following:

2. All Technology Systems Contractors shall thoroughly identify and address with SDOC during the quote phase all components of the proposed installation to identify for inclusion any excluded, omitted or inaccurate area that can later be determined by SDOC to be a necessary component.

3. This shall be accomplished to ensure the alleviation of later issues identified as either deficient or absent of all required needs and information as submitted by SDOC in their request for quote.

4. Any item, component, issue or information identified regarding this situation shall be addressed, discussed and resolved by the technology services contractors with SDOC prior to submission of any quote.
5. All such topics of discussion and information shall be provided to SDOC in a contractor submitted written request for information and clarification. All contractors shall be copied in the SDOC answer/response to all involved prospective contractors.

6. It shall be understood by all technology services contractors that after ample opportunity is afforded to identify and address any prospective issues that in proceeding with processing of said quote by SDOC for purchase order it shall be the responsibility of the technology systems contractor to provide, install, terminate, test, label, program, adjust and comply with any other goods or services necessary for a complete systems installation as determined complete by SDOC.

7. In the act of SDOC proceeding with the processing of any quote for purchase order it shall be the technology systems contractors responsibility regardless of omission or error in their original quote to include any and all missing physical pieces, parts and or components regardless of size and quantity or omission of any software, licensing and programming required and deemed necessary by SDOC in order to make the contractor installed system fully functional, operational and installed to SDOC standards and specifications at completion of installation to the satisfaction of SDOC.

8. All additional and SDOC required items shall be provided by the Technology Systems Contractor at no additional cost to SDOC and without addition of an additional work request or change order.

9. All technology structured cabling systems including any data, voice and video components installed when contracted shall be considered a complete quote in all respects and shall be submitted in the most efficient and cost effective manner possible without sacrificing SDOC established guidelines for quality of installation in the process in addition to reducing SDOC administrative correspondence where possible.

10. For all quote submissions technology systems contractors shall be required to provide to SDOC a detailed component specific per item price list and component total, a labor specific breakdown of all labor rates with individual man hours inclusive of all hourly rates with total and all pricing incumbent of sub contracted outside trade services necessary for the accomplishment of each project in addition to the grand total for each technology installation project for all quotes submitted.

11. All technology systems contractors agree that in failure to comply in the provision of all details and components for any specific area of each quote to SDOC satisfaction said quote shall be ruled incomplete and this shall be grounds for disqualification on subject quote where prudent in the best interest of the district.

12. All technology systems contractors agree that in failure to comply in the provision of any requested quote to SDOC in the timeframe specified said quote shall be ruled inadmissible and this shall be grounds for disqualification on subject quote where prudent in the best interest of the district.
1.04 TECHNOLOGY CONTRACTOR PRE-CONSTRUCTION SPECIFIC REQUIREMENTS:

A. **SDOC Standards and Specifications Compliance and Requirements** - All technology systems contractors agree in the acceptance of the terms of any SDOC ITSD Technology Systems contract to comply fully in all aspects with all sections, areas, details and language as set forth in the latest modified revision of the School District of Osceola County (SDOC) Division 27 Standards and Specifications. It is the intent of SDOC that the most current updated revision shall be published on the school district website for reference. Yet and still, it is the SDOC recommendation that the technology systems contractors not become complacent or make assumptions and to exercise logical processes if there be any indication that the version viewed is not the latest modified version. If upon review of the revision posted on the SDOC website in the instance where the posted standards and specifications appear not to be the most current, up to date version it is encouraged and strongly recommended all technology systems contractors contact the SDOC Technology Systems Construction Project Managers for information and clarification to ensure the most current and updated revision is made available to them. All specific SDOC sanctioned installation procedures, number specific parts, installation details and all other information contained in the most current modified revision of the (SDOC) Division 27 Standards and Specifications shall be strictly adhered to and complied with. Ignorance of updates is no excuse and will be afforded no exception.

B. **Requests for Information and Clarification Requirements** - All technology contractors shall submit in written format all requests for information and clarification regarding issues and questions arising in areas not specifically addressed or not transparent in meaning as well as for recommended installation alterations, substitutions or any proposed updates with regard to the (SDOC) Division 27 Standards and Specifications. All technology systems contractors shall consult the SDOC Technology Systems Construction Project Managers who shall be the ultimate decision making authority on specification of SDOC parts, proper means, method or course of action in which to proceed and they shall be consulted prior to proceeding with installations in question. No technology contractor shall make interpretations or assumptions on installation procedure or components to be installed. The contractor is encouraged and shall always seek the SDOC Technology Systems Construction Project Managers or their recommended qualified SDOC Information and Technology Services Department Representatives as final decision making authority for answers to all issues not clearly defined or included in the (SDOC) Division 27 Standards and Specifications. All such correspondence for questions, answers and responses verbal or written in nature shall be followed up for verification and documentation purposes via email copying all pertinent SDOC and technology systems contractor personnel. Failure to comply in such instances may result in removal of current installation and replacement with SDOC preferred parts, proper method or course of action to proceed as determined in the best interest of the district by the SDOC Technology Systems Construction Project Managers or their recommended qualified SDOC Information and Technology Services Department Personnel.

C. **Physical Cable and Hardware Requirements** - All technology systems contractors where contracted shall provide and install new components, hardware, cabling and devices “ONLY” for all installations. With the only exception being project specific owner provided cable or equipment as arranged and approved in written format by the SDOC Information and Technology Services and Department
DIVISION 27 02 00
School District of Osceola County
Technology Standards and Specifications

Technology Systems Construction Project Managers or their recommended qualified and authorized SDOC Information and Technology Services Department Personnel.

D. **Pre-owned and Refurbished Cable and Hardware Parts Requirements** - Unless prior approval is garnered in advance in writing through Information and Technology Services Department Representatives authorized to approve such requests no use of refurbished, salvaged, used or otherwise pre-owned hardware, cabling or devices of any sort is permissible nor shall be approved and authorized for any SDOC technology installation. No verbal approval shall be granted or considered in discussion. Failure of any technology systems contractor to comply shall be grounds for disqualification on subject quote and potentially dismissal as a qualified technology systems contractor under the terms of this contract based on the investigation of the incident and final determination by the SDOC Information and Technology Services and Purchasing Departments and or higher authority.

E. **Pre-installation / Pre – construction Walkthrough Requirements** - It shall be the SDOC ITSD recommendation and the absolute, exclusive responsibility of all technology systems contractors to conduct a pre-installation / pre – construction walkthrough at all SDOC technology installation projects and to submit all findings in writing to Technology Systems Construction Project Managers detailing a thorough and comprehensive list of all pre-existing interior and exterior site conditions and or damages prior to commencement of any give project. For existing and retrofitted sites it shall be the responsibility of the Project Engineer and the Technology Contractor to verify the condition of all spaces to include floors, paint, interior and exterior surfaces, ceiling tiles and other items prior to commencing any technology installation. Failure to do so shall by default cause the resultant selected contractor to be liable for all subsequent damages noted as incurred during project installation by either school administration or Information and Technology Services Department Representatives. All subsequent repairs shall be accomplished by the technology contractor at their sole expense with no additional cost to SDOC and shall be accomplished to the full satisfaction of the school administration and Information and Technology Services Representatives. It shall be the responsibility of all Technology Systems Contractors to repair and or replace all areas and all other items found to be subject to breakage or damage in any form as identified by SDOC Representatives at the completion of each technology installation project and before final payment is authorized.

1.05 **CONSTRUCTION AND INSTALLATION PHASE REQUIREMENTS:**

A. **Technology Systems Standards and Specifications Compliance** - All technology systems contractors affirm their compliance in acceptance of the terms of any SDOC ITSD Technology Systems contract or document that they shall remain in full obedience and compliance with all directives that constitute the SDOC Technology Systems Standards and Specifications as most currently revised and modified in the process of provision of all aspects of the SDOC ITSD Technology Systems elements as a minimum.

B. **Adaptability and Flexibility Requirements** – It is agreed that regardless the size or scope all technology installation projects are accepted by the technology systems contractor with the knowledge that they shall be fully accomplished and completed on time with no additional work order or change orders. All technology systems contractors shall be capable of mobilization of a work force to address scheduling needs for entire campus wide end to end technology systems infrastructure installations inclusive of power, grounding and all dead end cable demolition and removal services as well as demonstrated ability and flexibility to comply with SDOC requested quotes to answer scaled back
SDOC needs of smaller projects consisting of only selected integral technology component(s) and or potentially only power and grounding projects as applicable for any given technology system. All quotes for service shall be considered a quote for the full and integral system quoted regardless of error or omission and each quote shall be provided for each technology contract at the consistent and reasonable established and committed price.

C. **Skills, Training, Resources, Facilities and Capabilities Requirements** - All technology systems contractors affirm in acceptance of the terms of any SDOC ITSD Technology Systems contract or document that they have the SDOC required training, skills, resources, facilities and capabilities within their means as an organization to comply as obligated for any aspect of all SDOC ITSD Technology Systems requests for quotes which shall eventually at some period during this contract potentially comprise quotes for services to provide, install, locate, trench, bore, core bore, penetrate, troubleshoot, repair, replace, terminate, label, program, test, certify, warranty and in addition offer other installation related mechanical, electrical and plumbing requested products and services necessary for any aspect of the elements that constitute the SDOC technology systems inclusive of provision of all aspects of any required associated electrical service power and grounding systems and the demolition and removal of all locations containing what SDOC dictates as abandoned cables not terminated at both ends at a connector or other equipment and not SDOC approved and identified for future use with an SDOC approved tag or label.

D. **Proven Written Verified Documentation Requirements** - The SDOC expectation is that any obligated technology systems contractor is in agreement that they shall retain and maintain SDOC approved and verified licenses, certifications and that all employees shall be currently certified, qualified, skilled, experienced and capable technicians matched to the level of expertise for which SDOC has contracted the technology systems contractor. All technology systems contractors are further in agreement that they shall retain and maintain sustainable sufficient manpower to provide and support any and all requested products and services for any given request in agreed established timelines in support of all integral components of any given SDOC technology system or component project variation. Regardless of their other obligations.

E. **SDOC Technology Systems Contractor Skills and Familiarity Requirements** - All technology systems contractors selected shall be trained certified and capable of accomplishing all tasks as requested at a minimum for any technology system specified in this document. Any of the given SDOC technology systems shall be composed of differing variations of components inclusive of any and all outside plant and interior horizontal cabling infrastructure and components including buried and surface mounted exterior conduits, pull boxes, vaults, manholes, exterior and interior cabling supports, sleeving, trays and other support pathways, interior conduits, stubout and box assemblies, all mounting hardware components, software and electronics, power receptacles, grounding and other devices and components including all supporting MDF and IDF spaces and their SDOC specified configurations and components and all cabinet enclosure assemblies or other items as deemed necessary to support district telecommunications inclusive of all aspects regarding all fiber optic and copper systems cabling and components for which contracted that shall include but shall not be limited to:

1. **Network Data Systems**

2. **Intercom Systems**
3. Telephone Systems
4. Television Systems
5. Intrusion Detection Systems
6. Video Surveillance Systems
7. Smart Board Systems
8. Audio Enhancement Systems
9. Hand Held Radio Master Unit Systems
10. Component Audio Sound Systems

F. **Compliance with Applicable Documents and Publications Requirements** - All technology systems contractors affirm in acceptance of the terms of any SDOC ITSD Technology Systems contract or document that all contracted SDOC technology systems project installations shall be of SDOC approved specification, quality and design installation in all respects in accordance and compliance with the following inclusive but not all inclusive documents and publications at a minimum:

1. All current SDOC ITSD Division 27 Technology Standards and Specifications
2. SDOC CSI Master Format 2004, Division 27 – Communications
4. ANSI/TIA/EIA CABLING STANDARDS
5. National Electrical Manufacturer’s Association (NEMA) Publications
6. National Electrical Code 2008 NFPA 70 manuals or most recent version
7. All applicable current telecommunications industry distribution and design publication criteria for all other publications as adopted by SDOC.

G. **Test Equipment Requirements** - All technology systems contractors agree in the acceptance of the terms of any SDOC ITSD Technology Systems contract to comply with the requirements to retain, have on hand and utilize all test equipment as indicated in the SDOC Standards and Specifications and further agree that all fiber optic and copper cable test equipment required for installation and utilized for every project shall be currently calibrated test equipment for all items with readable calibration sticker(s) showing no evidence of tampering and applied and readily available for SDOC verification and inspection.
H. **Technology Fiber Optic Cable New Installation Requirements** - All technology systems contractors agree and shall be required to be capable to provide, install, terminate, label and test to 100% operational capability all network data multimode and single mode fiber optic cable where contracted to SDOC standards and specifications to the complete satisfaction of SDOC ITSD Technology Systems Construction Project Managers and qualified authorized representatives in all circumstances for all projects.

I. **Technology Cable Fiber Optic and Copper Existing Installation Requirements** - All technology systems contractors agree and shall be required to provide testing of existing cabling for instances where any new cable shall interface with existing cabling for purposes of continuity of new cabling to any originating source as directed by SDOC and shall provide SDOC approved corrective maintenance repair and replacement as necessary for all identified issues or areas found deficient.

J. **Technology New Cable Category 6, 5E and 5 Installation Requirements** - All technology systems contractors shall be required to be capable to provide, install, terminate, label and test to 100% operational capability all network horizontal category six and site dependent installations of category 5 and 5E copper data cable where contracted to SDOC standards and specifications to the complete satisfaction of SDOC ITSD Technology Systems Construction Project Managers and qualified authorized representatives in all circumstances for all projects. Further, all technology systems contractors agree to match existing manufacturers where existing systems are installed and shall only install systems for which they are currently certified and authorized by the manufacturer to install and warranty all components as an integral system “with no exception”.

K. **General SDOC Cabling Requirements** - No fan out of cabling, no droop of any cable bundles, no kinks, and no splices whatsoever are acceptable or permitted for any SDOC cabling installation. Any installed technology cables found “shaved” or otherwise ripped torn or damaged shall be removed and replaced by the technology systems contractor at no additional cost to SDOC. All cable bends shall be installed in compliance with all manufacturer recommended tolerances with no exception. Cabling on corners and turns shall be protected from chafing with approved devices and installed strictly IAW specific Telecommunications Standards regarding bend radius. No SDOC cabling shall be attached to or lay on or against any ventilation ducting, motorized or mechanical or electrical devices, threaded rod, grid hangars intended for ceiling support, vent duct strapping, rebar, building steel, EMT or PVC piping including technology stub out conduits or other differing technology systems cable runs. The only acceptable support shall be SDOC approved “J” hooks attached to drywall, contractor supplied painted grid hangars or threaded rods and other SDOC approved contractor provided pathways. All cable runs shall at point of field end stub out be installed with SDOC approved properly sized and supported service slack and shall run in a straight line with no droop to the point of termination or into the conduit stub out whichever is applicable. Service slack for all main technology systems cable bundles shall be dressed and installed with SDOC input and approval “ONLY”.

L. **Horizontal Data Cable Installation at Existing Site Locations** - In instances where the technology systems contractor is not currently certified and authorized by the manufacturer to install and warranty all components as an integral system where existing systems are installed the technology systems contractor agrees that they shall consult the SDOC ITSD Technology Systems Construction Project
Managers for the purposes of approving and determining the logical course to proceed. In situations where the technology systems components installed are not authorized for installation by the particular technology systems contractor normal resolution shall be to install a complete separate end to end installation of the components for which they are currently certified and authorized by the manufacturer to install and warranty all components as an integral system or in the best interest of the district they shall be ruled ineligible for installation and a qualified contractor shall be encumbered as deemed necessary by the SDOC Technology Construction Project Manager.

M. **Technology Installation Requirements** - All technology systems contractors shall be required to be SDOC approved trained, skilled and capable to provide, install, terminate, label, program and test to 100% operational capability all fiber optic and copper cabling installations regarding intercom, intrusion detection, video surveillance, telephone, television, audio enhancement, smart board and sound systems where contracted to quality and design expectations indicated in SDOC standards and specifications to the complete satisfaction of SDOC ITSD Technology Systems Construction Project Managers and qualified authorized representatives in all circumstances for all projects. Technology systems installations shall be composed of differing variations of components inclusive of but not all inclusive of at a minimum any or all combinations of the following:

1. Both interior and exterior areas for all technology systems installations.
2. All above and below ceiling areas for all technology systems installations.
3. Horizontal and vertical interior and exterior areas for all technology systems installations.
4. All in wall and surface mount areas for all technology systems installations.
5. All technology pathways, sleeving, floor box and transition point areas for all technology systems installations.
6. All wall, floor and ceiling penetrations for all technology systems installations.
7. All interior and exterior EMT and PVC conduit installations for all technology systems installations.
8. All project related electrical power receptacles, grounding and technology systems stub outs and outlet boxes.
9. All free standing and wall mount pull boxes, in ground vault and manholes and their installed conduit and supports for all technology systems installations.
10. All MDF and IDF spaces to include all components for each technology system installed including all supports, sleeving, stub outs, all free standing racks and components including isolation kits, cabinet enclosures, equipment panels, component assemblies, ladder rack, patch panels, vertical and horizontal wire managers, voice and data backboards and required colors and configurations of fire retardant paint, all applicable surge suppression, grounding, bonding, electrical receptacle installations, air conditioning units and head end equipment of any sort installed as contracted including all labeling, terminations, programming and testing.
11. Additionally any and all other systems, cabling and components in any and all spaces deemed pertinent to the proper project installation for a complete technology system to the complete satisfaction of SDOC ITSD Technology Systems Construction Project Managers for all technology systems installed.

N. **Daily Close Of Business Contractor Housekeeping Requirements** - All technology systems contractors shall upon completion of each day’s work on each installation agree that they shall comply with the requirement that all affected areas are to be returned to preconstruction condition, including but not limited to filling and tamping down of all exterior holes and or ditch locations. Packing of exterior building surface holes where work is to be continued, replacing of all ceiling tiles in all affected work areas, vacuuming of construction dust, etc. re-setting of all furniture including but not limited to desks, chairs, cabinets and equipment, removing or securing of any and all other hazards or identified problem areas. Further, that they shall also lift and properly support off the floor at all locations any pulled but unterminated coils and bundles of any type of technology cabling for which they are currently contracted to install. Coordinate all issues required to be addressed with SDOC ITSD Technology Systems Construction Project Managers for proper disposition of items not within the normal ability of the contractor to comply with.

O. **Technology Installation Project Completion Contractor Site Cosmetic and Safety Related Restoration Requirements** - All technology systems contractors shall upon project installation completion in whole ensure all affected areas are to be returned to preconstruction condition, including but not limited to UL approved and applied sealing and patching, painting with exact color matching of all identified interior and exterior holes to the approval and satisfaction of SDOC ITSD and school administrative personnel.

P. **Technology Installation Project Completion Contractor Overall Technology Site Restoration Requirements** - All technology systems contractors shall insure the replacing of all covers and all bolts and complete bolting on all manholes, vaults, free standing and wall mounted pull boxes, filling in and solidly packing down of all dirt in all construction ditches and holes to a level and smoothed preconstruction surface, replacing all broken, chipped or cracked ceiling tiles, bent or damaged ceiling tile grid, vacuuming of all surfaces, sweeping and fresh water wipe down from top to bottom of construction dust, dirt and debris in all locations interior and exterior, removal of all remaining pieces, parts and packaging, containers, boxes, spools etc. including above or below ceiling and at any exterior locations to the approval and satisfaction of SDOC ITSD and school administrative personnel. Coordinate all work and required power outages with the appropriate SDOC Technology Construction Project Manager.

Q. **Supports, Sleeves and Underground conduit Requirements** - Cable support is required throughout all technology cable installations for all cabling both interior and exterior in accordance with the most current SDOC Division 27 Standards and Specifications. All technology systems contractors shall ensure adequate dressing of all new technology cabling systems main cable runs and feeder installations and sleeving for all new technology cabling systems inclusive of runs even as small as one single cable shall be accomplished with SDOC approved hardware and fastening devices to the complete satisfaction of SDOC Technology Project Managers regardless of existing supports or sleeving. It is to be
understood by all technology systems contractors that they shall add additional supports or sleeving IAW SDOC Division 27 installation criteria where necessary to accommodate all technology systems installed throughout each new cable run even where new cables run with existing cable runs to insure the final installation is neat, professional and smart in appearance with no exception. All Technology systems installations shall be supported every five feet and for cable runs of two or more cables shall be secured every two feet with Velcro installed inclusive of single cable runs with Velcro at all “J” Hook locations. Cable ties and definitely not electrical tape are not an SDOC accepted means for securing cable bundles or service slack. Cable sleeves shall be installed, supported and sealed for all technology cable runs for all penetrations with no exception and shall be supported and bushed IAW SDOC Division 27 installation criteria electrical tape is not an acceptable means of bushing any sleeve or stub out. In addition all underground conduits installed shall be sealed where penetrating the building IAW SDOC installation criteria to SDOC satisfaction with no exception.

R. Technology Installation Project Smoke and Fire Ratings, Sealing and Penetrations, Sleeving and Pathways Requirements - All technology systems contractors shall request in writing to utilize existing sleeving and cable pathways where available for all contracted projects. If no response is provided the contractor shall proceed by providing and installing all new sleeving and cable pathways for the project. Where required in all other new installation instances the contractor shall provide and install all new sleeving and cable pathways necessary for the project. Sleeving is required wherever wall, ceiling or floor penetrations are required regardless of fire or smoke rating. However, for installation of sleeving and penetrations through any fire or smoke rated locations the sleeving and devices, caulking or other sealants utilized shall be UL approved products “ONLY” with no exception and shall be installed by technicians trained, qualified and certified to accomplish the sleeving installation. All installations shall be appropriate to maintain the rating of the firewall or smoke wall. All penetrations shall be sealed around the entire 360 degree exterior of each sleeve and the opening of each sleeve on both sides of every wall. All sleeves shall be properly secured supported to SDOC satisfaction with Kendorff and brackets or other SDOC approved devices.

S. Ceiling Tile Repairs - In the event a ceiling tile is damaged during any systems project installation it is the responsibility of the contractor to obtain and replace the affected ceiling tile. Within reason damaged tiles may potentially be obtained from the SDOC Maintenance Department. Still it shall be noted that any material provided to a technology systems contractor is to be considered nothing more than a courtesy on the part of SDOC and in no way constitutes any obligation to the contractor with regard to provisioning any materials whatever for repairs. Notify the Technology Construction Project Manager of the issue and they will attempt to make arrangements to obtain and provide a replacement tile for the systems contractor to install. However, if there are no tiles available or, if the tile is a special tile not readily supported it will remain the contractor’s sole responsibility to replace any tile damaged during their installation with a matching tile regardless of whether a replacement is provided for their installation or not.

T. Cleanliness and Safety Requirements - It shall be the responsibility of all SDOC contractors both technology systems and electrical to insure the environment of the work site at both the interior and exterior locations is maintained in a clean, orderly and safe manner on a daily basis. No unsightly conditions shall exist more than on a same day basis. All ceiling tiles shall be closed on a daily basis. The contractor shall remove all materials and debris both interior and exterior locations and above
ceiling as well as below ceiling from the site upon completion of the installation. Removal of all empty and occupied spools, boxes, packaging, wire, trimmings, and debris of any sort shall be accomplished. All contractors shall be required to have on hand daily and don when applicable all OSHA and SDOC required safety equipment. Failure to comply when directed by SDOC Technology Construction Managers, Information and Technology Services Personnel and or Site Administrative Staff even individually shall result in the removal of the technology systems contractor Project Manager and their entire crew from the project site in the best interest of the district with further action to be taken as determined necessary by authorized SDOC management.

U. **Unsafe Conditions Requirements** - Absolutely no unsafe condition shall be condoned or tolerated such as open un-attended and or un-flagged trenches, manholes or other similar hazards. No situation as such shall be left unattended at anytime during the work in progress and shall not remain open longer than the period of the day these hazards are being opened for work. Where possible all hazards shall effectively be closed and or filled at close of business on the same day in which the work occurred. In the special circumstance where closing said trench or other hazard were not feasible for closure on the same day, it is the responsibility of the technology systems contractor to make the Technology Construction Project Manager aware of the remaining issue with enough prior advance notice to permit proper notification of school administration. In all instances where this is necessary, it is the responsibility of the contractor to appropriately stake off, rope off and flag all effected hazardous areas with the appropriate caution or danger tape to the complete satisfaction of the Technology Construction Project Manager at no additional cost to SDOC.

V. **Restroom Facilities** – In the best interest of the district the use of restroom facilities by contractors within any technology systems project installation site (such as portables, classrooms, student stations, office and administrative areas etc.) at any campus or all other district facility locations is strictly prohibited. Unauthorized use of these facilities can result in dismissal as an approved contractor in the School District of Osceola County. If there are facilities within the confines of the permanent buildings available for use by contractors, the availability of these facilities is strictly the option of the district administration or campus administration. However, it is not the responsibility of School District of Osceola County to provide restroom facilities for contractors. It is recommended that facilities be sought in the local area at off campus and off district site locations in the event none are made available on site.

W. **Smoking, Eating and Drinking Requirements** – There shall be absolutely **NO SMOKING** on site at any SDOC location with no exception. This is inclusive of company and personal vehicles parked on SDOC property at any location. Eating and drinking shall be confined to sites reserved for technology construction contractor personnel or their company and personal vehicles or shall be conducted off district site. No drinks of any sort shall be permitted in any existing MDF or IDF closet or other SDOC technology space with no exception.

X. **Abandoned Horizontal and Vertical Communications Cabling** - All technology systems contractors shall be responsible to remove and dispose of any and all abandoned communications cable that is not terminated at both ends or at other equipment and not directed by SDOC Technology Systems Construction Project Managers to be identified “For Future Use” with an SDOC approved tag or label.

Y. **Notification of Technology Installation Project Completion and Request for Substantial and Final Inspection Requirements** - All technology systems contractors shall provide to the SDOC ITSD
1.06 SUBSTANTIAL AND FINAL INSPECTION SPECIFICS:

A. **Test Equipment Requirements** - All technology systems contractors agree in the acceptance of the terms of any SDOC ITSD Technology Systems contract or document to comply with the requirement that all test equipment utilized during the routine construction installation shall be the exact same test equipment utilized to conduct the re-test for all cabling at the schedule Substantial Testing and Inspection and shall be utilized as well as to store and print all test results.

B. **Substantial Inspection Test Results Copy Documentation** - All technology systems contractors agree in the acceptance of the terms of any SDOC ITSD Technology Systems contract or document to comply with the requirement that they shall provide to the SDOC ITSD Technology Construction Project Manager and or Project Engineer where applicable a complete copy of test results for all fiber optic and copper cables in paper format for the Substantial Inspection and cable re-test for verification of results. All fiber optic and copper test results shall further detail all parameters indicated as required by SDOC for each project.

C. **Final Copy of Test Results Documentation** - All technology systems contractors agree that the final clean version of all test results upon correction of identified issues for all fiber optic and copper cables shall be provided for the owner’s retention in both paper and electronic format once the re-test is accomplished with all issues that are identified corrected on the final copy.

D. **SDOC and Technology Contractor Inspections** – It is strongly recommended and encouraged and is also the absolute responsibility of all technology systems contractors to contact the SDOC ITSD Technology Systems Construction Project Managers and request additional phase by phase impromptu inspections during the course of any technology systems project. All technology systems contractors shall insure their project is at a minimum self-inspected but with the recommended assistance of the SDOC ITSD Technology Systems Construction Project Managers to be thoroughly and completely prepared in all respects upon submission of the SDOC ITSD request for substantial and final inspections. All technology systems contractors shall insure there is only one (1) Substantial and one (1) Final Inspection conducted by the SDOC ITSD Technology Construction Project Manager and or the project assigned engineer per project.

1. **NOTE:** Subsequent repeat inspections for project substantial and or final determined by SDOC Technology Systems Construction Project Managers to be resultant from the contractor’s inability to complete adequately to SDOC satisfaction any or all installation tasks previously identified for correction at the original substantial or final inspections for the same project shall be subject to back charge for all time and incidentals incurred to conduct these repeat inspections to accomplish and complete the inspection and project to 100%.

2. Multiple returns for verification of previously inspected and identified issues for correction that should have been resolved when identified is costly to the School District of Osceola County in manpower and materials and as such shall be calculated, reflected and deducted on payment of the
E. **Substantial 10% Testing and Project Inspection** - upon written receipt of notification of project construction and installation completion the SDOC ITSD Technology Systems Construction Project Managers shall schedule and conduct a required complete and comprehensive Substantial 10% Testing and Inspection site walkthrough, critique and inspection with the technology systems contractor, and their applicable sub-contractors such as electrical sub-contractor, security sub-contractor, intercom sub-contractor and sound system sub-contractor and for applicable projects where an engineer is assigned the project engineer shall also be in attendance to inspect the installation and review all test results and address all issues. Each project Substantial 10% Test and Inspection shall encompass review, critique and most importantly a written documented report of issues to be corrected regarding any and all of the following installation areas at their discretion at a minimum:

1. Upon completion of all contractor accomplished certified testing and before system commissioning, all Certified Communications Outlet testing shall be completed. All certified tests shall be performed in full compliance with telecommunications industry standards with the sample 10% retesting of all installed portions of the network as determined by the SDOC ITSD Technology Construction Project Manager. The Project Engineer, Technology Contractor and SDOC MTS Department Technology Construction Manager as a team shall conduct and witness all 10% re-testing. All communications outlets including existing outlets where applicable shall be tested. Cable testing shall be conducted per SDOC Standards and Specifications and shall be conducted inclusive of but not necessarily all inclusive of the following technology systems cabling installations and supporting hardware of all types as detailed:

   a. 100% testing of network data multimode and single mode fiber optic cable verified and accepted by the project engineer where applicable and SDOC ITSD Technology Systems Construction Project Managers in all other instances.

   b. Minimum random 10% project wide horizontal Category Six and site dependent installations of Category 5E and 5 copper data cable installations at all locations to be selected for testing by the SDOC ITSD Technology Construction Project Managers.

   c. Random project wide installations of intercom, intrusion detection, video surveillance, telephone, television, audio enhancement, smart board and sound system copper data cable installations at all locations chosen to be selected for testing by the SDOC ITSD Technology Construction Project Managers.

   d. Both interior and exterior areas for all technology systems installations.

   e. All above and below ceiling areas for all technology systems installations.

   f. Horizontal and vertical areas for all technology systems installations.

   g. All in wall and surface mount areas for all technology systems installations.
h. All technology pathways, sleeving, floor box and transition point areas for all technology systems installations.

i. All wall, floor and ceiling penetrations for all technology systems installations.

j. All interior and exterior conduit installations for all technology systems installations.

k. All free standing and wall mount pull boxes, in ground vault and manholes and their installed conduit and supports for all technology systems installations.

l. All MDF and IDF spaces to include all components for each technology system installed including all supports, sleeving, stub outs, all free standing racks and components including isolation kits, cabinet enclosures, equipment panels, component assemblies, ladder rack, patch panels, vertical and horizontal wire managers, voice and data backboards and required colors and configurations of fire retardant paint, all applicable surge suppression, grounding, bonding and electrical receptacle installations and air conditioning units and head end equipment of any sort installed including all labeling, terminations, and testing.

m. Additionally any and all other areas as deemed pertinent to the proper and satisfactory installation completion of all technology components for the entire technology system installation by the SDOC ITSD Technology Systems Construction Project Managers during substantial installation inspection to identify all remaining issues for completion of all technology systems cabling, hardware and all other devices installed.

F. **Completion of Substantial Inspection Identified Issues** - Upon completion of substantial inspection and 10% re-testing the SDOC ITSD Technology Systems Construction Project Managers shall submit an inspection report documenting all outstanding issues and establish a documented set timeframe for completion of all items that both the technology systems contractor and the SDOC ITSD Technology Systems Construction Project Managers are agreeable to.

G. **Final Project Inspection** - Upon receipt of notification from all technology contractors of accomplishment and completion of all identified documented items listed on the substantial inspection report the SDOC ITSD Technology Systems Construction Project Managers shall schedule and conduct a required Final Inspection site walkthrough and verification inspection with the technology systems contractor, and any applicable sub-contractors such as electrical sub-contractor, security sub-contractor, intercom sub-contractor and sound system sub-contractor and for applicable projects where an engineer is assigned the project engineer shall also be in attendance.

I. Final Inspection shall be conducted at a minimum to verify all issues identified on the substantial inspection report. However, it shall be noted that oversight on the part of the SDOC ITSD Technology Construction Project Manager and or the project assigned engineer during Substantial or for that matter Final Inspection to specifically identify any installation errors or omissions on the part of the technology systems contractors shall not relieve any technology systems contractor or their sub-contractors of the responsibility and obligation to correct any issue identified as deficient at Final Inspection or at any later time after project completion.
2. Final Inspection is considered complete when it has been verified and established that all issues identified in the Substantial Completion Inspection Report and any and all other remaining technology project issues are accepted as satisfactorily accomplished by the SDOC ITSD Technology Construction Project Manager.

1.07 TECHNOLOGY INSTALLATION WARRANTY SPECIFIC NOTES:

A. All Technology Systems Contractors shall provide a minimum fifteen (15) year manufacturers certificate of warranty for all installed horizontal cabling systems against defects in workmanship. Horizontal cabling systems as stated shall be inclusive of all associated components and hardware as an integral system installation.

B. All Technology Systems Contractors shall provide a manufacturer’s certificate of warranty for all technology systems components, hardware and cabling as an integral system installation inclusive of but not all inclusive of project wide technology systems installations of intercom, intrusion detection, video surveillance, telephone, television, audio enhancement, smart board and sound system copper data cable installations at all locations against defects in workmanship as established and agreed to by contract with the School District Of Osceola County, Florida.

C. All labor and materials for warranty issues shall be provided at no expense to the School District of Osceola County, Florida and be accomplished during normal SDOC established hours of operation U.O.N.

D. Warranty period shall commence on the SDOC documented date of acceptance of Final Inspection by the SDOC Authorized Representatives and instances where contracted the Project Engineer. Established Final Inspection completion shall be the date of satisfactory completion of all issues as verified by the SDOC ITSD Technology Construction Project Manager at Final Inspection.

E. Warranty notices shall be addressed by the applicable technology contractor as soon as possible but, not later than two (2) business days after SDOC documented notification of SDOC documented issue.

F. It shall be the responsibility of the SDOC ITSD Technology Construction Project Manager or for all engineered projects the engineer of record to insure that the Technology Systems Contractor shall arrange and submit all necessary paperwork to ensure the minimum fifteen (15) year manufacturers certificate of installation and warranty.

G. The Technology Contractor shall make available a service contract offering continuing factory authorized service of this system after the initial warranty period at the request of authorized SDOC Representatives.

H. For SDOC horizontal cable installations one of the following three (3) select and mutually exclusive solutions “ONLY” either COMPLETE CLOSED PANDUIT, ORTRONICS or AMP/TYCO SOLUTION shall be acceptable for SDOC horizontal cable installations and for the installed solution
SDOC shall be provided a mandatory minimum fifteen (15) year manufacturer installation and warranty package.

I. For SDOC Intrusion Detection installations Digital Monitoring Products of “DMP” active electronics and associated SDOC specified field components shall be the only select and mutually exclusive Intrusion Detection solution currently acceptable for SDOC Intrusion Detection installations which shall be provided a mandatory manufacturer installation and warranty package as contracted.

J. For all other SDOC Technology Systems installations inclusive of but not all inclusive of intercom, video surveillance, telephone, television, audio enhancement, smart board and sound systems all SDOC specified and contracted active electronics and associated SDOC specified field components shall be provided a mandatory manufacturer installation and warranty package as contracted.

1.08 OVERALL PROJECT INSPECTIONS AND TESTING:

A. All technology systems installations shall be tested from the head end device throughout each and all cable to and inclusive of the installed field device and guaranteed to be 100% functional and operational to the satisfaction of SDOC MTS Department with no exception. All applicable technology contractors shall provide documentation to SDOC MTS Department for retention in both written and electronic format verifying these results as proof.

B. All Category Six communications outlets shall be satisfactorily tested to 350mhz to demonstrate the Category Six (or other differing project specific Category 5E and 5 cables) transmission capability and to verify the integrity of the cabling and termination process.

C. Category Six (or other differing project specific Category 5E and 5 cables) horizontal cable testing shall be performed between the modular jacks at the communications outlet and the patch panels at the MDF and each IDF Space. Test results shall be provided by all contractors for approval in printed and electronic format displaying all tests.

D. Testing of UTP cabling shall be performed in accordance with the guidelines outlined in the Florida Department of Education, Retrofit for Technology Guidelines latest revision and in strict accordance to meet the Category Six requirements for new installations.

E. All technology contractors shall conduct Category Six cable testing with SDOC approved “only” certification testers and only use of certification testers that are proven currently calibrated is authorized for use at SDOC installations.

F. All single and multimode fiber optic strands for all fiber optic cables installed at all locations for every technology project shall be tested using an “OTDR” to verify the integrity of the cabling termination process and the overall transmission loss.
G. Only “OTDR” equipment proven as currently calibrated is authorized for use. Test results shall be provided by all contractors for approval in printed and electronic format displaying all tests. The OTDR trace output shall become a part of the as-built documentation.

H. For all engineered new construction, renovation and retrofit sites there shall be a mandatory scheduled Substantial Technology Inspection and 10% re-test for all architect and project engineer designed and managed projects. It shall be the responsibility of the project engineer to schedule and conduct this Substantial Technology Inspection and 10% Technology installation retest for all Category Six communications outlet terminations and a 100% retest of all fiber optic cable terminations using the same equipment the original testing was conducted with. Regardless of attendance by SDOC ITSD Technology Systems Construction Project Managers the project engineer shall schedule and conduct this Substantial Technology Inspection and 10% Technology installation retest. Attendance at any engineered new construction, renovation and retrofit sites for the Engineer’s Substantial Technology Inspection and 10% Technology Installation retest by SDOC ITSD Technology Systems Construction Project Managers shall be as a courtesy only to the engineer conducting the retest and inspection and is not mandatory.

I. All technology contractors at the time of the substantial technology 10% retest and inspection shall provide a complete set of both copper and fiber optic written test results for comparisons and verification during testing. Any issues noted at time of inspection with regard to typographical errors or omissions on the technology contractor provided copper and fiber optic written test results or discrepancies identified during verification at communications outlet ports shall be documented and corrected and a revised and comprehensive complete set of all copper and fiber optic written test results in both written and electronic format shall then be provided to the engineer for verification and approval and ultimately forwarded to the SDOC MTS Department for retention. In circumstances where the technology project is contracted directly by SDOC without the services of an engineer all aspects regarding the handling and provision of test results shall be provided directly to the SDOC MTS Department Technology Systems Construction Project Managers for all aspects regarding testing and documentation.

J. At Substantial Technology Inspection a thorough inspection of all MDF, IDF and all other technology related spaces and installations including hardware, cabling and pathways both interior and exterior shall be inspected for issues.

K. For all engineered new construction, renovation and retrofit sites all inspection issues shall be documented by SDOC MTS Department Technology Systems Construction Project Managers and submitted in the form of an SDOC generated inspection report to the Construction Services Department Project Manager and Construction Superintendent for resolution to the complete satisfaction of the SDOC MTS Department. In circumstances where the technology project is contracted directly by SDOC without the services of an Engineer and Construction Superintendent all aspects regarding all inspection issues shall be directly addressed by the SDOC MTS Department Technology Systems Construction Project Managers for all aspects regarding resolution of all inspection issues.
L. If during any Substantial Inspection as determined by the SDOC MTS Department Technology Construction Project Manager it becomes obvious that the Technology Contractor has too many issues to address the Substantial Inspection shall be cancelled, rescheduled and a repeat inspection shall be conducted. Correction of identified issues by the technology systems contractor real time during the inspection is permissible but shall not interfere or impede the progress of the ongoing inspection in any way or shall be ceased until inspection is completed. If the Substantial Inspection as determined by the SDOC MTS Department Technology Construction Project Manager is failed and canceled and a repeat inspection is scheduled it shall be the option in the best interest of the district to document and charge the technology systems contractor for the reschedule and return inspection as needs dictate.

M. Upon satisfactory completion of Substantial Inspection the inspection report of all issues identified shall be generated by SDOC ITSD for completion by the technology systems contractor.

N. When all issues are reported as resolved by the technology systems contractor including all testing issues the Final Inspection shall be scheduled and conducted the SDOC MTS Department Technology Construction Project Manager to verify all issues are resolved to the complete satisfaction of SDOC.

O. If during the Final Inspection other issues are noted an inspection report of these issues shall be generated for completion and a repeat inspection shall be conducted to insure the integrity of the technology installation to the complete satisfaction of SDOC. If the Final Inspection as determined by the SDOC MTS Department Technology Construction Project Manager is failed and canceled and a repeat inspection is scheduled it shall be the option in the best interest of the district to document and charge the technology systems contractor for the reschedule and return inspection as needs dictate.

1.09 PROJECT COMPLETION:

A. The intent of this document is to insure the delivery to the School District of Osceola County of a bona fide and verified one hundred percent complete, functional and operational, premium quality installation ready for SDOC occupation and use. Anything less is unacceptable.

B. Project completion as SDOC established is the date subsequent to Final Inspection that the SDOC ITSD Technology Construction Project Manager has conducted and passed for all installed technology systems the substantial and final inspections and has verified all applicable training has been conducted, complete and accepted and when the SDOC ITSD Technology Construction Project Manager has verified receipt of all project test documentation in all required formats, all warranty documentation for all installed systems is received, all as-builts for all installed systems is received and that all has been provided in accordance with the guidelines outlined in the Florida Department of Education, Retrofit for Technology Guidelines latest revision.

C. All technology systems contractors agree in the acceptance of the terms of any SDOC ITSD Technology Systems contract or document to comply with the requirement that regardless of any SDOC approved sub-contractors they utilize the main and contracted technology systems contractor alone is wholly responsible and liable in all respects for every detail and aspect of the contracted technology project installation in its entirety whatsoever that may be as well as for the installation, potential damages and
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actions of all sub technology, sub electrical contractors or other SDOC approved sub-contractors they may contract for assistance in any area of any and all sub-contracted trades for any SDOC technology project installation under the primary technology systems contractor where authorized by SDOC.

D. Omission of any essential detail in any SDOC ITSD Technology Systems contract or document once the purchase order or other documents of obligation are issued shall not relieve the technology systems contractor of the obligation to furnish all items and resolve all issues as required for installation completion as and where deemed required by SDOC MTS Department to the complete satisfaction of the School District of Osceola County, Florida and the SDOC MTS Department including compliance with installation standards in accordance with School District of Osceola County: Division 27 Standards and Specifications (Latest Revision).

E. All technology systems contractors agree in the acceptance of any SDOC ITSD Technology Systems contract or document to comply with the requirement that satisfactory project completion shall be determined by SDOC based on when all items in the SDOC scope of work are completed, all items in all SDOC generated inspection reports are completed, all staff training is accepted and complete, all test results are correct and complete and both revised paper and electronic copies are received by SDOC and all warranty certificates and documentation for all aspects and trades of each project is received and verified to be to the complete satisfaction of SDOC MTS Department. Only then shall the project be considered complete, final and closed.

F. Upon SDOC approval of satisfactory project completion and when the project is considered by SDOC MTS Department as complete, final and closed the SDOC MTS Department Technology Construction Project Manager shall submit to the technology systems contractor for their retention an SDOC Technology Department Contractor Evaluation Submittal as an SDOC MTS Departmental critique of the contractor’s performance. This shall be retained by the SDOC MTS Department permanently for reference as to the performance of all contractors and shall be used as verification and documentation with regard to future decision on approval for selection for new SDOC ITSD Technology Systems installation contracts or documents.
PART 2 – GENERAL TECHNOLOGY INSTALLATION REQUIREMENTS

1.01 SUMMARY:

A. The premise distribution concept is a cabling infrastructure standard designed to enable educators the flexibility to utilize existing and new technologically centered models of teaching and learning. The philosophy is such that school initiated implementations of various technologies can utilize these technology options and not be hindered within reason by facility-based constraints. These specifications are designed to permit the most flexible connections and integration of different types, brands, and models of computing, multi information, and communications technology equipment available.

1.02 PREMISE DISTRIBUTION SYSTEM AND CABLING INFRASTRUCTURE:

A. SDOC technology and communication equipment spaces shall be identified as Main Distribution Frame (MDF) and Intermediate Distribution Frame (IDF) spaces.

B. The technology cabling infrastructure installation for all district locations is based on a Premise Distribution System (PDS) consisting of both interior cabling infrastructure and exterior outside plant cabling infrastructure. Interior cabling infrastructure consists of various types of interior cabling designed for indoor use to accommodate varied technology Information. The purpose is to distribute and interface technology Information at all MDF and IDF Closet locations through cable support pathways installed throughout the interior structure of each building and to applicable interior spaces, carrying data, intercom, television, security devices, outlets or other systems to their destinations. Exterior outside plant cabling infrastructure consists of more durable backbone cabling designed for outdoor installation connected and interfaced through outside pull boxes, pedestals, manholes, vaults and other cable pathways to provide and enable the same various technologies available to be carried and distributed throughout a campus or between other site buildings as designed. Both interior and exterior infrastructures interact and interface to provide a single Premise Distribution System (PDS) designed to distribute all technology systems where needed with flexibility for expansion not only for the present but also for the reasonable and foreseeable future.

C. It shall be the responsibility of the architect and project engineer to include on all SDOC conformed plans the design of a single Consolidated Technology Backbone Cable Riser Detail (Figure 1) identifying all backbone cable runs required by SDOC MTS Department for installation. Cable Risers are to include technology cable types, quantities, strand and pair counts, all points of transition and or termination end to end for each type of technology backbone cable. This Technology Backbone Cable Riser Detail shall identify all MDF and IDF Space numbers and all building numbers as well as all floor and cabinet numbers, communications vaults, pull boxes, wall mounted or free standing pedestals and any other transition or termination point. All technology backbone cable ends shall be permanently labeled at all points of termination with type written legible permanent ink labels with lettering of a size that is easily read to identify the far end (ultimate destination point) point of termination. All Technology Backbone Cable Riser Details shall contain all details as outlined in Figure 1 with no exception.
D. MAIN DISTRIBUTION FACILITY (MDF):

1. By standard design there is only one (1) MDF location per campus with multiple Intermediate Distribution Facility (IDF) locations feeding back to the MDF. The MDF is the heart of all campus technology systems housing the head end electronics and equipment for the technology systems serving the campus. It is the intent that all technology head end equipment originates from and in the MDF space. However, there may be unforeseen circumstances which preclude this concept. In any such instance it is the responsibility of the Architect, Project Engineer and all applicable SDOC Representatives to determine appropriate alternate locations that will most efficiently serve the campus. The MDF is normally where all offsite services backbone cabling for network fiber optics, telephone, cable television and other outside/off campus DEMARC services and signals originate at
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for offsite campus locations. These outside services terminate in the MDF and their signals are
distributed throughout the campus on school district campus backbone cabling to other campus
buildings or sections of the same building at established IDF areas as needed.

2. The MDF shall be located in the same building and in close proximity to the Media Center.

3. The MDF minimum dimension established for all new construction see Figure 3A - MDF Detail
   “Typical” shall be a minimum ten (10) foot wide by twenty (20) foot long (10’ W x 20’ L) area with
   no exception. The MDF minimum dimension established for all renovation construction see Figure
   3B and 3C - MDF Detail “Typical” shall be a minimum ten (10) foot wide by ten (10) foot long
   (10’ W x 10’ L) area with no exception. Increase of the established size of the MDF shall be
determined based on the size of the campus it services, the number of single and multi-story buildings
it serves, and the amount of technologies installed. The MDF shall have no windows installed and
access to this space shall not open to the exterior of the building. The access door(S) to the MDF shall
swing outward. Where possible as design permits double doors shall be installed and shall open into a
building main corridor. At a minimum the access door shall be a minimum four (4) foot wide
oversized door which as previously stated shall open swinging outward onto a main corridor.

4. The MDF layout and associated VDBB technology configuration shown in Figure 3 - MDF Detail
   “Typical” is typical and may differ by site based on the technology requirements determined by
SDOC MTS Department. It is the responsibility of the project architect, engineer and the SDOC
ITSD Technology Construction Project Manager to determine the final MDF design layout
requirements with input from others as deemed necessary for each technology project installation. It
is the responsibility of the project architect and engineer to insure the conformed documents indicate
the exact technology systems detail and VDBB configuration detail design as indicated and required
by SDOC authorized representatives and that the SDOC ITSD approved MDF detail design is
displayed on the same Building “T” and “TE” sheet where the MDF is indicated and designed into
the building on the construction plan pages. The “T” Sheet MDF Detail shall indicate all technology
designed and the “TE” Sheet MDF Detail shall indicate all electrical needs as designed.

5. The MDF location shall be such that the 295’ distance limitation for copper Category Six
Communication Outlet cabling is not exceeded. If necessary where limits can exceed specifications
an (IDF) shall be added to adhere to 295’ distance limitation requirements. It is the responsibility of
the project engineer to insure all installed cable is within distance limitations for cable installation
specifications and to ensure no issues regarding warranty of the installed system.

6. The MDF houses the incoming DEMARC equipment and terminations for all outside services
regarding network fiber optics, telephone lines and services, cable television and other outside
services and auxiliary campus monitoring services. The MDF is the main closet housing hardware for
cross connection and interface to the campus equipment for these outside services to campus
technology systems and equipment. The MDF is the main closet housing hardware for cross
connection and distribution to the campus for network, intercom, telephone, cable and campus
television, video surveillance, intrusion detection and other technology related systems signals
between campus buildings on backbone cabling to each building or other IDF spaces located in areas
of the same building. The MDF is the closet housing hardware for patching and cross connection and
distribution of technology related systems signals to classrooms and administrative office spaces and areas needed that are located within that same building housing the MDF space and designed to be designated for distribution from that space. All incoming conduit for technology backbone or other cabling shall be placed along the VDBB walls. All conduits shall be stacked at a depth of not more than two (2) 4-inch conduits or 1-foot distance from the VDBB for all locations and technology systems.

7. MDF and IDF Floor and slab conduits shall be labeled with metallic stamped and banded labels for far end location. Unused floor and slab conduits shall be “capped” off. Populated floor and slab conduits shall be plugged with removable HILTI CFS-PL Firestop Plugs or SDOC approved fire stopping plug equal. Unused and populated conduit sleeves shall be plugged with removable HILTI CFS-PL Firestop Plugs or SDOC or approved fire stopping plug equal.

8. The MDF houses the voice and data head end electronics, intercom amplifier head end, security intrusion detection system (IDS) main panels, video surveillance system DVR(s) or IP servers head end electronics and other technology related equipment and connections for auxiliary systems such as fire alarm monitoring panels and HVAC monitoring devices and is the cross connection and originating distribution point for campus telephone lines, as well as telephone connections for fire alarm, elevator emergency, security and other monitoring devices requiring telephone connections. The backbone cabling links between all other campus buildings for these and other potential technology systems are ultimately connected back to and terminate in the MDF.

9. The MDF shall have dedicated clean power receptacles which shall be installed behind the equipment racks on the voice and data technology backboards (VDBB) at 80" A.F.F., U.O.N. Physical location of all space clean power receptacles shall be coordinated with the Project Engineer and SDOC ITSD Technology Construction Project Manager. There shall be a minimum two (2) twist lock 220VAC 30 AMP (NEMA-L6-30R) clean power receptacles installed in the MDF Space. However, in any instance where the MDF Space contains more than the standard three (3) free standing racks there shall be two (2) twist lock 220VAC 30 AMP (NEMA-L6-30R) clean power receptacles installed for every three (3) free standing technology systems equipment racks installed. Each clean power receptacle shall be dedicated, clean power project designed and engineered. These clean power receptacles shall be appropriately spaced either between or under the installed ladder racks mounted on the VDBB that support the free standing technology systems equipment racks. These clean power receptacles shall be utilized for the connection of a multi-outlet surge suppression device and/or UPS. In addition to the NEMA L6 power requirements established for network electronics there shall be 120VAC 20-AMP clean power duplex or quad receptacles installed at 80” A.F.F, U.O.N. which shall be strategically located every eight (8) feet with a minimum of one (1) receptacle installed per wall. These receptacles shall be to accommodate the present and future power requirements of various installed technology electronics as required. The Project Engineer and SDOC ITSD Technology Construction Project Manager shall determine final design requirements with input from others as needed.

10. All MDF and IDF Space walls shall be covered with Voice and Data Backboard (VDBB) which shall be sheets of READY SPEC pre-manufactured plywood backboard. All plywood sheets shall be painted with an approved SDOC specified color/shade of gray. Each VDBB READY SPEC pre-
manufactured plywood backboard shall be ¾” A-C grade plywood, coated on all sides (with no exception) with two coats UL Classified Intumescent fire retardant latex paint and each individual sheet installed with a Backboard Fire Retardant Certification label. On the front surface of each VDBB section the Plywood Grade and UL Classified Fire Retardant Latex product label shall be detailed. It is the responsibility of the Architect, Project Engineer, General Contractor, Electrical Contractor and Technology Contractor to consult with the SDOC Information and Technology Services Department Authorized Representatives to ensure a proper site project specific VDBB configuration design is identified and detailed on all conformed project documents and plans. Appendix “C” identifies detailed information for all Technology Systems Backboard Area Borders and their Color Designation. (See Paragraph 10 below.) All identified Technology Systems Backboard Areas shall be painted with a two (2) inch color border matching that technology system color around the entire perimeter for that system backboard. Inside on each perimeter of that designated system backboard the technology system name shall be stenciled with TWO INCH DIAMETER CAPITAL LETTERS placed center, top, bottom and both sided for each systems VDBB. This shall be accomplished with UL Classified Fire Retardant Latex paint. It shall be the responsibility of the project engineer and the General Contractor to insure all VDBB installed systems equipment shall be mounted on the designated VDBB sheets for that system “ONLY” and no others. Systems components installed in non-designated VDBB Sections shall be relocated at the sole expense of the contractor in violation to include any costs associated with repair and restoration of affected fire retardant VDBB sections to original specification. All Technology T-Drawings shall reflect these requirements on SDOC project conformed documents and plans.

11. The color code for each technology system in the MDF and all IDF closet locations shall have a two (2) inch border with two (2) inch stencils which shall be as follows:

- Fire Alarm Systems Backboard Two Inch Border - Red
- Intrusion and Video Security Systems Backboard Two Inch Border - Orange
- HVAC/Auxiliary Systems Backboard Two Inch Border - White
- Intercom Systems Backboard Two Inch Border - Blue
- Voice and Data cabling Backboard Two Inch Border - Yellow
- Outside telephone and television Services carrier DEMARC Equipment service entrance Backboard Two Inch Border - VIOLET or PURPLE (NOTE: THE PURPLE STRIPING BORDER IS ONLY INSTALLED AT THE MDF LOCATION AS THIS IS THE ONLY AREA ESTABLISHED FOR INCOMING OUTSIDE SERVICES PROVIDERS FROM THE STREET. THE PURPLE STRIPING BORDER IS NOT PAINTED ON AT ANY IDF LOCATION.)
- CATV Television Distribution Backboard Two Inch Border – Green (IF SPECIFIED FOR INSTALLATION)
- Refer to Figure 2 below for typical MDF and IDF closet technology systems color code examples.
VOICE AND DATA BACKBOARD INSTALLATION NOTE:

- Insure all VDBB system stripe locations and ALL VOICE AND DATA BACKBOARDS butt to one another at all locations in every communications closet. There shall be no “GAPS” between system backboards and differing color systems stripes at any location. This shall be typical for all installations.

WALL FIELD(S) FOR SERVICES INDICATED – PROVIDE AND INSTALL SDOC SPECIFIED “ReadySPEC” BACKBOARD WHICH SHALL BE 4’ BY 4’ SECTIONS OF ¾ INCH PLYWOOD 8’ IN HEIGHT AROUND THE ENTIRE PERIMETER OF EACH MDF AND IDF CLOSET. PRIMARY BACKBOARD PAINT COLOR SHALL BE TWO (2) COATS OF LIGHT GRAY FIRE-RETARDANT PAINT WITH A SECONDARY BORDER PAINT WHICH SHALL BE 2” BORDER TWO SIDES, TOP AND BOTTOM WITH 2” STENCILS PAINTED TWO SIDES, TOP AND BOTTOM IN 2” LETTERS FOR EACH APPLICABLE SYSTEM AREA. BORDER AND STENCILS TO BE INSTALLED IN DISTINCT COLORS AT SPECIFIED CLOSET AREAS AS DETAILED ON CONSTRUCTION PLANS FOR CLOSETS AND FOR ALL SYSTEMS LISTED BELOW:

- FIRE ALARM: RED
- INTERCOM: BLUE
- SECURITY: ORANGE
- VOICE/DATA: YELLOW
- HVAC/AUX: WHITE
- TELEVISION: GREEN (INSTALLED ONLY IF SPECIFIED)
- OUTSIDE SERVICES: PURPLE (INSTALLED AT MDF LOCATION ONLY)

1. ALL BACKBOARDS IN ALL MDF AND IDF LOCATIONS SHALL BE READYSPEC MANUFACTURED BACKBOARDS, PAINTED ALL SIDES WITH UL CLASSIFIED FIRE RETARDANT LATEX PAINT.
2. BACKBOARDS FIELD COLOR SHALL BE LIGHT GRAY IN COLOR, SECONDARY BORDER STRIPING - STRIPING AND LETTERING COLORS SHALL BE AS IDENTIFIED ABOVE, AND PER THE SDOC DIVISION 27 SPECIFICATIONS. ALL COLORS SHALL BE APPROVED BY SDOC ITS DEPARTMENT.
3. ALL BACKBOARDS SHALL BE INSTALLED AS INDICATED PER THE DWG’S. INSTALLATION SHALL BE SEAMLESS AND BUTT TO ONE ANOTHER AT ALL LOCATIONS. THERE SHALL BE NO GAPS/SEPARATION BETWEEN ANY BACKBOARDS.
4. REFERENCE SPECIFICATIONS FOR ADDITIONAL MATERIALS, AND INSTALLATION REQUIREMENTS.

LOW VOLTAGE SYSTEMS BACKBOARD DETAIL NTS

Figure 2 MDF / IDF BACKBOARD BORDER AND STENCIL Detail “Typical”
12. **MDF Space and all IDF Spaces shall be environmentally Air Conditioned and independently (A/C controlled)** 24 hours a day, seven days a week with isolated stand-alone A/C unit installation. A properly air conditioned and maintained space is essential to the continued functionality and operation of all installed network electronics. The isolated stand-alone A/C main unit for the MDF and each IDF space shall always be designed and engineered for installation above the door at the entrance to the space in both the MDF and in all IDF spaces for safety of personnel and to avoid potential leaks and water damage to sensitive electronic equipment installed in the space. The accompanying HVAC voice and data backboard shall be installed in close proximity for mounting of HVAC controls and all other HVAC equipment for the applicable space. The overall area of the HVAC voice and data backboard shall be painted light gray in color with a white painted two inch 360 degree perimeter border and white painted two inch stenciled lettering indicating HVAC CONTROLS stenciled at SDOC approved locations on the HVAC backboard area. All paint utilized shall be fire retardant paint “ONLY”. The nominal temperature maintained in both the MDF and all IDF Spaces shall be seventy degrees Fahrenheit. Once adjusted and set the A/C temperature of the MDF and all IDF spaces shall be maintained not to exceed more than plus or minus two degrees of the nominal setting with no exception. As a preventive measure in anticipation of eventual power outages all isolated stand-alone A/C units shall be capable of automatic reset to the preferred program setting of seventy degrees Fahrenheit upon restoration of normal power.

13. **MDF Space and all IDF Spaces are not and shall not be utilized for office spaces, installation of HVAC air handlers or similar HVAC equipment.** No janitorial supplies or equipment, storage of auxiliary or industrial type equipment that can potentially cause equipment hazards of any sort that could cause water damage, physical damage, dust, dirt, debris or equipment such as hand held radio master units which can generate frequencies that can potentially disrupt the proper routine operation of installed technology electronics shall not reside in these spaces. In other words no non technology related equipment for which the space has not been originally designed and intended shall be housed in these spaces.

14. It shall be the responsibility of the Project Architect and Project Engineer to ensure no piping carrying or having the potential to carry fluids of any kind shall exists in or extends through, above, below, in or around the interior walls of any MDF or IDF space or equipment. All piping of this nature shall be routed around the exterior walls of these spaces in a manner conducive to the safety and operational integrity of the expensive technology systems electronics installed in these locations. The floor shall be smooth and finished with a covering that shall not generate dust. Due to issues regarding electrostatic discharge (ESD) to sensitive electronic equipment among other undesirable issues carpet is not permitted for installation in MDF and IDF spaces.

15. In each IDF Space to facilitate remote functions for HVAC controls and intrusion detection security panel electronics installations and for convenience and general use as needed, a single Category 6 D2 **data outlet** shall be installed on the HVAC/Auxiliary Systems “White Bordered and stenciled” Backboard, a single Category 6 D2 **data outlet** shall be installed on the Security Systems “Orange Bordered and stenciled” Backboard and a single Category 6 D4 **data outlet** shall be installed on the Voice and Data Systems “Yellow Bordered and stenciled” Backboard for convenience and general use as needed. All data outlets shall be installed at 60 inches A.F.F.U.O.N.
16. In the MDF Space and all IDF Spaces all installed free standing technology equipment racks shall have a minimum four (4) foot clearance maintained from the edge of the rear foot/base outer edge on each rack to the finished surface of the VDBB (see Figure 4 - Technology Systems Equipment Rack Detail). There shall also be a minimum four (4) foot clearance maintained from the edge of the front foot/base outer edge on each rack to the finished surface of the front finished systems wall or VDBB as applicable. In the MDF and each IDF Space it shall be the responsibility of the Project Architect and Project Engineer to ensure a minimum thirty-six (36) inch distance is maintained between the free standing technology systems racks and all other installed systems panels including but not limited to fire alarm system panels, HVAC systems control panels, electrical and other panels. Also that a minimum eighteen (18) inch distance is maintained from the top of each and all free standing and other technology systems racks and all other installed racks to any ceiling installed fire system sprinkler heads. General and Technology Contractors shall in all circumstances verify all distances, measurement and free standing technology equipment rack placement with the Project Engineer and SDOC ITSD Technology Construction Project Manager.

17. **ATTENTION:** MDF and IDF Rack configurations shown in Figure 5A and 5B - Technology Systems MDF and MDF Equipment Rack Details are shown as typical basic MDF and IDF space and rack configurations “only”.

a. Actual MDF and IDF space and rack including technology systems backboard placement configurations may differ and shall be designed by the project engineer and all configurations approved by SDOC MTS Department Authorized Personnel to indicate exact project specific locations of MDF and IDF closet and rack positions and quantities with all sizes, types and amounts of needed rack components and quantities for each given location in addition to all project specific voice and data backboard placement and backboard size allotments for each technology system in each IDF and MDF space.

b. As designed and engineered all specific rack layout configurations including all project specific engineered quantities of racks, fiber optic LIU panels, copper data patch panels, vertical and horizontal wire managers, voice and data backboard orientations, electrical receptacles, grounding etc. based on site specific exact design needs indicating the exact positioning and space orientation as identified by the project engineer shall be submitted for final SDOC ITSD review, approval and where required input for rework.

c. Where required the exact rack component positions, rack and voice/data backboard orientation for the site specific design criteria submitted by the project engineer shall be red lined by qualified and authorized SDOC MTS Department representatives and resubmitted to the project engineer for final positioning and orientation of all MDF and IDF closet components.

d. It shall be the responsibility of the project engineer to determine the exact quantity of copper and fiber panels required for each MDF and IDF Space based on the number of SDOC required copper and fiber optic cables submitted for design to be installed at each space. It is the responsibility of the project engineer to match and balance the required space and rack configuration of all copper and fiber optic patch panels on the technology equipment racks to the
satisfaction of qualified and authorized SDOC MTS Department representatives and to ensure a sufficient number of free standing racks or cabinets are included in an SDOC ITSD approved design to support the installation of current technology electronics equipment and to insure sufficient additional rack space is available for reasonable expansion as specified by SDOC MTS Department representatives.

e. It is the responsibility of the project engineer to indicate in the conformed technology construction documents the accurate and appropriate number of actual project specific patch panels required and to insure these rack configurations are site specifically detailed and balanced for all locations to SDOC satisfaction on all conformed construction documents.

f. In addition to the standard installation of network data free standing equipment racks for patch panels in the MDF the intercom head end equipment shall be installed in a separate additional free standing equipment rack designated solely for that purpose and the video surveillance head end equipment shall be installed in another separate additional free standing equipment rack designated solely for that purpose.

E. Velcro cable wraps or approved equivalent “only” shall be utilized to bundle all PDS wiring and cable runs at the MDF Space, all IDF Spaces and all locations through the entirety of each individual run regardless of the technology installed. Cable ties are not an SDOC accepted means to secure cable runs.
WALL FIELD FOR SERVICES INDICATED – PROVIDE AND INSTALL SDOC SPECIFIED “ReadySPEC” BACKBOARD WHICH SHALL BE 4’ BY 4’ SECTIONS OF ¾ INCH PLYWOOD 8’ IN HEIGHT AROUND THE ENTIRE PERIMETER OF EACH MDF AND IDF CLOSET. BACKBOARD PAINT COLOR SHALL BE TWO (2) COATS OF GRAY FIRE-RETARDANT PAINT WITH A SECONDARY BORDER PAINT WHICH SHALL BE 2" BORDER TWO SIDES, TOP AND BOTTOM WITH 2" STENCILS PAINTED TWO SIDES, TOP AND BOTTOM IN 2" LETTERS FOR EACH APPLICABLE SYSTEM. BORDER AND STENCILS TO BE INSTALLED IN DISTINCT COLORS AS LISTED BELOW:

- FIRE ALARM: RED
- INTERCOM: BLUE
- SECURITY: ORANGE
- VOICE/DATA: YELLOW
- HVAC/AUX: WHITE
- OUTSIDE SERVICES: PURPLE (INSTALLED AT MDF LOCATION ONLY)

Figure 3A - MDF New Construction Detail “Typical”
Figure 3B - MDF New Construction and Renovation Details “Typical”
Figure 3C - MDF New Construction and Renovation Details “Typical”
Figure 3D - MDF New Construction and Renovation Details “Typical”

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Figure 3D - MDF New Construction and Renovation Details “Typical”
Figure 4- Technology Systems Equipment Rack Detail “Typical”
Figure 5 - Technology Systems IDF and MDF Equipment Rack Detail “Typical”

**DETAIL KEYNOTES:**

1. 48-PORT FIBER PATCH PANEL
2. 24-PORT FIBER PATCH PANEL
3. 48-PORT VOICE PATCH PANEL
4. 24-PORT VOICE PATCH PANEL
5. 48-PORT STATION PATCH PANEL
6. 7’ FREE-STANDING RACK (SEE RACK MOUNTING DETAIL)
7. VERTICAL CABLE MANAGEMENT – CPI COMBINATION CABLEING SECTION #301 SERIES
8. HORIZONTAL CABLE MANAGEMENT – CPI COMBINATION CABLEING SECTION #301 SERIES

**INSTALLATION NOTE:** FOR ALL IDF FREE STANDING TWO POST RACK INSTALLATIONS THE RACK CONTAINING THE FIBER OPTIC LIU’S AND THEIR HORIZONTAL WIRE MANAGEMENT SHALL HAVE NO OTHER EQUIPMENT INSTALLED AND SHALL ALWAYS BE INSTALLED AS THE FARDEST LEFT RACK AS VIEWED FROM THE FRONT OF THE RACKS. ALL COPPER PATCH PANELS AND THEIR HORIZONTAL WIRE MANAGEMENT SHALL ALWAYS BE TO THE RIGHT OF THE RACK CONTAINING THE FIBER OPTIC LIU’S.
F. INTERMEDIATE DISTRIBUTION FACILITY (IDF):

1. The minimum IDF dimension established for new construction (see Figure 6A – IDF Detail “Typical”) shall be a minimum of ten (10) foot wide by ten (10) foot long (10’ W x 10’ L) area with no exception. The IDF minimum dimension established for all renovation construction shall also be a minimum ten (10) foot wide by ten (10) foot long (10’ W x 10’ L) area with no exception. Increase of the established size of the IDF shall be determined based on the size of the building it services and the amount of technologies installed. The IDF shall have no windows installed and access to this space shall not open to the exterior of the building. The access door to the IDF shall swing outward. At a minimum the access door shall be a minimum four (4) foot wide oversized door which as previously stated shall open swinging outward and shall open into a building main corridor.

2. There shall be a minimum two (2) two post free standing racks installed in all IDF Closet locations with no exception. Dependent upon the requirements of the building there may be need for more than the minimum two (2) two post free standing racks installed but never less than the minimum two racks shall be installed. The specified four (4) foot distance between the technology systems equipment racks and the VDBB shown on Figure 4 - Technology Systems Equipment Rack Detail “Typical” shall be maintained in all instances.

3. Each IDF layout and associated VDBB technology configuration shown in Figure 6A - IDF Detail “Typical” is typical and may differ by site building or floor based on the technology requirements determined by SDOC MTS Department. It is the responsibility of the project architect, engineer and the SDOC ITSD Technology Construction Project Manager to determine each final IDF location design layout requirements with input from others as deemed necessary for each technology project installation. It is the responsibility of the project architect and engineer to insure the conformed documents indicate the exact technology systems detail and VDBB configuration detail design as indicated and required by SDOC authorized representatives and that each SDOC ITSD approved IDF detail design is displayed on the same Building and floor plan “T” and “TE” sheet where the specific IDF designed for each building and floor is indicated on the construction plan pages. The “T” Sheet specific IDF Detail shall indicate all technology designed and the “TE” Sheet specific IDF Detail shall indicate all electrical needs as designed.

4. IDF Spaces are to be located in each building, wing, floor, and other locations as needed for all district sites. The location of and number of campus IDF Spaces shall be dependent upon the need to satisfy the 295' distance limitation requirements for all installed copper Category Six Communication Outlet cabling to insure no cable lengths are exceeded at any location for any installed PDS site. If necessary additional IDF Closets shall be designed in to adhere to the 295' UTP copper Category 6 data cabling distance limitation requirement in all instances for all locations.

5. Each IDF space houses the hardware for cross connection and distribution to that building for all network, intercom, telephone, CATV and campus television, video surveillance, intrusion detection and other technology related systems signals incoming on backbone cabling from the MDF space located in the main campus building or from the MDF location in the same building at a different
interior building location. Each IDF also houses the hardware for the backbone cabling to the building interior infrastructure cabling for patching and cross connection for the distribution of these technology related system signals to desktop and other devices installed in both classrooms and administrative office spaces and other areas that are located within that same building housing the IDF space.

6. Each IDF shall have dedicated clean power receptacles which shall be installed behind the equipment racks on the voice and data technology backboards (VDBB) at 80” A.F.F., U.O.N. Physical location of all space clean power receptacles shall be coordinated with the Project Engineer and SDOC ITSD Technology Construction Project Manager. There shall be a minimum one (1) 220VAC 30 AMP (NEMA-L6-30R) clean power receptacle installed in each IDF Space. However, in any instance where an IDF Space contains more than the standard two free standing racks there shall be two (2) 220VAC 30 AMP (NEMA-L6-30R) clean power receptacles installed for every three (3) free standing technology systems equipment racks. Each clean power receptacle shall be dedicated, clean power project designed and engineered. These clean power receptacles shall be appropriately spaced either between or under the installed ladder racks mounted on the VDBB that support the free standing technology systems equipment racks. These clean power receptacles shall be utilized for the connection of a multi-outlet surge suppression device and/or UPS. In addition to the NEMA L6 power requirements established for network electronics there shall be 120VAC 20-AMP clean power duplex or quad receptacles installed at 80” A.F.F, U.O.N. which shall be strategically located every eight (8) feet with a minimum of one (1) receptacle installed per wall. These receptacles shall be to accommodate the present and future power requirements of various installed technology electronics as required. The Project Engineer and SDOC ITSD Technology Construction Project Manager shall determine final design requirements with input from others as needed.

7. In each IDF Space to facilitate remote functions for HVAC controls and intrusion detection security panel electronics installations and for convenience and general use as needed, a single Category 6 D2 data outlet shall be installed on the HVAC/Auxiliary Systems “White Bordered and stenciled” Backboard, a single Category 6 D2 data outlet shall be installed on the Security Systems “Orange Bordered and stenciled” Backboard and a single Category 6 D4 data outlet shall be installed on the Voice and Data Systems “Yellow Bordered and stenciled” Backboard for convenience and general use as needed. All data outlets shall be installed at 60 inches A.F.F.U.O.N.

8. Refer to MDF Section for specific direction regarding both MDF Space and all IDF Spaces which shall be environmentally Air Conditioned and independently (A/C) controlled.

9. Refer to MDF Section for specific direction regarding both MDF Space and all IDF Spaces which are not and shall not be utilized for office spaces, installation of HVAC air handlers or similar HVAC equipment.

10. Further, it shall be the responsibility of the Project Architect and Project Engineer to ensure no piping carrying or having the potential to carry fluids of any kind shall exists in or extends through, above, below, in or around the interior walls of any MDF or IDF space or equipment. All piping of this nature shall be routed around the exterior walls of these spaces in a manner conducive to the
safety and operational integrity of the expensive technology systems electronics installed in these locations. The floor shall be smooth and finished with a covering that shall not generate dust. Due to issues regarding electrostatic discharge (ESD) to sensitive electronic equipment among other undesirable issues carpet is not permitted for installation in MDF and IDF spaces.

11. All installed free standing technology equipment racks shall have a minimum four (4) foot 4' clearance maintained from the rear foot/base outer edge of each rack to the finished surface of the VDBB (see Figure 4 - Technology Systems Equipment Rack Detail). There shall be a minimum 4' clearance maintained from the front foot/base outer edge of each rack to the finished surface of the front finished systems wall or VDBB as applicable. Refer to MDF Section 1.02 D15 for specific direction regarding both MDF and all IDF Spaces minimum distances from other panels and sprinkler piping. Verify all distances, measurement and free standing technology equipment rack placement with the Project Engineer and SDOC ITSD Technology Construction Project Manager.

12. Velcro cable wraps or approved equivalent “only” shall be utilized to bundle all PDS wiring and cable runs at all locations through the entirety of each individual run regardless of the technology installed. Cable ties are not an SDOC accepted means to secure cable runs.
G. **WORKSTATIONS** - Workstations are basically characterized into two categories, Administrative and Classroom.

1. The administrative Communications Outlet or workstation is defined as any work site not based in a classroom or a work site that is not used for student based instructional purposes (typically front office, dean’s area, cafeteria, stage, etc.).

2. The classroom Communications Outlet or workstation is defined as a work site that directly involves student based instruction (classrooms, teacher work areas, labs, library, Information center, etc.).
Teacher’s Classroom Communications Outlet is typically located at the area designated on the plans as the teacher’s work area (to accommodate a teacher workstation). There shall be a minimum of two (2) additional Communications Outlets in each classroom for student use. Teacher work areas adjacent to the classrooms shall have one Communications Outlet for every two teachers. Common teacher work areas or lounges shall have a minimum of two (2) Communications Outlets each. The labs, library, Information center, etc. shall require Communications Outlets based on the educational needs of the school.

H. COMMUNICATIONS OUTLETS:

1. At each workstation location, a minimum four position modular communications outlet faceplate shall typically be installed to accommodate both voice and data inputs from local MDF or IDF locations.

2. All faceplates shall consist of a minimum four (4) Category Six cabled communications outlet with each cable terminated to an RJ45 Non-keyed module terminated using 568A method. See Figure 7 – D2, D4 and D6 Outlet Detail “Typical”.

3. Changing the standard number of communications outlet ports from four (4) - D4 to six (6) – D6 (typically D6 outlets are installed only at lab design locations) or to decrease the number of outlet ports from four (4) - D4 to two (2) D2 (typically D2 outlets are installed only at intelligent Board or Smart Board and Digital Television Outlet design locations) or other shall be determined by and coordinated with the Project Engineer and SDOC ITSD Technology Construction Project Manager.

4. Data communication outlet boxes shall be a minimum 2.5" deep U.O.N.

5. All Category 6 cabling from each outlet location shall homerun terminate from each outlet location in the designed and designated local MDF or IDF Space.

6. No Intermediate splices are acceptable and the maximum distance limitation standard established by EIA/TIA specification / limitations is 295' feet with no exception.

7. It is the responsibility of the Project Engineer to insure this specification / limitation is adhered to in each project technology design and that there are ample IDF Spaces provided to comply with this specification / limitation with no exception.
I. EXISTING CAMPUS DATA OUTLET INSTALLATION OF DIFFERING BRANDS

1. At existing campus and other locations instances will arise where requests for additional data drop outlets shall occur in expansion of the original installation. These data drop outlet requests could range anywhere from single D1 data outlets to multiple D4 or D6 data drop outlet installations.

2. Instance shall also occur where these requests are solicited for quotes and installation by outside technology contractor sources.

3. Where outside technology contractors quote these installations it is preferred by SDOC that the contractor quote and install the same solution as is currently existing and installed campus wide which will be a COMPLETE CLOSED PANDUIT, ORTRONICS or AMP/TYCO SOLUTION.
4. Still and all if the contractor quoting is not certified in the existing solution currently installed campus wide and is quoting the requested installation with the intent to install a differing solution that contractor shall be certified and qualified to install that different solution. These installations are permissible at the option and discretion of SDOC Technology Systems Construction Project Managers providing the following conditions are met and complied with in full:

a. The SDOC ITSD Technology Systems Construction Project Managers have determined that a differing solution is acceptable for the installation.

b. The contractor shall in all respects be certified and qualified for installation of the solution differing from the existing solution as SDOC specified inclusive of RCDD specifications.

c. The contractor shall in all SDOC approved instances install a complete and separate installation each time inclusive of differing solution patch panel, cable, jacks and faceplates.

d. There shall be no intermingling of differing solutions where approved as this could potentially void the warranty of the existing solution installed.

e. The separate solution shall be completely separate of the existing solution and when installed the contractor shall provide warranty for the differing solution.

f. For any questions contact the SDOC ITSD Technology Systems Construction Project Managers prior to installation. Correction of any installation error shall be the sole responsibility of the installing contractor, shall be at no additional cost to SDOC and shall be to the complete satisfaction of SDOC Authorized Personnel.

J. CLEAN AND GENERAL POWER RECEPTACLES:

1. Clean Power Receptacles also referred to as Computer or Data Receptacles shall be black in color with stainless steel faceplates with no exceptions.

2. All clean power receptacles shall be labeled by the general contractor with contractor provided and installed typewritten labels IAW with Division 27 Standards and Specifications. All labels shall be on each faceplate with the Panel Number and Circuit Breaker Number feeding that specific clean power receptacle at all locations with no exception.

3. General Use Power Receptacles also referred to as General Power Receptacles shall be gray or ivory in color with stainless steel faceplates or as designed.

4. As a routine both clean and general power receptacles and communications outlets with noted exceptions shall be located at 18” A.F.F., U.O.N. to the center of the faceplate.
5. All Construction Services Department Project Managers, all general contractor superintendents and their project managers, all electrical contractors and their technology systems installation subcontractors and their sub-contractors shall be aware of the following information regarding the placement and installation location of clean power receptacles and communication outlets:

a. **No clean power receptacle and associated communication outlet shall be installed in, cutout or covered by the installation of modular furniture or cabinetry unless specifically designed for installation in such a manner.** All issues arising with regard to this issue shall be brought to the immediate attention of the project engineer and corrective action taken.

b. Clean power receptacles and associated communication outlets intended for installation in this manner shall be noted as such on all plans and specifications. It is implied and understood for the information of all Facilities and Construction Services Department Project Managers, Technology Construction Managers, Project Engineers and Site Construction Superintendents and their Project Managers that other than those clean power receptacles and associated communication outlets designed and noted for installation in this manner no other clean power receptacles and associated communication outlets are to be installed in this manner with no exception.

c. In circumstances where this is an issue when identified it is mandatory that Project Engineer and Site Construction Superintendent and their Project Managers take action and in each instance the clean power receptacles and associated communication outlets in question shall immediately be addressed and resolved by relocating to an appropriate and useable location.

d. Each clean power receptacle and the associated communication outlet are to be relocated to a useable location above, beside or to a new location away from the counter or furniture being installed.

e. In instances where this is not identified and resolved prior to the counter or furniture being installed and the receptacle is covered and/or cutout in the furniture impeding the normal and intended proper operability and use it shall be the responsibility of the general contract superintendent, their electrical contractors and systems contractors and sub-contractors to relocate and install the clean power receptacle and the associated communication outlet in question to a location suitable for use that is satisfactory with the Technology Construction Manager or appropriate SDOC Representative with no exceptions.

f. Typically, by design each classroom shall have a dedicated clean power circuit.

g. Administrative locations shall have a dedicated clean power circuit for workstation connections based on functionality.
h. Teacher workrooms with at least one workstation must also have dedicated clean power.

i. A dedicated duplex clean power receptacle shall be provided and shall be no more than 12" to 24" distance adjacent to each installed communications outlet. D1 through D4 data outlets shall be installed with a duplex clean power receptacle at each location. All D6 data outlets shall be installed with a quad clean power receptacle at each location with no exception. In instances where outlet sizes are increased above D6 multiples of the quad or duplex receptacles mentioned here shall be installed to accommodate these port increases using the directives in this paragraph.

j. Computer power systems shall be separated from other site power sources using “K-13” rated isolation transformers in each building feeding surge protected clean power panels.

k. Additionally, each circuit shall have its own neutral, oversized to handle the additional neutral current.

l. Each branch circuit feeding computer power receptacles shall not exceed three (3) duplex clean power receptacles per circuit.

m. All dedicated clean power circuits shall be surge protected by design. (For more information refer to Retrofit for Technology Guidelines, current revision.)

K. KRONOS CLOCK, EXTERNAL RINGERS AND OTHER CONNECTIONS:

1. KRONOS Clock (dimensions are ten (10) inches wide, ten (10) inches High and four (4) inches deep) connections require installation of a D2 data outlet and general power receptacle installed at all designated locations. The D2 data outlet shall be installed parallel in conjunction with a duplex general power receptacle within 12 inches at all designated locations. These power and data outlets shall be installed at a height of sixty (60) inches A.F.F. to the center of the data outlet single gang box. The data and general power receptacle should remain in close proximity.

2. For external ringer connections at the Kitchen areas or other locations and other instances requiring installation of a single port data drop there shall be a total of one (1) Category Six cable (D1) cable installed U.O.N. at one modular faceplate port designated for external ringer connection or other uses as designated.

3. For all applications above install D1 data port and stubout above the door to the Kitchen Office U.O.N. D1 data port shall be installed in the top left faceplate port (for use as a typical D1 communications outlet) this cable shall home run terminate from the single port on the modular faceplate to a patch panel port in the local IDF space. This will permit a data connection to be patched for data or the telephone number designated for the Food Service Manager Office to an external ringer for the food preparation area.
4. These D1 locations shall be installed at a minimum ninety-six (96) inches A.F.F. U.O.N. at designated location on conformed plans. Other D1 locations installed may vary for installation height as detailed on conformed plans. See Figure 9 - D1 Outlet Detail “Typical”

Figure 9 – D1 Outlet Detail “Typical”

L. INTELLIGENT BOARD PROJECTOR DATA CONNECTIONS:

1. General contractor shall provide and install all Intelligent Board Projector plate assemblies inclusive of all components, cabling and connections which shall also require installation of a D2 dual data port outlet at each designated classroom and all other ceiling projector plate assembly locations for installation configuration One (1). A total of two (2) Category Six cables (D2) shall be installed at one modular faceplate designated for projector plate or teaching wall D2 connection locations. For configuration Two (2) all components routine to installation at projector plate assemblies shall be located at the teaching wall and installed in general contractor provided and installed in wall conduits and boxes of the size and configuration as detailed in section 27_10_00 on the teaching wall area above the intelligent board at ninety six (96) inches above finished floor or at six inches below ceiling height where applicable. Refer to Section 27_10_00 for installation specific details.

2. On each projector plate general contractor shall provide and install deep single gang EMT knockout boxes for all installed outlet faceplates and devices inclusive of a properly sized and fitted ¾ inch grommet, bushing or coupler and for the data installation one (1) single gang data faceplate complete with a two (2) Category 6 RJ45 module data ports installed, terminated, labeled and tested to the local MDF or IDF space as appropriate. General contractor shall also provide and install the VGA Extender Module and all other projector plate assemblies including the two Category 5 VGA Extender patch cables to the Teacher Station Faceplate location. The contractor shall install
individual data faceplate blanks as appropriate to fill all open spaces on the data faceplate. The contractor shall install individual stainless steel faceplates as appropriate to fill all open single gang spaces on each projector plate.

3. Data faceplate and all components shall be a match with installed site technology components either COMPLETE CLOSED PANDUIT, ORTRONICS, AMP/TYCO SOLUTION with no exception. See Figure 10 - Ceiling Projector Plate Detail “Typical”

Figure 10 – Classroom Ceiling Projector Plate Detail “Typical”

M. POWER AND DATA POLE INSTALLATIONS:

1. All contractors shall adhere to the following with regard to locations where SDOC has specified the installation of power poles.

2. All contractors shall provide and install all manufacturer provided power pole components and all components whether manufacturer provide or not that are considered by the SDOC Technology Construction Project Manager as necessary to support and secure the power pole installation. This shall include as a minimum power pole ceiling grid bracket and foot. The foot shall be secured to the floor with TAPCONS or other SDOC approved fastening devices only. The ceiling grid bracket shall be secured according to manufacturer approved recommendations. All power poles shall be level and securely installed to the satisfaction of the SDOC Technology Construction Project Manager.
3. Power poles utilized for project installation shall consist of a dual assembly with separated power and data channeling. The power channel shall include a minimum of two duplex power receptacles regardless of whether the intent of the SDOC Technology Construction Project Manager for the installation is to power both receptacles or to make active only a single receptacle.

4. All power pole assemblies shall be provided with bushings above ceiling to transition the power and data cabling into the appropriate channeling.

5. Data outlets to be installed in the data channeling portion shall be installed only as the SDOC Technology Construction Project Manager and the Division 27 standards dictate. Consult Figure 11 – Power Pole Data Outlet Component Detail “Typical”

   **Figure 11 – Power Pole Data Outlet Component Detail “Typical”**
N. TELEPHONE INFRASTRUCTURE:

1. The telephone infrastructure shall consist of shielded/flooded PE89 Category 3 copper backbone cables homerun installed from the MDF Space to each IDF Space located in all exterior building locations.

2. For IDF spaces located in areas of the same building install interior copper backbones of indoor PVC jacketed cables homerun installed from the MDF Space to each IDF Space at all locations within that same building.

3. For all backbone cables insure inclusion of adequate pair counts to anticipate moderate expansion.

4. All pairs of each telephone backbone cable shall terminate to individual 66 blocks which are installed on the appropriate VDBB. Terminations are on the left side and on one (1) side only of each 66 block.

5. The right side of each 66 block is intended for uses as an internal SDOC installed point of cross connect as needed and shall be left open and unused by all contractors.

6. Interior telephone infrastructure shall consist of Category 6 or above UTP cables installed from the local MDF or IDF network rack and patch panel infrastructure within the specified not to exceed length of 295’ feet for each communication outlet faceplate location.

7. All communications outlet cables are intended for use as either voice or data ports to service either device connection by changing the patching and cross connects in each Communications Closet where needed dependent upon needs of the space and its occupants.

8. Copper voice cross-connects shall be provided in the MDF and each IDF Space.

9. As NEC dictated and directed all PE89 shielded/flooded backbone cable shall be terminated within fifty feet of entrance to the interior of all buildings or shall run in its entirety in EMT OR RIGID conduit and stub out in the interior of the closest local MDF or IDF Space.

10. Each PE 89 cable shall terminate to an SDOC approved CIRCA or SDOC approved equal Building Entrance Primary Protector Block.

11. Each Protector Block shall be grounded with a #6 stranded copper green jacketed ground wire homerun installed to the space TGBB. An MGB 66-Block Ground Bar Rail shall be grounded with a #6 stranded copper green jacketed ground wire homerun installed to the space TMGGB / TGBB and shall be installed on the left side of all 66 blocks where backbone cables and patch panel 66 blocks are terminated in order that appropriate secondary telephone surge suppression devices where needed can be properly installed.
12. In each MDF and IDF Space on the VDBB in the vicinity of the telephone backbone wall field terminations as designed there shall be a Voice “ONLY” 66 block bank connected to Voice “ONLY” patch panels at the two post free standing racks specifically for “VOICE” Only Patch Connections. From the 66 blocks there shall be minimum twenty five (25) pair indoor PVC jacketed voice cable(s) terminated on one (1) cable end to the 66 blocks on the outer pins “ONLY” top to bottom and on the left side “ONLY” with the other end of the same indoor PVC jacketed voice cable(s) terminating on a single 48 port patch panel (or more as designed and designated) for “VOICE” Only Patch Connections installed on each free standing rack or communications cabinet. Each pair of the same indoor PVC jacketed voice cable(s) shall terminate to one (1) patch panel port pair only sequentially on the white blue pins of each patch panel port one (1) through forty-eight (48) with pair number twenty-five of each twenty five (25) pairs coiled or neatly secured as approved by the Technology Construction Project Manager. The cable jacket shall be stripped back and installed securely at the far left end of the patch panel with a cable tie or approved fastener and the exposed pairs shall be neatly laid in the patch panel channel to the far end port 1 and 25 location on the forty-eight (48) port Voice Patch Panel. Each pair beginning with the white blue pair shall be sequentially punched down to the white blue pins on each patch panel port excepting pair 25 which shall be curled and secured at the end near the PVC jacket. Dual cables shall be Velcro strapped together and all single and dual cable runs from the 66 blocks to the patch panels shall be secured on the voice data backboard and installed in a neat and clean manner on both the ladder rack and to the patch panel locations through the vertical wire management.

13. This assembly is installed to support SDOC cross connects as needed between the voice backbone cable blocks and the patch panels for all closets. All cross connects shall be approved cross connect wire “ONLY” as is manufactured and intended for that purpose unless otherwise noted for uniformity and neatness of installation. Use of multiconductor cables is not normally approved and only approved by SDOC Technology Construction Project Managers. All cross connect wire shall be punched down on the 66 blocks on the outer pins “ONLY” top to bottom and on the right side “ONLY” for all installations with bridging clips installed for trouble isolation. No other installation format shall be approved for new installations requiring these assemblies. Punching both cables down to the left side of 66 blocks is not approved and will be required to be re-punched where violations are noted. All surge suppression shall be installed at the backbone termination point and shall not normally be installed at the Voice Patch Panel “VPP” 66 blocks although there may be instances where this may occur as authorized by competent authority.
14. The MDF and each IDF shall have a minimum one (1) 48-port patch panel each dedicated for copper voice connections only. See Figure 12 – Telephone Equipment Bond Detail “Typical” for exact assembly of this configuration.

15. In instances where construction requires a dedicated direct telephone connection for specialized equipment such as the elevator telephone, fire alarm, HVAC monitoring and security monitoring panels there shall be installed an individual Category 6 or possibly Category 3 PVC telephone cable installed in the local MDF or IDF location closest to the device. From the Communications closet 66 block to the device the Category 6 or possibly Category 3 PVC telephone cable will home run and be installed internally to the device by the contractor installing and testing the applicable system and equipment.

16. SDOC MTS Department will assist in ordering of the telephone line and cross connecting, testing for dial tone and labeling of the number on the end of each device cable which shall be installed from the device to the communications closet by the General Contractor.

Figure 12 – Telephone Equipment Bond Detail “Typical”
O. INTERCOM INFRASTRUCTURE AND PROTECTION:

1. The installation and utilization of either fiber optic backbone cable or copper underground backbone cable or a combination of both copper and fiber optic backbone cabling shall be determined by the engineer and SDOC personnel during project design based on the intercom head end specification and design for each project and any special project site specific circumstantial needs. The Main Intercom Head End Device shall be installed in the Campus MDF Space unless otherwise specified. The backbone intercom cabling installation between the MDF and each IDF Space shall either be individual homerun bundles of copper West Penn AQC369 cable or a determined number of strands of multimode fiber optic cable as each unique project shall dictate.

2. Homerun individual West Penn 355 cables shall be installed from the individual AQC369 cables at the MDF and each IDF Space to each office space with volume control installed for those circuits. Homerun individual West Penn 355 or as an SDOC ITSD approved alternative West Penn 4245 cables shall be installed from the individual AQC369 cables at the MDF and each IDF Space to each classroom call button for those circuits and from each call button to each classroom speaker and intercom clock homerun individual West Penn 291 or as an SDOC ITSD approved alternative West Penn 4245 cables shall be installed. Classroom circuits shall typically consist of one (1) call button, one intercom clock and one speaker only.

3. Homerun individual West Penn 291 or as an SDOC ITSD approved alternative West Penn 4245 cables shall be installed from the individual AQC369 cables at the MDF and each IDF Space for each indoor and or outdoor speaker zone. Indoor speaker zones shall consist of no more than five (5) speakers per circuit. Outdoor speaker zones shall consist of no more than two (2) speakers per circuit.

4. Refer to Figure 13 – Intercom Speaker Configurations Detail “Typical”

5. Backbone intercom cabling between the MDF and each IDF Space shall be of sufficient quantities to service all intercom requirements with minimum 20% expansion for the building or area installed unless otherwise noted. It is the responsibility of the project engineer to insure proper quantities of intercom cable are designed in for each SDOC project to provide for current needs as well as reasonable expansion capability.

6. Intercom cross connects shall be conducted at the MDF and each IDF Space. All backbone and infrastructure intercom cabling shall terminate to 66 blocks installed on VDBB intercom wall field as designated in the MDF and each IDF Space location. All conductors on each intercom cable shall be terminated. The intercom trunk or backbone cables shall be terminated to the outer pins on the left side only on 66 blocks leaving the right side of each 66 block open for cross connection of the intercom infrastructure cabling and finally for installation of protection or bridging of the circuits. The intercom infrastructure field cables shall terminate on the outer pins on the right side only of these same 66 blocks. The 66 block center pins shall bridge the signal to both the left and right sides of each 66 block with bridging clips and at the head end with voltage surge protectors on the left backbone side.
7. The use of items not SDOC approved such as wire scrap or other conductive items to bridge these connections is unacceptable. Primary connections at and to the intercom head end location shall be bridged with approved voltage surge suppression protectors in lieu of bridging clips.

8. All Intercom 66 block terminations shall be labeled with typewritten labels only reflecting far end termination points for backbone cabling and infrastructure field cables such as classroom number, corridor etc. Spare cabling shall be labeled spare to MDF or IDF as applicable with pair numbers.

9. In the MDF all shields shall be looped together on the Intercom side of the 66 blocks. The shields shall all be bridged to the field wiring.

10. The MGB ground bars shall be mounted behind the 66-block mounting brackets to allow the PB-CLN and PB-SPK protectors, as required to sit flush on the 66-blocks. The MGB Ground Bars shall be mounted on the same side as the outside plant trunk cables.

11. The labeling on all 66-blocks shall correspond with a location in the field. Identify all circuits by room number, and type of equipment (Call-Button, Speaker, Hall Zone or Outdoor Zone). All Intercom cabling shall be labeled at both ends with an SDOC approved typewritten labeling scheme only. The Intercom Cable labeling shall correspond with the Intercom physical port number on both ends. The project engineer and or SDOC ITSD Technology Construction Project Manager shall be contacted for any issues regarding labeling. Failure to contact an SDOC ITSD authorized representative for direction shall result in removal of the installed labeling and replacement with approved labels at the sole cost of the contractor at no additional expense to SDOC.

12. The system circuit numbers shall be permanently identified on the left side of the 66-blocks. The location of the field device shall be identified on the right side of each 66-block. This labeling shall also be an SDOC approved permanent typewritten labeling system.

13. At all IDF locations, bridge the shields through on all 66-blocks.

14. The intercom system shall be balanced and programmed for All-Call and Call-In.

15. FISH room numbers shall be properly programmed into the head end for each circuit.

16. Zones shall be properly identified and programmed.

17. The intercom system shall be fully programmed with all features operational and appropriate training scheduled and conducted with school administration.

18. Intercom cable shall be installed in a separate pathway. Intercom cables shall never be installed in the same raceway/pathway as data infrastructure cable.
19. Secondary voice electronics / equipment voltage surge suppression devices shall be installed in strict compliance with manufacturer provided installation procedures with no exception. Voltage surge suppression devices shall be as follows:

Intercom voltage surge suppression devices:

a. Call-Button- EDCO PB-CLN  
b. Speakers- EDCO PB-SPK

Telephone voltage surge suppression devices:

a. CO Lines- EDCO HCO  
b. Analog telephones- EDCO HAE as required by the manufacturer.  
c. Digital telephones- EDCO HDE as required by the manufacturer.

**Figure 13 – Intercom Speaker Configurations Detail “Typical”**

**TYPICAL CLASSROOM**

**TYPICAL CORRIDOR**

**TYPICAL OUTDOOR SPEAKERS / HÖRNS**

**TYPICAL OFFICES**

**GENERAL INTERCOM NOTES:**

1. MAX, FIVE (5) SPEAKERS PER CIRCUIT (WITH OR WITHOUT VOLUME CONTROL)  
2. MAX, ONE (1) CALL BUTTON PER CIRCUIT  
3. MAX, TWO (2) EXTERIOR HORNS / SPEAKERS PER CIRCUIT

**INTERCOM WIRING:**

1. WEST PENN 385CABLE – 4g. 22 AWG STRANDED W/2SHIELDED, 2 UNSHIELDED OR WEST PENN 4245CABLE AS AN SBOC MTSD APPROVED ALTERNATE  
2. WEST PENN 291CABLE – 2g. 22 AWG STRANDED WITH SHIELD OR WEST PENN 4245CABLE AS AN SBOC MTSD APPROVED ALTERNATE  
3. EACH OFFICE SPACE, CLASSROOM, OUTDOOR SPEAKER GROUP, OR CORRIDOR SPEAKER GROUP SHALL BE HOMERUN TO INTERCOM WALL, FIELD IN NEAREST IFP / MIF ROOM, DAISY-CHAINING OF INTERCOM FEEDERS WILL NOT BE ACCEPTED

**Figure 13 – Intercom Speaker Configurations Detail “Typical”**
1.03 CABLING, RACEWAY AND CABLE SUPPORT SYSTEMS:

A. All communications outlet locations shall have four (4) blue jacketed Category Six data cables, unless otherwise noted by design, installed from each workstation to the local MDF or IDF Space within the 295’ distance limitation. Each MDF and IDF Space shall provide a controlled space for cross connection and patching of the communications data infrastructure to the incoming backbone data infrastructure provided from the Campus MDF Space. Communications data backbone infrastructure cabling shall consist of a minimum of one (1) twenty-four (24) strand multi-mode 50/125 fiber optic backbone cable and a minimum of one (1) twelve (12) strand single-mode fiber optic backbone cable unless otherwise noted by design installed from the Campus MDF Space to each IDF Space.

B. Interior building raceways installed from the MDF and IDF Spaces supporting Category Six data cabling, intercom, telephone, intrusion detection and video surveillance security, smart board and other projector VGA, USB, RCA cables and all other technology cable runs shall be installed in individual separate cable runs throughout each entire installed run from end to end with no exceptions.

C. All analog and digital technology cables of any type installed in PLENUM Air spaces shall be PLENUM CABLES and shall be readily identifiable on all cable jackets as PLENUM cable. It shall be the responsibility of all architects, engineers, general contractors and technology contractors to identify the proper riser or plenum air space and provide and install the appropriate cable for all installations and circumstances. Evidence of improper type cable installation shall be replaced by the contractor at no expense to SDOC. Change order or additional work and material requests of this nature are not acceptable and shall not be approved. All infractions and corrective work of this nature shall be accomplished by the contractor for expected installation completion and shall not impede the scheduled substantial completion for any project.

D. All contractors shall provide and install their own separate grid hangars painted with blue paint and “J” hook supports which shall be installed every five (5) feet with Velcro wraps at all “J” Hook locations and in addition all cable runs with two or more cables in a bundle shall be Velcro wrapped every two (2) feet.

E. All Category 6 and all other technology systems cables installed inclusive of patch cords shall be supported above ceiling using “J” hooks or other SDOC ITSD approved support devices “ONLY”. Cable ties are not an SDOC ITSD approved support device and neither is stand-alone Velcro without installation of “J” hooks. Each technology system shall be separated from the other systems able runs at all points to avoid any potential electronic interference or crossover. No two technology systems cables shall be mixed or installed in shared pathways with no exception. See Figure 14 - “J” - Hook Detail “Typical” below for information on interior pathway support systems for technology installations.

F. No technology cabling for any system shall be cable or Velcro tied or secure in any manner to any sleeving or stubout at any point. Further all cables installed in all “J” hook support systems and at all sleeving and stub outs shall be installed with a smooth transition into all sleeving and stub outs in order not to stress the cable installation in any manner. SDOC ITSD Technology Systems Construction
Project Managers shall retain final authority for decision to require all technology contractors to rework any run determined by SDOC Technology Project Managers not to be in compliance with SDOC standards and specifications.

G. Existing “J” hook systems currently populated with Category 6 or for that matter all other existing technology systems cable runs may be utilized to support additional new like cable runs if in the vicinity providing proper “J” hook fill capacities are observed and not exceeded. Consult SDOC ITSD Technology Systems Construction Project Managers for final approval as they will have final say in this matter. Improper installation and resultant overfill could result in additional corrective costs which shall be the sole responsibility of the contractor where SDOC ITSD Technology Systems Construction Project Managers determine in fact that the run is not acceptable and approved for installation of additional cables which would result in removal of the new cables, installation of additional supports, reroute of the new cables and restoration of the existing cable run to like new and compliant condition where required. For new cable runs bundled with existing cable runs the completed cable run shall be installed restoring the finished existing cable run to like new condition to present a neat uniform and acceptable Division 27 compliant installation.

Figure 14 - “J” - Hook Detail “Typical”
H. SLEEVING:

1. Contractors shall provide and install technology cable sleeving at any and all locations where installed technology systems cabling will penetrate any existing wall. This is regardless of the fire or smoke rating or lack of fire or smoke rating of any particular wall. The electrical contractor shall provide UL approved through-penetration firestop systems and through-penetration firestop devices, sealants and related products for all fire-rated or smoke rated floor or wall penetrations. All fire or smoke rated floor or wall penetrations shall maintain the integrity of the floor or wall assembly. Refer to SDOC Division 27 Appendix “G” for specific firestop penetration information.

2. In no circumstance shall any SDOC installed technology systems cabling transition through any wall through an existing hole whether cut or punched through without passing through SDOC approved contractor provided and installed sleeving. Instances where pre-existing installation practices would indicate otherwise shall be disregarded for new installations regardless of any pre-existing condition indicating the contrary. Installed sleeving shall be of appropriate size to accommodate a minimum 25% increase in cable fill.

3. No contractor shall utilize any pre-existing installed sleeve or conduit with or without other technology cables installed without prior written permission from SDOC ITSD Technology Constructor Project Manager or authorized representative. Failure to comply shall result in removal of all installed cables at the sole expense of the contractor. Upon SDOC ITSD inspection if it is determined that damage has been sustained by pulling new cables over existing original cables by “burning” over top of these cables or other damage these cables shall be replaced by SDOC approved technology contractors at the sole expense of the contractor causing the damages.

4. Electrical contractors shall install SDOC specified and identified sleeving as designed. It is the responsibility of the project engineer to insure appropriate sleeving of adequate size and quantities is designed and included for all technology systems and identified on all conformed plans. Wall penetrations shall be cut or drilled for all sleeving. The penetration hole shall be no more than of sufficient size to install the selected sleeve. All penetration holes shall be clean and neat cut or drilled with appropriate sized hole saws, core bore tools or other appropriate equipment. Penetrations shall not be screw driver or knife penetrations or made with a hammer under any circumstance.

5. The contractor shall remove all construction debris including all dust and small particles of debris both above and below ceiling immediately upon completion of work in the applicable location.

6. Sleeving for any SDOC technology installation shall only be SDOC approved manufactured sleeving intended for use as sleeves. The contractor shall not manufacture their own sleeves of salvaged or other materials not SDOC approved and not specifically intended for use as sleeves. The electrical contractor shall adequately support both sides of each sleeve with support plating provided with the sleeve kit from the manufacturer for that sleeve. Penetrations for all sleeving shall be sealed and fire-stopped with UL approved fire-rated caulk around the exterior of all installed sleeves and stub ups when installation is complete.
7. Upon completion of cabling installation the electrical contractor shall install a UL approved removable fire rated fire stopping material to seal the interior cavities of each and all sleeves installed. Conformed plans shall indicate the recommended minimum size and location of all sleeving. It is the responsibility of the project engineer, technology systems contractor and electrical contractor to coordinate the final size, location and quantity of sleeving. All conduit stub outs and sleeving shall be provided with SDOC approved couplers and or bushings. Sleeving installations shall be to the satisfaction of the SDOC TS Department Construction Project Managers or approved representatives. See Figure 15 - Sleeve Detail “Typical”

![Figure 15 - Sleeve Detail “Typical”](image)

I. The project engineer, general contractor, electrical contractor and or technology systems contractor as site applicable shall provide EMT conduit, sleeving and all connection back boxes as design specified for all intercom, video surveillance, burglar detection and all other field device cables from each head end location to each device location to include drilling of door frames and core drilling of exterior or other walls for the installation of field devices to include flush mount door contacts, exterior cameras and exterior speakers or other design specified devices. Minimum size of EMT conduit for all stub out locations shall be no less than 3/4” inch EMT conduit unless otherwise specified with bushings provided for all stub out locations. It is the responsibility of project engineer, general contractor, electrical contractor and or technology systems contractor as site applicable to coordinate the final size, location and quantity of stub outs with the SDOC TS Department Technology Construction Project Manager.
J. For retrofit and renovation installation surface mount conduit and box penetration assemblies are acceptable. For new construction installation only recessed boxes and conduit with cover flush to exterior are acceptable. The portion of the sleeve to the box at the exterior shall be attached / coupled to either a single or double gang junction box. Exterior surface mount boxes shall be installed and secured with SDOC approved fasteners to the surface of the building exterior wall. The interior portion of all sleeves shall extend beyond the finished surface of the interior wall a minimum of six inches and shall have an EMT clamp of appropriate size to secure the sleeve at the wall and an SDOC approved coupler or bushing installed on the end. All exterior and interior wall penetrations shall be sealed around the surface portion on each sleeve end. Upon completion of cable installation the interior of each sleeve shall be packed with a removable SDOC approved fire retardant material. The SDOC TS Department Technology Representatives shall approve all technology systems conduit and sleeve placements. All exterior conduit connections and back boxes shall be weatherproof. All conduits and back boxes surface mounted on the exterior of any building shall be painted to match the existing building painted surface or trim. All cable runs shall be properly supported with SDOC approved devices as directed in SDOC Specifications and Standards. Refer to Figure 15A of this section for routine exterior camera cabling sleeves and flush in-wall box and cover installation specifics. Refer to Section 27_04_00 Wireless Access Point Systems and Section 27_08_00 Intercom Systems figure details for exterior installation of sleeve and box assemblies specific to these systems.
NOTE:
AT DUAL CAMERA DROP LOCATIONS IT IS REQUIRED THAT TWO OF THESE ASSEMBLIES BE INSTALLED SIDE BY SIDE.

EXTERIOR / OUTDOOR VIDEO SURVEILLANCE LOCATION IMPORTANT NOTE:

ALL BACK BOXES SHALL BE INSTALLED SQUARE WITH THE BUILDING ARCHITECTURE.

THERE IS NO MEANS OF ADJUSTMENT ON THE FACEPLATES TO COMPENSATE FOR BACKBOXES INSTALLED OUT OF SQUARE.

CORRECTION OF BOXES OUT OF SQUARE SHALL BE THE SOLE RESPONSIBILITY OF THE GENERAL CONTRACTOR.

EXTerior / OUTDOOR VIDEO SURVEILLANCE BOX LOCATION DETAIL “TYPICAL”
K. For all SDOC MDF and IDF Spaces specified ladder rack shall be installed above the technology systems equipment racks and shall extend around the interior perimeter of each MDF and IDF space attaching to the installed VDBB. The technology systems equipment racks shall have installed ladder rack from the top of each separate rack extending to the finished surface of the VDBB and shall be attached to the top of the free standing rack and the VDBB with manufacture approved hardware only. All ladder rack shall be attached to the surface of the VDBB using SDOC approved fastening devices. All SDOC MDF and IDF Spaces shall be designed with adequate EMT sleeving installed at designated locations in each space to allow a clean transition of cabling to and from the ceiling space. There shall be sufficient size and quantity of sleev ing designed to support current cabling requirements as well as reasonable future expansion. All sleeving shall be installed with strong, sturdy safe supports and sleeving shall be grounded as required.

L. All contractors shall provide “only” SDOC specified horizontal wire management devices for all MDF and IDF Space equipment racks and cabinets. Install wire management devices between each patch panel, fiber optic inter-connect center, proposed hub, switch and router. Horizontal wire management devices shall be installed beginning at the top of each rack and cabinet. For each technology installation all contractors shall provide three (3) additional horizontal wire management devices for each rack and cabinet installed. Install all horizontal wire management devices provided in the racks. Consult SDOC MTS Department Technology Construction Project Manager for placement of additional wire management.

M. All contractors shall provide “only” SDOC specified vertical wire management devices on each side of all freestanding technology equipment racks. As an example One (1) technology equipment rack shall have (2) two vertical wire management devices and two (2) technology equipment racks shall have (3) three vertical wire management devices installed. All contractors are to insure that there are adequate RMU screws provided for all SDOC installation needs and that all RMU screws provided with the racks and management are delivered with the installed free standing technology equipment racks.

N. All contractors shall provide adequate cable tray, cable guides, “D” Rings, J-hooks, posts, wire management devices, sleeves and other supports as specified to provide neat, clean, safe and professional cable installations for all technology systems. Velcro wraps are the SDOC specified primary means of securing horizontal cabling. Cable ties are not acceptable unless otherwise specified by SDOC MTS Department Technology Systems Construction Project Managers or approved representatives.

O. ABOVE CEILING SUPPORTS, CEILING TILES AND DAMAGES:

1. As a general note for all existing sites and new construction technology projects in the event of damage to ceiling tiles during any technology installation it is the responsibility of the general contractor, electrical contractor and or technology contractor as applicable to obtain and replace any damaged ceiling tile(s). At existing installations (not of a new construction nature) within reason damaged tiles can possibly be obtained from the SDOC Maintenance Department. Notify the SDOC MTS Department Technology Construction Project Manager of any issue and arrangements shall be
made to obtain and provide a replacement tile for installation by the identified contractor if available.

2. However, in the event there are no tiles available or if damaged tiles are of a special type not readily supported it shall in all instances be the responsibility of contractor to procure and replace all damaged tiles. It is the contractor’s responsibility to replace all damaged ceiling tiles before final site inspection can be conducted.

3. All locations where ceiling penetrations are made through ceiling tiles for all systems projects each penetration shall be a clean neat cut, notched and neatly fit to seat around the sleeve or other hardware installed.

4. In no instance is breaking or chipping of tiles an acceptable method for providing access of technology hardware installations from below to above ceiling.

5. Where speakers or other devices are contractor installed in a ceiling grid tile space the speaker or other device shall always be installed with an appropriate manufacturer recommended support bracket / device appropriately fastened to the ceiling grid.

6. It shall be the responsibility of the contractor to install additional ceiling grid hangar wire or other safety cables for added support at any location where new speakers or devices are installed to the satisfaction of the SDOC MTS Department Construction Project Manager.

7. For all existing sites and new construction technology projects in the event of damage to the furniture, fixtures, equipment, personal items and all interior surfaces in the form of scuffs, gouges or other issues identified as nonexistent prior to construction it shall be the responsibility of the contractor to repair all damages to the satisfaction of SDOC.

P. CLEANLINESS AND SAFETY:

1. At all SDOC Technology construction sites it is the responsibility of all contractors, both technology systems and electrical to insure the environment of the work site at both the interior and exterior locations is maintained in a clean, orderly and safe manner on a daily basis.

2. No unsightly or unsafe conditions shall exist for more than the same day basis unless approved by SDOC ITSD Technology Construction Project Managers.

3. All ceiling tiles shall be closed on a daily basis.

4. The contractor shall remove all materials and construction debris both interior and exterior from the site upon completion of the daily installation.

5. Absolutely no unsafe condition such as open trenches, manholes or other hazards shall exist or be left unattended at any time during the work in progress and shall not remain open longer than the period of the day these hazards are being opened for work.

6. All hazards shall be closed and or filled at close of business on the same day the work occurred.
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Technology Standards and Specifications

7. In special circumstance where closing said trench or other hazard is not possible on that same day, it is the responsibility of the contractor to make the SDOC MTS Department Technology Construction Project Manager aware of the issue with ample advance notice to permit proper notification to school administration.

8. In all instances where this is necessary, it is the responsibility of the contractor to appropriately stake off, rope off and flag all effected hazardous areas with appropriate caution or danger tape to the satisfaction of the Technology Construction Project Manager prior to close of business that same day.

1.04 TECHNOLOGY BACKBONE CONDUIT, VAULTS AND FLOOR BOXES:

A. New campus and other site new construction technology backbone conduit cabling pathway installations:

1. During the design phase, the project architect and engineer shall insure with the input of qualified SDOC technology representatives that SDOC approved adequate pathways shall be installed and available for all SDOC designated technology systems backbone cabling end to end from the MDF to all IDF locations and from all buildings to all new communications vaults and technology systems backbone conduit shall be designed and constructed with adequate head room for current and future expansion purposes with no exception.

2. Campus or other site new construction technology backbone conduit systems between the building housing the MDF Space and outer buildings housing IDF Spaces shall consist of SDOC MTS Department required conduit quantities consisting of four (4) inch conduits designed to accommodate the installation of all current technology backbone cabling with additional conduits installed for reasonable growth and expansion of a minimum 25% additional same sized conduit.

3. The project architect and engineer shall design with input from designated and qualified SDOC Technology Representatives and the project general contractor shall provide and install SDOC designated minimum two (2) four inch conduits for the installation of technology systems backbone cabling “ONLY” (and no other trade cabling such as HVAC or Fire Alarm cabling) homerun from each new SDOC designated building IDF location to the SDOC designated MDF location through a network of SDOC specified traffic rated communications vaults with spring loaded steel lids strategically placed where SDOC approved about the exterior of the campus buildings at not more than two hundred feet distance between vaults.

4. All SDOC designated and specified traffic rated communications vaults shall be installed with heavy duty technology cable supports to dress and support all technology systems backbone cable installed. No technology systems cabling shall be permitted to lay unsupported in the floor of any communications vaults with no exception. There shall be no other trade related cabling such as HVAC or Fire Alarm cabling installed in SDOC designated technology systems backbone conduits or traffic rated technology communications vaults.
5. All newly installed SDOC designated technology systems backbone four inch conduits shall be installed with three 11/4 inch innerducts in each new four inch conduit. Each 11/4 inch innerduct that is vacant shall be installed complete with pull string and shall be plugged with appropriate innerduct plugs. Any and all “spare” / vacant conduits (not just four inch conduits but all vacant conduits in every IDF and MDF space) shall be verified open and unobstructed end to end, provided and installed with mule tape or pull string as appropriate and shall be provided and installed on each and all ends especially in all IDF and MDF spaces interior with UL approved HILTI Brand Fire Stopping Plugs CFS-PL 4 and or of the appropriate width (or SDOC approved equal) for each SDOC designated technology systems backbone conduit. Further each conduit shall by the general contractor, electrical contractor and technology contractor be sealed around the conduit opening at all locations with UL approved fire and smoke rated fill materials by general contractor provided and verified certified minimum level 1 fire stopping sealant installation technicians to prevent potential future intrusion of water, gasses, insects and rodents to interior communications space locations. All conduit ends shall be bushed and shall be marked with permanent tags denoting all far end locations.

6. All newly installed SDOC designated technology systems backbone four inch conduits shall be installed from all new SDOC designated building IDF locations to SDOC designated new spring loaded steel lid communications vault locations with matching pairs of conduits throughout ultimately to the MDF closet location.

7. For all multilevel buildings each floor shall be designed and installed with its own SDOC designated separate and individual complete and functional SDOC designated IDF communications closet IAW SDOC Division 27 Technology Standards and Specifications which shall be installed with SDOC designated minimum two (2) four inch sleeves between floors for the installation of separate homerun installations of backbone technology cabling from the SDOC designated MDF to each SDOC designated IDF communications closet installed on each floor of each building. Separate sleeving shall be installed for all SDOC designated telecommunications ground bus bar tie cabling which shall also be individually grounded IAW NEC Requirements.

8. All four (4) inch conduits shall be installed with three (3) 1-1/4” inch inner-ducts unless otherwise noted by design. Additional four (4) inch, three (3) inch and two (2) inch technology conduits shall also be installed as designed for adequate delivery of all the technology systems backbone cabling current and future.

9. At all new construction, existing campus and other existing district sites all new building construction shall be engineered to include minimum two (2) four inch conduits for technology cabling installation to each new building IDF and each new four inch conduit shall be installed with three (3) 1-1/4” inch inner-ducts from the new construction IDF to the MDF which shall be provided and installed by the general contractor, electrical contractor and technology systems contractor.

10. All new construction shall include contractor provided and installed communication ground vaults designed with adequate SDOC specified communication ground vaults of quantities installed to insure not more than 200 foot distance between installed communication ground vaults is exceeded
and with SDOC specified numbers of four inch technology systems conduit and innerduct runs feeding from the MDF to all building IDF Spaces.

11. In the event there is no underground pathway installed at existing campus and other district sites for new building construction a new pathway shall be engineered and designed by the project architect and project engineer and provided and installed by the general contractor, electrical contractor and technology systems contractor inclusive of new four inch conduits installed with three (3) new 1-1/4" inch inner-ducts in each four inch conduit and a vault system that shall complete a pathway to the existing campus MDF to establish a minimum underground pathway on which to build a future underground technology system campus wide with a future planning event.

12. Where needed for a complete pathway between the new building(s) IDF locations to the existing campus MDF the project architect and project engineer shall engineer and design and the general contractor, electrical contractor and technology systems contractor shall provide and install four inch conduits and innerduct where needed by cutting the existing MDF slab and installing at the MDF a sufficient number of four inch conduits and innerduct to provide a complete pathway for the future underground requirements for all new building(s) being constructed as well as conduit for the future design of a complete campus underground conduit system to be designed with the thought in mind to provide all needed conduits at the existing campus MDF with a one (1) time only renovation of the MDF conduit system that will not have to be repeated at a later date.

13. At all existing campus and other district sites all new additions of any variety of technology systems backbone cabling shall be installed in 1-1/4" inch inner-ducts. In the instance where there are no innerducts installed the contracted general contractor, electrical contractor and technology systems contractor shall provide and install the required number of 1-1/4" inch inner-ducts. In the event the fill capacity of the existing conduit system is either blocked / obstructed, at maximum fill or would be exceeded by new additional backbone cabling installation or the addition of new innerduct thus precluding the installation of a new innerduct pathway the general contractor, electrical contractor and technology systems contractor shall in this event be required to provide and install a new conduit pathway of sufficient size and quantities of conduits and innerduct to provide 25% future expansion inclusive of the required number of 11/4 inch innerducts for each four inch conduit to permit all backbone cable projects to be installed in new innerduct.

14. All buried technology systems conduits shall be installed IAW NEC directives with no exception. SDOC buried conduit installation shall be minimum twenty-four (24) inches to top of conduit from finished grade and for all installations where technology conduit is installed with electrical conduit a minimum one (1) foot 360 degree separation distance shall be required from all electrical conduit in same trench.

15. For all engineered projects it is the responsibility of the project engineer to insure the SDOC specified conduit sizes and quantities are designed and included for all technology systems on all conformed plans. For all other projects it shall be the responsibility of the technology systems contractor contracted for each individual project.
16. It shall be the responsibility of the architect and project engineer to include on all SDOC conformed plans the design of a single Consolidated Technology Backbone Conduit Riser Detail identifying all backbone conduit pathways required by SDOC MTS Department for installation to include all conduit sizes and counts with all points of connection or stub out end to end for each conduit.

17. This Technology Backbone Conduit Riser Detail shall identify all MDF and IDF Space numbers and all building numbers and all floor and cabinet numbers, communications vaults, pull boxes, wall-mounted or free-standing pedestals and any other connection or stub out point.

18. All conduit ends at all connection and stub up points shall be permanently labeled to identify the far end (ultimate destination point) point of connection.

19. All Technology Backbone Conduit Riser Details shall be designed to SDOC satisfaction with no exception. See Figure 16 – Conduit Riser Example Detail “Typical” for amplifying information.

20. All stubbed out ends of each conduit shall be permanently labeled for far end locations. Provide sample of labeling to the Project Engineer and SDOC MTS Department Technology Construction Project Manager for approval.

21. The electrical contractor shall install all conduit and inner-duct. Each conduit and inner-duct shall also include installation of a heavy-duty “MULE TAPE” pull line. All unused and spare conduit and inner ducts shall be sealed with a cap or other SDOC approved device or substance.

22. **NOTE: FOR ALL NEW CONSTRUCTION BUILDING(S), EXISTING SITE NEW CONSTRUCTION BUILDING(S) AND ALL NEW INSTALLATIONS OF ALL FIBER OPTIC AND COPPER TECHNOLOGY SYSTEMS BACKBONE CABLING INSTALLATIONS BETWEEN EXISTING BUILDINGS INSTALLED BY THE CONTRACTED GENERAL CONTRACTOR, ELECTRICAL CONTRACTOR AND TECHNOLOGY SYSTEMS CONTRACTOR ALL FIBER OPTIC AND COPPER TECHNOLOGY SYSTEMS BACKBONE CABLING BETWEEN BUILDINGS SHALL BE PROVIDED AND INSTALLED IN CONTRACTOR PROVIDED AND INSTALLED CONDUIT AND INNERDUCT FOR MANAGEABILITY AS WELL AS PROTECTION.**

23. **ALL FIBER OPTIC TECHNOLOGY SYSTEMS BACKBONE CABLING INSTALLATIONS SHALL BE INSTALLED IN THE CONTRACTED GENERAL CONTRACTOR, ELECTRICAL CONTRACTOR AND TECHNOLOGY SYSTEMS CONTRACTOR PROVIDED AND INSTALLED IN INNERDUCT FROM THE CONDUIT SERVICE ENTRANCE INTO EACH BUILDING FOR THE ENTIRE RUN THROUGH THE OVERHEAD / CEILING CAVITY TO THE INTERIOR OF EACH IDF AND MDF SPACE.**
24. **WHERE THE INNERDUCT(S) ENTER THE MDF AND EACH IDF SPACE THROUGH THE CEILING CAVITY IT SHALL ENTER THROUGH GENERAL CONTRACTOR, ELECTRICAL CONTRACTOR AND TECHNOLOGY SYSTEMS CONTRACTOR PROVIDED AND INSTALLED FOUR INCH CONDUIT SLEEVES.**

25. **Exposed outdoor conduit installations** are not an SDOC MTS Department sanctioned or approved option for technology pathway installation. However, in rare instances “ONLY” it may be necessary to utilize this method of conduit pathway installation. If no other alternative is available this method may be utilized only upon approval of the SDOC TS Department Technology Construction Project Managers.

26. Where installed exposed conduit outdoors and not direct buried shall follow and meet the codes of the **last ratified revision of NEC with no deviation or exception.**

27. Insure the applicable schedule and type of conduit appropriate for the project is installed for exposed conduit runs.

28. All contractor installed exposed conduit shall be supported with SDOC approved pipe straps and fastening hardware and shall be strapped at a minimum distance at every five (5) feet throughout the entirety of each run. For short runs of ten feet or less this conduit shall have a minimum three straps installed at both exposed ends and in the middle section of the conduit run.

29. In addition, six (6) inch expansion fittings shall be properly installed for all exposed conduit runs and 2" and 4" expansion fittings shall be properly installed between junction boxes and conduit termination points. All SDOC surface mount conduit installations shall be supported to SDOC satisfaction with no exception.

30. No penetrations in existing covered walkways or roof structures are acceptable or SDOC approved.

31. All engineers and contractors shall ensure all exposed conduit installations are in strict compliance with all directives of NEC, BICSI specifications, the manufacturer’s installation procedures and all other applicable codes and standards and that the installation is to the complete satisfaction of SDOC MTS Department Technology Representatives.
B. Industry standard communications ground vaults, manholes, pull boxes and pedestals:

1. These vaults and enclosures shall be installed, sized and placed accordingly as designed. Installation shall be in full compliance with all industry and manufacturer guidelines for traffic rating, sizing and placement.

2. All new construction contractor installed communication ground vaults, manhole and pull box installations shall be site designed with adequate quantities installed to insure not more than 200 foot distance between installed boxes and conduit runs feeding all MDF and IDF Spaces.

3. Adequate support as SDOC directed shall be installed around the interior radius of each ground vault, manhole and pull box enclosure.
4. All new construction and renovation contractor installed communications ground vaults and manholes shall have a minimum twenty-four (24) inch gravel aggregate base installed for drainage with no exception.

5. All new construction and renovation contractor installed and SDOC MTS Department contractor installed communications pull boxes shall have a minimum six inch gravel aggregate base installed for drainage with no exception.

6. It is the responsibility of the project engineer to insure appropriate ground vaults, manholes and pull boxes of proper type, adequate size and quantities are designed and included for all technology systems on all conformed plans. See Figure 27 - Ground Vault / Manhole Installation Detail “Typical” for amplifying information.

7. Proper bend radius shall be adhered to when installing conduit sweeps for installations of fiber optic cabling. No more than two (2) sweeps or 90-degree bends shall be installed between pull points or ground vaults, manhole and pull boxes with no exception. It is the responsibility of the project engineer to insure compliance of these requirements for all conformed plans.

8. Outside Plant Service Providers include but are not limited to the following services: Cable Television Services, Network Services, Telephone Services and other providers as necessary.

9. Conduit requirements for street access from these and all other outside service entities to the MDF Space shall be a minimum three (3) four (4) inch conduits installed from the MDF Space to the street location at the campus or district building property line transiting through a minimum of one installed ground vault with twenty-four (24) inch aggregate gravel base with additional vaults installed as needed dependent upon site distance limitations. See Figure 17 - Ground Vault / Manhole Installation Detail “Typical” for amplifying information.

10. DESIGN AND ENGINEERING NOTE: All Fire Alarm plan design shall be on separate plan design sheets and detail pages in all aspects from technology systems cabling installation plan design sheets and detail pages. All Fire Alarm cabling and devices shall be installed in a complete and separate conduit and pull box system.

11. FIRE ALARM SYSTEMS NOTE OF PARTICULAR IMPORTANCE:

   a. Fire Alarm Systems backbone cables and conduit specifications by virtue of their critical functionality are specialty items not part of routine Technology Systems cabling in functionality.

   b. Fire Alarm Systems specialty cabling, conduits and pathway requirements and specifications are defined and detailed by residential expertise located in both the SDOC Fire Alarm Division of the SDOC Maintenance Department and SDOC Code Compliance or others as assigned, not by the Information and Technology Services Department.
c. **Fire Alarm Systems** are installed and maintained with differing specialty parameters and operational functionality critical to the safety and well-being of building occupants and as such require a complete and separate isolated pathway separate to the exposure of routine operations performed in and around standard technology systems cabling.

d. **Fire Alarm Systems** by virtue of their critical specialty functionality shall be installed in complete separate and isolated fire alarm systems “QUAZITE” or other pull boxes as specified by others with specialty conduit pathways which are not and shall not be designed to comingle and remain in contact with any portion of standard technology systems conduit, technology systems vaults, technology systems pathways or technology systems supports outdoor or indoor with no exception.

e. Due the critical specialty operability required of **Fire Alarm Systems** installation in rugged environments of prolonged exposure could cause potential future damage when exposed to routine day to day trafficking that can occur during technology maintenance and cabling installations regarding standard technology systems cabling and conduit systems. Such environments are not conducive to prolonged specialty reliability and operability and as such a separated and isolated installation pathway for **Fire Alarm Systems** is required.

f. Fire Alarm cabling and termination points shall be separated from all other technology cabling systems.

g. Instances may occur where by exception only due to unavoidable necessity there is a need for fire alarm cabling to share the same communications manhole with other technology communication cabling.

h. In these rare exceptions all Fire Alarm System feeder cabling shall be installed in corrugated, flexible, non-metallic conduit where transiting within the shared ground vault or manhole.

i. Absolutely no fire alarm conductors shall be permitted to be exposed at any point in the interior of the shared ground vault, manhole or other enclosures with no exception.

j. It is the responsibility of the contractor to ensure only the installation of approved and appropriate connectors to fasten and terminate this conduit run within the confines of the manhole shall be provided and installed as design exception directs.

k. It is the responsibility of the project engineer to ensure appropriate measures are taken during the design process to ensure that both systems are designed separately.
1. However, when these exceptions are noted and occur it is the responsibility of the project engineer to ensure that both systems are designed appropriately in complete compliance with all parameters regarding this exception in the eventuality that this unfortunate event occurs.

**Figure 17 - Ground Vault / Manhole Installation Detail “Typical”**

**November Notes:**

1. ANSI/SCET7.7 TIER 15 RATED
2. LID MUST HAVE “COMMUNICATIONS” LOGO AND STAINLESS STEEL BOLTS FOR SECURITY.
3. STEEL LID
4. 2" GRAVEL BASE
5. OPEN BOTTOM
6. CABLE RACKING ON TWO (2) SIDE WALLS
7. ALL CONDUITS SHALL BE PLACED WITH A MINIMUM 30" CLEAR COVER.

**Utility Vault Notes:**

1. ANSI/SCET7.7 TIER 15 RATED
2. LID MUST HAVE “COMMUNICATIONS” LOGO AND STAINLESS STEEL BOLTS FOR SECURITY.
3. STEEL LID • “SPRING HINGED FOR EASE OF OPENING”.
4. 2" GRAVEL BASE
5. OPEN BOTTOM
6. CABLE RACKING ON TWO (2) SIDE WALLS
7. ALL CONDUITS SHALL BE PLACED WITH A MINIMUM 30" CLEAR COVER.

**Vault Design Notes:**

1. DESIGN PULLBOX IN ACCORDANCE WITH ACI 318, AASHTO, & ASTM G57
2. DESIGN CONCRETE STRUCTURE AND STEEL COVER FOR HORIZONTAL LOADING
3. USE CONCRETE HAVING 5000 PSI COMPRESSION RATING IN 28 DAYS
4. USE ASTM A-615 REINFORCING STEEL WITH 60,000 PSI YIELD STRENGTH
5. PLACE HANDHELD ON 8" MIN. GRAVEL BASE
6. MIN. EXCAVATION 8" x 8" x 8" x 8" DEPTH
7. PROVIDE PULL EYES ON WALLS ALL DUCT ENTRIES
8. PROVIDE INSERTS FOR TWO CABLE RACKS ON EACH WALL LOCATE INSERTS TO CLEAR DUCT ENTRIES

**Figure 17 - Ground Vault / Pull Box Installation Detail “Typical”**
C. **Floor Box installations:**

1. Floor Box installations shall be designed and installed for all required locations inclusive of various computer labs, multi-purpose spaces, Information Center locations and other areas by designed. All installed floor boxes shall be Walkerbox Fully Adjustable Floor Box (RESOURCE RFB Multiservice Shallow Steel Recessed Floor Box, Part #RFB4 or RFB4-CI-1 as required) or SDOC approved equal “ONLY”. Note that the cast Iron box may be required site dependent in instances where floor box installations are placed under the slab and not in the slab. See **Figure 18 - Floor Box Detail “Typical”.**

   a. **Cast Iron Floor Box Configuration-**

   Floor Box  
   P/N# RFB4-CI-1  
   This box is complete with two (2) brackets for two (2) duplex power receptacles.

   Communications Bracket- requiring an order of one (1) four port bracket for each box (design dependent)  
   P/N# CILT-2-RT  
   Blank- requiring an order of two (2) for each box  
   P/N# CIH/LT-B

   Aluminum Cover w/flange for installation for VCT- requiring an order of one (1) for each box  
   P/N# S36BBTCAL

   b. **Steel Floor Box Configuration-**

   Floor Box-  
   P/N# RFB4  
   This box is complete with two (2) brackets for two (2) duplex power receptacles.

   Communication Bracket- requiring an order of one (1) four port bracket for each box (design dependent)  
   P/N# DTB-2-2RT

   Blank- Requiring an order of one (1) for each box. This one will cover the extra power receptacle location.  
   P/N# RFB-B

   Blank- Requiring an order of one (1) for each box. This one will cover the extra communications receptacle location.  
   P/N# DTB-2-2-TKO Do not remove knockouts when used as a blank.
Aluminum Cover with flange for installation with VCT- Requiring an order of one (1) for each box. P/N# S36BBTCAL

Figure 18 - Floor Box Detail “Typical”

2. Technology Communications conduits for all floor box installations shall be home run to all stub out locations. Looping of conduits between floor boxes shall not be acceptable with no exception.

3. All floor box technology communications conduits shall be minimum one (1) inch in diameter from all floor box locations to each stub out.
1.05 TRANSITION POINT CABINETS:

A. Floor Box Transition Point Cabinets:

1. It is mandatory that all contractors shall install Outdoor rated or "Flooded" GEL Filled Category Six data cabling in all below slab floor box conduits and all other Category Six data cable installations where conduits are installed below slab and at all other below ground installations.

2. Outdoor rated or "Flooded" GEL Filled Category Six data cables contain water repellant GEL to prevent damage that water seepage can cause. Therefore, "Flooded" GEL Filled Category Six data cables shall be installed to increase the lifespan of Category Six data cable at floor box locations and all other Category Six data cable installations where conduits are installed below slab and at all other below ground installations.

3. SDOC ITSD has determined that it is not acceptable to terminate any "Flooded" GEL Filled Category Six data cables installed in the MDF and IDF locations directly to the voice and data patch panels even when this cable will reach the patch panel location for termination. Due to daily climate expansion and contraction "Flooded" GEL Filled Category Six data cables tend to leak the flooded water repellant GEL installed. To prevent GEL leakage (regardless of properties of conductivity) onto sensitive technology electronics installed at these locations these "Flooded" GEL Filled cables shall always be stopped and terminated for floor boxes at the stub out location and for other below slab and other underground runs shall be stopped and terminated where the cables surface at both ends of any conduit in which they are installed. To transition this outdoor "Flooded" GEL Filled cable from each floor box and other conduit stub out location to indoor rated Category Six cabling Transition Point Cabinets shall be installed.

4. The "Flooded" GEL Filled Category Six cabling from floor box and other conduit stub out locations shall be terminated within ten (10) feet of the floor box stub out and other conduit stub out locations where it shall be properly transitioned from "Flooded" GEL Filled Category Six data cabling to indoor rated Category Six data cabling in the installed Transition Point Cabinet.

5. The Transition Point Cabinet shall be a NEMA 1 HOFFMAN CONSOLIDATION POINT CABINET ENCLOSURE Part Number AHE12x12x6 or SDOC ITSD approved equivalent “ONLY”. A suitable SDOC ITSD Substitute is perfectly acceptable based on quality of the substitute. However, the SDOC specified dimensions at 12 X 12 X 6 will need to match as a minimum where maintenance at the cabinet can be performed.

6. The Transition Point Cabinet does not need to be lockable but a hinged and latched door is preferred to prevent loss of screws and or the box cover. A cut sheet on the proposed substitute product shall be submitted to SDOC ITSD for approval for each new project.
7. Installation of the Transition Point Cabinet Enclosure shall be where the hinged cover will drop and stay open at the bottom of the enclosure. This will allow for more convenient maintenance. All enclosures shall have couplers installed for smooth transition of incoming and outgoing cables. The Transition Point Cabinet Enclosure location shall be labeled on the ceiling grid below ceiling in a visible area near each cabinet and all floor box locations shall be indicated with the label “TP” indicating transition point cabinet location.

8. All "Flooded" GEL Filled Category Six data cables and all indoor rated Category Six data cables shall be labeled with permanent typewritten labels on the outside of the enclosure within twenty-four inches of the cabinet and on the 110 block covers on the interior of the enclosure for ease of identification indicating the Patch Panel Port Number associated with each cable. This shall mean there will be a matching of one "Flooded" Category Six data cable and one indoor rated Category Six data cable labeled with the same Patch Panel Port Number for all cables installed, terminated, tested and labeled in each applicable Transition Point Cabinet location.

9. Each Transition Point Cabinet shall be installed with a fifty pair Category Six 110 Block which will provide the capability of terminating up to twelve (12) Category Six data cables at each location.

10. All "Flooded" Category Six data cable cables shall be terminated in Transition Point Cabinets at all conduit stub out locations and then continued with mated indoor rated Category Six data cables installed to each local MDF or IDF Space ultimately terminating at rack mounted data patch panels and on the field end where applicable for installations other than floor box locations to wall outlet data connectors in those data outlet locations.

11. For manufacturer warranty purposes all Category Six 110 Blocks and data cabling shall be of the same selected manufacturer as the Category Six infrastructure solution being installed for the site.

12. All Category Six data cabling installed at all floor box and all wall outlet data connectors in other data outlet locations shall be tested and pass certification from the MDF and all IDF voice and data patch panels to the Category Six RJ45 Jack ends with no exception. These data cable installations shall be subject to the same rigorous installation standards and inspections as any other Category Six installation. Test results shall be provided in written and electronic format for owner’s retention.

13. All Category Six data cable installation in all floor box locations and all other data outlet locations shall be labeled on each cable at all points of termination with typewritten labeling throughout the entire path.

14. It shall be the responsibility of the project engineer to insure the appropriate floor box and cabling is specified for installation by design.
15. It shall be the responsibility of the project engineer to insure both the "Flooded" GEL Filled Category Six data cables and all indoor rated Category Six data cables installed are of the appropriate PLENUM or RISER rating required for all locations specific to the installation by design.

B. Wireless Access Point “WAP” Transition Point Cabinets:

1. Unless otherwise noted an SDOC ITSD Technician or SDOC ITSD contracted company shall provide, install and test all physical electronic AP Units.

2. At the time of the actual physical electronic AP Unit installation either SDOC ITSD Technicians or an SDOC ITSD contracted company shall provide, install and test the cabling from the WAP Transition Point Cabinet to each designated physical electronic AP Unit location.

3. Wireless Access Point “WAP” Transition Point Cabinet cables and "WAP" Single Drop cables shall be Category Six Data cable which shall be Blue Jacketed Category 6 Unshielded, Twisted Pair (UTP), 24 AWG, 4 pair cables.

4. WAP cables shall be installed site specific at select designated locations on the interior of each campus building and each floor in each campus building as design dictates. For SDOC Technology plan design purposes WAP Transition Point Cabinet cable counts and locations shall be determined by the SDOC ITSD Wireless Access Point Area Supervisor.

5. All WAP Category Six cable installations when installed shall be within the 295’ distance limitation with no exception.

6. To eliminate guess work that occurs with single drop WAP installations regarding inadequate cable quantities and single "WAP" drop installations at locations not at appropriate locations WAP Transition Point Cabinets shall be installed with multiple WAP cables for adequate wireless access system AP coverage to accommodate varying needs.

7. The WAP Transition Point Cabinet shall be a NEMA 1 HOFFMAN CONSOLIDATION POINT CABINET ENCLOSURE Part Number AHE12x12x6 or SDOC ITSD approved equivalent “ONLY”. A suitable SDOC ITSD Substitute is perfectly acceptable based on the quality of the substitute. However, the SDOC specified dimensions at 12 X 12 X 6 will need to match as a minimum where maintenance at the cabinet can be performed.

8. The WAP Transition Point Cabinet does not need to be lockable but a hinged and latched door is preferred to prevent loss of screws and or the box cover. A cut sheet on the proposed substitute product shall be submitted to SDOC ITSD for approval for each new project.
9. Installation of the WAP Transition Point Cabinet Enclosure shall be where the hinged cover will drop and stay open at the bottom of the enclosure. This will allow for more convenient maintenance. All enclosures shall have couplers installed for smooth transition of incoming and outgoing cables.

10. The WAP Transition Point Cabinet Enclosure location shall be indicated as follows: the cabinet shall be labeled on the ceiling grid below ceiling in a visible area near each cabinet and all wireless access point cabinet locations shall be indicated with the label “WAP” indicating WAP Transition Point Cabinet location.

11. All Category Six data cables installed in WAP Transition Point Cabinet enclosures shall be labeled with permanent typewritten labels on the outside of the enclosure within twenty-four inches of the cabinet and on the Category Six 110 block covers on the interior of the enclosure for ease of identification.

12. Each WAP Transition Point Cabinet shall be installed with a fifty pair Category Six 110 Block which will provide the capability to install and terminate up to twelve (12) Category Six data cables.

13. For manufacturer warranty purposes all Category Six 110 Blocks and data cabling shall be of the same selected manufacturer as the Category Six infrastructure solution being installed for the site.

14. All Category Six data cabling installed shall be tested and pass certification from the MDF and all IDF voice and data patch panels to the Category Six RJ45 Jack ends with no exception. These data cable installations shall be subject to the same rigorous installation standards and inspections as any other Category Six installation. Test results shall be provided in written and electronic format for owner’s retention.

15. All Category Six data cabling shall be labeled on each cable at all points of termination with typewritten labeling throughout the entire path.

16. It is the responsibility of the project engineer to insure the appropriate cabling is specified for installation by design.

17. It shall be the responsibility of the project engineer to insure all Category Six data cables installed are of the appropriate PLENUM or RISER rating required for all locations specific to the installation by design.
C. Transition Point Cabinet symbol TPX and WAP TPX:

1. The Transition Point Cabinet symbol denoted on all technology plan detail sheets shall be TPX. The X on each plan location will be replaced with the number of Transition Point Cables for each Cabinet location. Examples: A Transition Point Cabinet with ten (10) cables to be installed shall be noted on the Technology Plan Sheet as TP10. A minimum ¾ inch permanent typewritten TP label shall be provided and installed by all technology contractors on the ceiling grid below ceiling at each exact location where these cabinets are placed to locate each above ceiling and on the exterior cover door of each Transition Point Cabinet for ease of identification.

2. The WAP Transition Point Cabinet symbol denoted on all technology plan detail sheets shall be WAP TPX. The X on each plan location will be replaced with the number of WAP Transition Point Cables for each Cabinet location. Examples: A WAP Transition Point Cabinet with ten (10) cables to be installed shall be noted on the Technology Plan Sheet as WAP TP10. A minimum ¾ inch permanent typewritten WAP label shall be provided and installed by all technology contractors on the ceiling grid below ceiling at each exact location where these cabinets are placed to locate each above ceiling and on the exterior cover door of each WAP Transition Point Cabinet for ease of identification.

1.06 TECHNOLOGY SYSTEMS MARQUEE SIGN REQUIREMENTS:

A. Contractor shall provide and install one (1) NEMA 4 Weatherproof Hinged Lockable Enclosure dimensions 12" X 14" X 7" complete with backboard installed interior at a suitable site location on the base of the Marquee sign.

B. Contractor shall provide and install one (1) #6 copper stranded green jacketed grounding cable in ½ PVC conduit installed to ground level coupled from the bottom of the NEMA 4 Weatherproof Enclosure.

C. Contractor shall provide and install one (1) general power duplex weather proof twenty amp receptacle installed in the interior bottom to left or right side in the NEMA 4 Weatherproof Enclosure.

D. Contractor shall provide and install one (1) dual port fiber block complete with two (2) SC fiber bulkheads installed in the interior top and to the top left or right side in the NEMA 4 Weatherproof Enclosure on the same side as the power receptacle is installed in the bottom of the enclosure. Contractor shall provide and install one (1) dual port fiber block complete with two (2) SC fiber bulkheads installed on the MDF voice and data backboard at an SDOC designated location. For manufacturer warranty purposes all fiber block and SC fiber bulkhead components installed shall be of the same selected manufacturer as the Category Six infrastructure solution being installed for the site.
E. Contractor shall locate and provide and install all items required to complete the marquee sign conduit connection for the homerun conduit from MDF in building to the installed NEMA 4 Weatherproof Enclosure at the marquee sign location and shall provide, install and attach via a weatherproof coupler at the bottom of the enclosure.

F. Contractor shall provide and install one (1) six strand multimode fiber optic cable from the MDF in the main building to the NEMA 4 Weatherproof Enclosure at the marquee sign location. For manufacturer warranty purposes all fiber optic cable and components installed shall be of the same selected specifications and manufacturer as the fiber optic infrastructure solution being installed for the site.

G. Contractor shall provide and install, terminate, test and label end to end two (2) SC multimode fiber optic connectors installed in the NEMA 4 Weatherproof Enclosure and at the MDF voice and data backboard locations and install the two fiber optic connectors to the two (2) SC fiber bulkheads installed in the dual port fiber block in the interior of the NEMA 4 Weatherproof Enclosure and at the MDF voice and data backboard dual port fiber block. Secure all strands and the cable at both ends. Utilize strain relief at both ends. Provide a five foot service slack at both ends. Fiber optic service slack at NEMA 4 Weatherproof Enclosure shall be neatly transitioned around the interior of the box and secured with Velcro. Fiber optic service slack at MDF voice and data backboard shall be neatly coiled in a two foot circle at the bottom of the dual port fiber block and secured with Velcro.

H. Contractor shall provide, install and support one (1) 3/4 inch flex conduit with weather proof couplers on both ends from the bottom of the NEMA 4 Weatherproof Enclosure to the RJ45 connection point location in the interior of the marquee sign. At the point of RJ45 connection at the interior of the marquee sign ensure the 3/4 inch flex conduit is secured with pipe straps every two feet to the point of RJ45 connection and secure the flex conduit with the end turned down with straps to prevent water intrusion.

I. Contractor shall provide and install one (1) Certified Category Six RJ45 patch cord Yellow in color “ONLY” in the 3/4 inch flex conduit end to end. Allow sufficient patch cord length to permit two (2) feet minimum slack at both the Weatherproof Enclosure interior and the point of RJ45 connection at the interior of the marquee sign for connections from a future SDOC provided and installed Information converter to be installed in the interior of the NEMA 4 Weatherproof Enclosure. After the installation of the Certified Category Six RJ45 patch cord seal the 3/4 inch flex conduit end at the RJ45 connection point location in the interior of the marquee sign with an SDOC approved waterproof sealant. Coil the two foot service slack at the RJ45 connection point location in the interior of the marquee sign and in the interior of the Weatherproof Enclosure with Velcro to insure it does not dangle.

J. Contractor shall remove / demo out any provided fiber optic and or copper CAT5 cable provided for installation with the marquee sign in observance of the fact that all SDOC data installations for all like locations shall be connected via SDOC approved fiber optic cable and not copper from the interior of all buildings to any exterior equipment and shall be installed to SDOC cable and component standards and specifications. Cable provided for installation may or may not be to SDOC standards and Specifications and therefore, shall be considered unusable where provided for installation by outside sources.
1.07 TECHNOLOGY SYSTEMS FIBER OPTIC, VOICE AND DATA CABLEING:

A. For all new construction fiber optic and copper technology systems backbone cable installations and for all new additions of fiber optic and copper technology systems backbone cables installed at existing campus and other sites all backbone cable shall be installed from the campus MDF to each campus IDF space in UL approved (Riser or Plenum Rated as installation situtional application specifics deem necessary) Corrugated Conduit Innerducts of sufficient quantities with regard to all fill applications. All new innerducts shall be provided and installed by the general contractor, electrical contractor and the technology systems contractor for each specific project under the construction budget.

B. Fiber optic backbone cables:

1. Fiber optic backbone cables designed for installation from the MDF to each IDF Space shall be FDDI grade, minimum one (1) multi-mode OM-4 50/125 micron tight buffered cable rated for indoor/outdoor installation with a minimum 24-strands color coded and minimum One (1) single-mode OS-2 8.3/125 micron tight buffered cable with a minimum twelve (12) strands color-coded. Exact cable quantities and strand counts with sufficient cables and strand counts for minimum 25% growth and expansion shall be determined during design phase of all projects by the project engineer based on inputs of SDOC MTS Department Authorized Representatives. Cable manufacturer shall be Corning Cable Systems or SDOC approved equal only. Refer to conformed plan documents for exact fiber optic cable installation quantities and increased strand counts. Exact cable strand counts with sufficient strands for minimum 25% growth and expansion shall be determined during design phase of all projects by the project engineer based on inputs of SDOC MTS Department Authorized Representatives. All fiber optic cables shall be installed from the campus MDF to each campus IDF space in UL approved (Riser or Plenum Rated as installation situational application specifics deem necessary) Corrugated Conduit Innerducts of sufficient quantities with regard to all fill applications.

2. Fiber Optic Patch Cords shall be FDDI grade, multi-mode and single-mode installed with duplex connectors as specified and required. Manufacturer shall be Corning Cable Systems or SDOC approved equal only.

C. Voice and data copper cables:

1. Voice copper cables designed for installation from the MDF to each IDF Space for exterior campus building to building installations shall be a determined number of multi-pair outdoor PE89 type shielded flooded Category Three telephone cable or in circumstances where deemed appropriate multi pair indoor Category Three shielded telephone cable. For installation from the MDF to each IDF Space or from one IDF to other IDF Spaces in the interior of the same building indoor unshielded Category Three cable shall be installed. Refer to conformed plan documents for exact copper cable installation quantities and increased pair counts. Exact cable pair counts with sufficient pairs for minimum 25% growth and expansion shall be determined during design phase of all
projects by the project engineer based on inputs of SDOC MTS Department Authorized Representatives.

2. Intrusion detection security system backbone cabling shall be installed between the MDF and an IDF at every outer building campus wide U.O.N. The Intrusion detection backbone cabling shall consist of two individual homerun installations of West Penn AQ244 cable from the Main Intrusion detection panel location to a voice and data backboard security zone expander panel location in each building. SDOC approved surge suppression shall be installed at cable terminating end in each building.

3. Data infrastructure copper cable from the MDF and all IDF locations to each communications outlet workstation faceplate shall be Blue Jacketed Category Six Unshielded, Twisted Pair (UTP), 24 AWG, four (4) pair for each RJ45 data line jack. All RJ45 data line jacks shall be terminated to EIA 568-A wiring standard. Flooded Category Six cable shall be utilized and transitioned to indoor rated Category Six cabling at all floor box and other locations where the floor box or other Category Six cabling is installed in any underground conduits.

4. All Category Six cable jackets shall be BLUE “ONLY” in color with no exceptions.

5. Information Retrieval D1 Data Ports: Shall be Blue jacketed Category Six Unshielded, Twisted Pair (UTP), 24 AWG, 4 pair cables installed at designated television outlet locations and terminated at the patch panels in the local MDF or IDF Space within 295’ distance limitation. These patch panels shall be labeled to distinguish between the Voice, Data and Auxiliary use. All ports on these patch panels shall be terminated in sequence. No ports on these or any patch panels shall be skipped.

6. RJ45 Patch Cords shall be Certified Unshielded Twisted Pair (UTP), stranded, Category 6, four (4) pair terminated 568A of SDOC selected colors and approved Manufacturer “ONLY”.

D. Plenum rated cabling:

1. Plenum rated cabling shall be installed in all plenum ceiling and other plenum spaces or locations site specific as applicable and where required. Installation of Riser cabling in Plenum spaces is an NEC violation.

2. It is **always** the responsibility of the project engineer to make the determination for the need and requirement for and of PLENUM cables and to insure the proper type of cabling is installed whether Plenum or Riser inclusive of all fiber optic and copper backbone and infrastructure cabling for all technology systems.
1.08 **VDBB BACKBOARDS AND MDF / IDF TERMINATIONS:**

**A. Voice and Data Back Boards (VDBB):**

1. The voice data backboards in MDF and IDF Communications Closets are painted for the protection of the inhabitants of the facility and are to be made adequately and appropriately fire retardant.

2. The SDOC MTS Department preferred selection for MDF and IDF Communication Space VDBB installations is the installation of READY SPEC BACKBOARD of appropriate color to accommodate the installation of systems hardware and grounding bus. All sheets shall be ¾” A-C grade plywood coated with two coats UL Classified Intumescent fire retardant latex on all sides with Backboard Certification label. Plywood Grade & use of UL Classified Fire Retardant Latex shall be detailed on product label. Where VDBB is installed Ready Spec Brand Voice and Data Backboards shall be provided. Manufacturer’s specification sheets are available and provided.

3. For sites where the preferred selection for MDF and IDF Voice and Data backboard installations is not an option the following are the SDOC MTS Department specifications to provide, assemble and install fire retardant Voice and Data Backboards for building MDF and IDF Communication Spaces that will be accepted as adequately and appropriately compliant for fire retardant VDBB:

   a. Contractor shall provide APA 3/4” A-C Grade Plywood “ONLY”.

   b. Contractor shall provide 100% Acrylic Latex Primer/Sealer to each individual sheet of plywood with no exception.

   c. Contractor shall apply two coats of UL Classified Intumescent Fire Retardant Latex Coating applied to front, back and all edges of plywood with no exception.

   d. Where any plywood backboard is cut and raw surfaces are resultant these raw surfaces shall also be touched up following the above procedures with no exception.

**B. VDBB and MDF / IDF Free Standing Rack Terminations and Cross-Connect Hardware:**

1. Voice terminations and cross-connects shall be contractor provided and installed 66-Blocks with adequate spools for wire management installed at predetermined locations on MDF and IDF VDBB. Minimum two (2) spools per 66-block.

2. Category 6 Data Patch Panels shall be contractor provided and installed COMPLETE CLOSED PANDUIT, ORTRONICS or AMP TYCO SOLUTION “ONLY” as specified to comply with the 15-year technology installation project warranty requirements. Routinely specified are 48 port Category 6 Data Patch Panels only. However, upon SDOC approval site designed specifications may call for the installation of 24 port Category 6 Data Patch Panels.
3. Fiber Optic Light Interconnect Unit (LIU) – Shall be contractor provided and installed OPTICAL CABLE CORPORATION Rack Mount Assembly, Fiber Optic Cabinets RTC72 or SDOC approved equal “ONLY”. All fiber optic LIU panel bulkhead blank locations shall be fully loaded with maximum amount of fiber optic bulkheads installed with no exception.

4. Fiber Cable Termination Connectors shall be contractor provided and installed SC duplex type, multi-mode and single-mode, as required unless otherwise noted by SDOC ITSD Technology Project Managers.

1.09 PATCH CORDS:

A. Fiber Optic and Copper patch cables are project specific regarding type, length and quantity. The type, length and quantity of patch cords for each project shall be determined and provided by SDOC ITSD U.O.N. on conformed documents or specifications. Unless otherwise specified and requested during project design all Fiber Optic and Copper patch cables shall be owner provided and installed.

B. When general contractor provided all Copper patch cords shall be CERTIFIED four (4) pair #24AWG UTP stranded, Category Six patch cords as specified. Copper patch cords shall be wired for EIA/TIA 568A sequence. SDOC TS Department representative U.O.N. or as specified by the project engineer shall estimate the necessary quantities based on potential equipment to be installed.

1.10 RACKS/ WIRE MANAGEMENT DEVICES/CABINET ENCLOSURES:

A. Free Standing Two Post Equipment Racks:

1. Free Standing two post equipment Racks shall be manufactured by CHATSWORTH PRODUCTS INC. “ONLY” dimensions 19" wide by 84" height. Rack shall be floor Mount Two Post Equipment Rack Part Number #55053-703 “ONLY” black in color black in color and shall be provided and installed by General Contractor / Electrical Contractor / Applicable Technology Contractor.

2. The General Contractor / Electrical Contractor / Applicable Technology Contractor shall provide to SDOC MTS Department a minimum of fifty (50) spare rack screws per each installed free standing rack and each cabinet enclosure for all technology systems equipment installations regardless of technology application.

3. Horizontal Wire management devices installed shall be CPI Horizontal Manager Part Number #30130-719 “ONLY” black in color. THIS IS A 19” WIDE BY 2 RMU MANAGER.

4. Vertical Wire management devices installed shall be CPI Vertical Manager Part Number #30164-703 “ONLY” (7’ HIGH X 3.65” WIDE X 6” DEEP Managers) black in color for all Floor Mount Equipment Racks and Technology Equipment Cabinets as well. Install vertical wire management between and at the end of all equipment racks in the MDF and each IDF.
5. All Rack Assemblies require inclusion of manufacturer recommended isolation pads and insulator kits for installation see Figure 19 – Rack Mounting Detail “Typical”.

6. Minimum distance from edge of rear foot of free standing rack shall be no less than 48” inches from rear foot edge to finished VDBB.

**Figure 19 – Rack Mounting Detail “Typical”**

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**B. Cable Management Devices:**

1. Ladder rack is required for installation on all free standing rack assemblies extending to the finished VDBB as a minimum and shall be installed in all MDF and IDF Spaces as indicated on all conformed plans. Included shall be end caps installed for all protruding ladder rack ends with no exception.

2. All items shall be black in color. All ladder rack shall be installed with manufacturer specified hardware required for a complete installation to the satisfaction of the Technology Construction Project Manager or other Authorized SDOC Representative.

3. All ladder rack and rack installations shall be installed using SDOC approved fastening devices.

4. The practice of securing ladder rack brackets to VDBB with drywall screws is not an acceptable method or fastening device. Consult Technology Construction Project Manager for approved fasteners in all instances where this is a question.
5. All individual ladder rack sections and all individual free standing racks shall be grounded with individual homerun #6 copper stranded green jacketed ground wire attached “metal to metal” (not attached to painted surfaces) from the rack or ladder rack to the MDF or IDF Space Copper Ground Buss Bar. Ground connections shall be installed using paint free nut and bolt fastening devices. Self-tapping screws shall not be acceptable for use as ground connections. Ground connections shall not be fastened to the existing threaded screw holes on any free standing rack.

C. Cabinet Enclosures:

1. Technology Electronics Equipment Cabinets installed as IDF Cabinet Enclosures for installation in buildings and other applicable locations or structures where an IDF Space is not practical such as P. E. Offices at covered Play Areas and Multipurpose locations or intended as enclosures for sound system, television and Information retrieval cabinets shall be Floor mount Chatsworth Products Inc. “M” Series MEGAFRAME Cabinet Systems and the part number is dependent on length, height and other site specific requirements. These specified equipment cabinets shall be installed at SDOC designated locations according to conformed plans with manufacturer specified cooling fans, shelving and hardware only and grounded per SDOC specifications with no exception.

2. Server Electronics Equipment Cabinets shall be installed by the contractor and shall be floor mount APC NetShelter SX42U Cabinet, part number #AR3100 of SDOC specified quantity installed at SDOC designated locations in the Campus MDF Space according to conformed plan. APC NetShelter Cabinets shall be installed with SDOC specified ladder rack and manufacturer specified hardware required only and grounded per SDOC specifications. Included shall be end caps installed for all protruding ladder rack ends with no exception.

1.11 LABELING:

A. Equipment patch panels, cables, terminations and all specified hardware shall be identified at all locations using an SDOC directed and established alpha-numeric sequence “ONLY”. Spare cables (if any) shall be terminated and identified as “SPARE” at each location.

B. Communications outlets shall be identified using white with black lettering, permanent, clean, typewritten labels. Provide a label that fits within the designated area on the faceplate, as one continuous piece. Before installation, submit sample for approval by an SDOC MTS Department Technology Construction Project Manager or authorized representative.

C. The communications data patch panels in the MDF and each IDF Space shall be labeled using white with black one (1) inch lettering in permanent, clean, typewritten labels. Panels shall be labeled as Patch Panel “A”, Patch Panel “B” and so on as required by the number of patch panels installed in each MDF and IDF Space or cabinet. Refer to Figure 20 - Patch Panel Labeling “Typical”.

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D. Each communication outlet workstation shall be labeled to identify the local MDF or IDF Space it is being served from by indicating the MDF or IDF number centered on the label and by each patch panel port number in the local MDF or IDF Space to which each communications outlet port is terminated. As an example a D2 communications outlet with the two (2) ports labeled C25 IDF# 6 C26 indicates the communications cables for ports C25 and C26 terminate to patch panel “C” port numbers 25 and 26 in IDF #6. Prior to installation of any outlet labeling sample labels shall be submitted for approval by the project engineer and the SDOC MTS Department Technology Construction Project Manager or authorized representative.

E. Identify the Main Distribution Facility as the MDF. Identify each Intermediate Distribution Facility as an IDF. Unless otherwise noted each IDF Space shall be labeled to match the building in which it is housed. An IDF Space or Cabinet within building #800 shall be labeled as IDF#8. For buildings with multiple floors and multiple IDF Spaces or Cabinets each individual IDF Space shall be labeled with letters beginning as designed or determined by project engineer or SDOC MTS Department Technology Construction Project Manager or authorized representative as example IDF #8A, IDF#8B, IDF#8C and so on for all IDF Spaces within that same building. Each MDF and IDF Space Door and or MDF and IDF Cabinet shall be identified with a permanently labeled and engraved plate with minimum two inch lettering.

F. All cabling and terminations shall be labeled at each end and all points of termination with approved permanent typewritten labels. NO HANDWRITTEN LABELING WILL BE ACCEPTED! Prior to installation of any labeling sample labels shall be submitted for approval by the project engineer and the SDOC MTS Department Technology Construction Project Manager or authorized representative. Violations are subject to removal on label schemes not SDOC approved and replacement with SDOC approved suitable labeling schemes.

G. All 188/110 protectors and all 66-block terminations shall be permanently labeled with type written labels. All 66-block intercom terminations shall be labeled for Speaker circuit, Call-In Circuit, etc. as designed.
1.12 GROUNDING/SURGE SUPPRESSION:

A. All MDF and IDF Spaces and cabinets, technology pedestals and other technology spaces by design shall have adequate and appropriate telecommunications grounding bus bars and equipment installed in full compliance with all sections of NEC Codes as applicable with no exceptions. It is the responsibility of the Project Engineer to insure all project grounding is in full compliance with NEC Codes as designed and installed. All technology cabling specified for grounding shall be installed and associated equipment connected to each telecommunications grounding bus bar (TGBB) in full compliance with NEC Codes. All MDF and IDF Space equipment racks, ladder racks, shielded backbone type cable requiring ground terminations shall be properly grounded using stranded copper green jacketed ground cable as follows:
1. Homerun install a minimum #4 THHN copper stranded, green jacketed ground cable from the Computer/clean power panel feeding the respective MDF and each IDF Space to each TGBB located in each individual MDF and IDF Space as well as any other communications space, cabinet or pedestal. This #4 THHN copper stranded, green jacketed ground cable shall be installed in conduit and the conduit must be grounded at the TGBB with the same size ground cable as is installed in the conduit.

2. Homerun install a minimum #6 THHN copper stranded, green jacketed ground cable from building steel to each TGBB located in each individual MDF and IDF Space as well as any other communications space, cabinet or pedestal. A separate TGBB shall be installed at other VDBB locations in the MDF and IDF Spaces having communication cabling terminations requiring grounding. Security and Surveillance Systems cabinets and equipment shall also be homerun grounded to the TGBB as designed.

3. In buildings with multiple IDF Spaces there shall be a minimum #6 THHN copper stranded, green jacketed backbone cable installed between each Telecommunications Grounding Bus Bar in compliance with ANSI/TIA/EIA-607. Each ground cable shall be sized in accordance with specifications and always in full compliance with National Electric Code directives.

4. The Electrical Contractor shall homerun terminate each main ground conductor at all MDF and IDF locations to a Copper Ground Bus Bar. Bus bar specifications are minimum 1/4"D x 4"H x 20"W manufacturer Harris/Dracon #10622-020 or SDOC approved equal.

5. All ground connections shall be stranded copper green jacketed homerun ground cables unless otherwise noted. There shall be no stacking of ground lugs or multiple ground cables under same ground lug connection intended for one cable. All ground lug connections shall be fastened to each TGBB with crimp type lugs for all connections. Use approved NEC and U/L Listed devices “ONLY”. All ground cables attached to the TMGGB and all TGBB locations in all MDF and IDF Spaces shall be labeled to SDOC satisfaction to identify far end ground connections on both ends with clean typewritten permanent labels.

6. All individual ladder rack sections and each individual technology equipment rack and or cabinet shall be homerun grounded to the space TGBB using a minimum #6 copper stranded, green jacketed ground cable.

7. All individual homerun ground cables to the space TGBB shall be supported on the VDBB with approved supports. In no instance shall any ground cable be strapped to EMT conduit or be installed in the same run including any sleeving with technology systems cabling. Ground cable sleeves transitioning ground cable from ceiling spaces into applicable MDF or IDF Spaces shall be grounded on one end of each sleeve with a ground conductor of the same size as the cable in the sleeve or conduit using an electrical coupler with attached ground bonding lug.
8. All SDOC Specified ground connections can be seen in the following Figure 21 - Grounding Bus Bar Detail “Typical” and Figure 22 - Communication System Grounding Riser Detail “Typical”.

Figure 21 - Grounding Bus Bar Detail “Typical”
Figure 22 - Communication System Grounding Riser Detail “Typical”
B. Grounding and voltage surge suppression devices shall be installed for all coaxial backbone cables originating from exterior building locations. Installations in all instances shall adhere to all NEC Codes when being installed at their point of termination entering or departing each building. Grounding of all TVSS devices shall be a minimum #6 stranded copper, green jacketed ground cable homerun to the local MDF or IDF Space TGBB. Television Voltage Surge Suppression (TVSS) Protection shall be installed on the following technology and related systems coaxial backbone cables:

a. Television backbone coaxial cables entering any building or structure.

b. TV Antenna Tower coaxial cables entering any building or structure.

c. Satellite Antenna coaxial cables entering any building or structure.

d. All television backbone trunk coaxial cables between buildings entering any building or structure.

C. Grounding and voltage surge suppression devices shall be installed for all shielded telephone backbone cables originating from exterior building locations. Installation in all instances shall adhere to all NEC Codes when being installed at their point of termination entering or departing each building. All telephone shield ground bond connectors shall be attached to minimum #6 stranded copper, green jacketed ground cable homerun to the local MDF or IDF Space TGBB. As a minimum Shielded Telephone backbone cables shall be installed and bonded to ground in the manner described as follows:

1. All shielded telephone backbone trunk cables shall be connected to ground by attachment to a Shield Ground Bond Connector. Each Shield Ground Bond Connector shall have a protective sheath installed between the bond connector and the voice cable pairs and shall be installed in full compliance with Manufacturer recommended installation guidelines in addition to SDOC Specifications.

2. Install 3M TELCOM PN# 4460-S SHIELD BOND CONNECTOR KIT “ONLY” on PE89 telephone and all other shielded telephone cables as follows:

a. Determine where the shield ground bond connector is to be installed on the PE89 telephone or other shielded telephone cable.

b. Insure adequate allowance for length of cable conductors in order to properly punch down all conductors when complete.
c. Carefully cut and remove unneeded portion of sheath and shield insuring no conductors are cut or damaged in this process. Split the sheath and shield approximately 1-1/2 inches from the top down. Do this parallel to the conductors insuring not to damage conductors in the process. Take care not to strip the cellophane and ribbons from the telephone cable conductor bundles to avoid unravel of conductors which can result in additional work to tone and match conductors during installation punch down.

d. Insert a hole through the sheath and shield at approximately ¼-inch from the top of the sheath. Insure the hole is of adequate diameter for insertion of the shield bond connector post. Insert the shield bond connector post through the hole from the inside of the cable sheath and shield where the body of the connector is against the metal shield.

e. With the post of the connector inserted through the sheath and shield place the post of the connector through hole of the outer portion of the shield ground bond connector placing this piece against the outer sheath.

f. Secure this assembly together with one of the two (2) threaded nuts provided with the kit. Tighten the outer connector portion to the inner connector portion securing the outer sheath and inner metal shield between the 2 shield ground bond connector pieces.

g. Insert the plastic insulating boot provided with the kit between the exposed cable conductors and the metal portion of the shield ground bond connector with the post attached. Securely insert the plastic boot far enough down this assembly that no metal portion of the shield ground bond connector will contact any cable conductors.

h. Close and hold this assembly tightly together and using electrical tape, tape the assembly securely in place with electrical tape. Tape the outside of the sheath to include the entire exposed outer portion of the metal shield ground bond connector. Install the electrical tape from approximately ¼-inch below the bottom of the cut in the sheath, to approximately ¼-inch above the end of the sheath tightly winding the electrical tape. Insure the top of the installed threaded nut and the threaded post of the connector assembly are the only exposed metal items on the outside portion of the sheath.

i. After thoroughly taping the assembly, install and securely butt an approved grounding lug against the first installed threaded nut in the assembly by securely installing the second threaded nut provided with the kit to the shield bond connector post.

j. See Figure 23 - Shield Ground Bond Connector Assembly “Typical” below for example of assembled telephone shield bond connector and cable.
D. Ground cable specified for any SDOC MTS Department technology projects shall be sized at no less than #6 copper stranded, green jacketed ground cable in all instances.

E. All installed ground cables shall be in full compliance with NEC Codes and shall be home run with no Intermediate splices. Specifics regarding design requirements for new construction technology projects are the responsibility of the project engineer to insure all grounding is of adequate size and quantity for NEC compliance.

F. It shall also be the responsibility of the project engineer to incorporate all SDOC ITSD Technology Standards and Specifications requirements specified in the technology design. Looping of ground wire is an NEC Violation and is not permitted.

G. In circumstances where ground blocks are installed to connect multiple ground connections all such ground installation assemblies shall be in complete compliance with applicable NEC Codes or these installations shall be removed.
H. All technology installation ground cables shall be installed in the shortest, straight line path that can be designed and all connections shall be to the closest local TMGBB/TGGB as authorized SDOC Technology Representatives direct.

1.13 OVERALL TECHNOLOGY SYSTEMS CABELING INSTALLATION GUIDELINES:

A. Prior to installation the general contractor or other technology installation contractors shall verify with authorized SDOC MTS Department Technology Representatives all device locations to include but not all inclusive communications racks, communications outlets, clean power receptacles and all other technology related equipment and outlets as designed.

B. Contractor shall test all fiber, UTP copper data cables and all other technology cables both indoor and outdoor rated. Upon receipt at project site contractor shall test all optical fiber cable while on reels. Contractor shall use an OTDR to verify length and locate cable defects, splices and connectors including the loss value of each. All strands of all fiber optic cables shall be tested prior to installation to determine continuity of each strand end to end. Contractor shall retain the test data and include this record with closeout documentation at completion of project for owner retention. Upon completion of installation fiber optic tests shall be accomplished by contractor from one end of each strand using an OTDR with launch fibers at both ends. UTP Copper tests shall be accomplished by the contractor using typical UTP test equipment for Category Six (6) (or above as demanded by project specifications) verification and as required by the manufacturer’s warranty program. Contractor shall provide both a paper and electronic copy of all test results for review by engineer and when approved by engineer this copy shall be submitted to owner for retention at closeout of project. At substantial completion, it is mandatory that the contractor participate in a ten (10) percent retest of all UTP and fiber optic cables with both the project engineer and the owner for verification of submitted test results.

C. All technology systems cables shall be homerun installed in continuous runs from each communications outlet and all communications patch panels and as designed in continuous runs from all patch panels and communication closets between the MDF and each IDF Space without Intermediate splices with no exception.

D. Contractors shall provide adequate service slack as directed by authorized SDOC MTS Department Representatives at all termination locations. Service slack Recommendations are as follows: Ten (10) foot slack for all cables and cable runs entering the MDF and all IDF Spaces. Three (3) foot slack at all Communication Outlets and all other technology systems equipment cables field installed. All service slack shall be neatly coiled and secured in a wide not tight loop and supported at the closest location to each equipment conduit stub out location as possible. Attaching of technology systems cable or service slack to EMT conduit or EMT conduit stub outs is not permitted.
E. The installation path for all cables shall be carefully planned and designed to minimize the total length of each cable run and for communications data cabling to insure compliance in all respects with the Category Six cabling distance limitation of 295’.

F. Based on qualified input solicited from electrical engineers and multiple data cable manufacturers there shall be no application of foreign substance(s) to any installation of Category 6, 5E, 5 or other rated copper cables purposely or accidentally applied to indoor rated CM, CMR, CMP, or LS0H rated cabling products.

Examples of infractions include yet are not limited to paint overspray of any sort or composition; application of water based pulling lubrications, spray on insulations, ventilation ducting and piping pastes, adhesives or glues, etc. These and other foreign substances shall not be permitted to come in contact with any data cabling installation with no exception. These foreign chemicals and substances can and will degrade cable performance reducing the life of cable installed causing it not to perform as was originally intended and purchased and will void the cable manufacturer’s product warranty. The reasons for this policy are as follows:

- Chemical reactions caused by the interaction of foreign materials with the cable jacket’s PVC alloy compounds can damage the cable jacket over time.
- Cable jackets for indoor rated cables are porous, and foreign substance(s) may be absorbed through the jacket and affect the electrical performance of the cable. Please note that this effect may not be seen immediately after initial application of the foreign substance.
- Foreign substances applied to the jacket can change the smoke and flame performance of the product as listed.
- Covering the cable legend with a foreign substance can also result in a violation per the National Electric Code (NEC). If an inspector is unable to read the legend to confirm the correct cable is installed, a code violation can be issued.
-Attempting to clean the foreign substance(s) off the cable can also damage the cable, and affect its performance.

Therefore, any technology systems cabling and specifically any data cabling installation in any quantity found covered, smeared, painted or molested as indicated in any capacity as deemed applicable by SDOC TSD Technology Systems Construction Project Managers shall be the responsibility of the Facilities Department Project Manager, the site general contractor and their offending sub-contractors to have all affected cable in all areas removed and replaced to SDOC satisfaction by a competent SDOC approved certified technology contractors at no cost to the school district in all instances with no exception.

G. All technology cable installations shall be Velcro wrapped every 24” and structurally supported with “J” hooks every five (5) feet. Existing ceiling grid support wires intended for support of the ceiling grid or for support of other contractor installed systems and cabling shall not be used as structural support for technology cable installations.
H. All contractors shall provide and install a separate grid wire and “J” Hook support system. All technology cabling supported by “J” Hooks where the “J” Hooks are suspended from a ceiling grid wire in the overhead shall have a ceiling grid wire continuous from where the wire is secured in the overhead passing below the “J” Hook location and fastening to the ceiling grid. All such ceiling grid wires shall be painted with a swatch of paint blue in color to identify this as a technology systems grid wire not intended for support of the ceiling grid.

I. The end of these painted grid wires shall be attached at the ceiling grid location as part of the attempt to secure the supports in a manner not to interfere with the proper functioning of the installed ceiling grid, lighting fixtures or other mechanical and electrical systems installed above ceiling.

J. Contractor shall install separate support systems for all technology systems cabling. In corridors cabling shall run above the corridor ceiling and shall be installed within four (4) inches of corridor side walls to allow unobstructed access to the ceiling space for maintenance of technology cable installations.

K. All technology cabling installation shall maintain a minimum twenty-four (24) inch clearance from all fluorescent light fixtures.

L. No technology systems cabling shall be secured by tie-wrapping or any other method to any EMT or other conduits, MC cabling, plumbing or sprinkler system piping, mechanical or electrical systems threaded rod, ventilation duct straps or supports, mechanical or electrical supports or equipment, or any structure not SDOC TS Technology System Construction Project Manager approved.

M. No technology systems cabling shall droop or lay on ceiling tiles, HVAC ducting, building steel, conduits, tubing, rebar, MC cabling or other devices whether an effort was made for the systems cabling to be bundled and supported or not.

N. No technology systems cabling shall be fed through ceiling rebar as a sole means of support.

O. All technology systems cabling shall be installed in SDOC approved supported pathways; only attached using SDOC approved fastening devices attached to SDOC authorized building structure.

P. See Figure 24 - Technology Systems Cable Run, Pathway Support and Stub out Configuration “Typical” for detailed information.

Q. All SDOC ITSD drawings and details provided for installation to the contractor are “TYPICAL” and diagrammatic only! All materials and equipment required to complete the installation of a fully functional system may not be described or detailed. However, it is expected that in any instance where in the scope of the requested project it is stated that “The contractor shall provide a fully functional 100% operational, installed and tested system to SDOC satisfaction.” It shall be the responsibility of the contractor to provide all items as designed to SDOC for a 100% operational system.
R. All contractors shall adhere to all applicable codes, standards and SDOC Standards and Specifications regardless of designing authority with no exception.

Figure 24 - Technology Systems Cable Run, Pathway Support and Stub out Configuration “Typical”
Figure 25 - Technology Systems Exterior Surface Mount Pathway Configuration “Typical”
1.14 SUBMITTALS:

A. Specification Sheets shall be submitted for approval by a SDOC MTS Department authorized representatives at time of Bid opening from all technology installation contractors for all technology systems equipment and hardware designed for installation to include all cable types. Any Contractor not providing the required submittals for all items shall be subject to being rejected at time of Bid Opening.

B. An outline drawing of equipment racks showing relative position of all major components shall be submitted for SDOC review and approval if placement of equipment is other than what is on the drawings provided in Bid Document.

C. Wiring diagrams showing typical connections for all equipment shall be submitted for SDOC review and approval.

D. Prospective Technology Contractors shall submit a current certificate as proof they are an installing agent/company to offer one of the selected technology manufacturer’s either COMPLETE CLOSED PANDUIT, ORTRONICS or AMP/TYCO SOLUTION. Product warranty for a minimum fifteen years from date of installation acceptance for properly registered and approved projects in Florida.

E. Labeling samples as specified in Section 1.10 Labeling shall be submitted for SDOC review and approval.

1.15 TESTING AND INSPECTIONS:

A. All technology systems installations shall be tested and documentation provided to SDOC MTS Department for retention in both written and electronic format.

B. All Category Six communications outlets shall be tested to demonstrate the Category Six transmission capability and verify the integrity of the cabling and termination process.

C. Testing shall be performed between the modular jacks at the communications outlet and the patch panels at the MDF and each IDF Space. Test results shall be provided by all contractors for approval in printed format displaying all tests.

D. Testing of UTP cabling shall be performed in accordance with the guidelines outlined in the Florida Department of Education, Retrofit for Technology Guidelines latest revision and in strict accordance to meet the Category Six requirements.

E. All technology contractors shall conduct Category Six cable testing with SDOC approved “only” certification Testers and only use of certification testers that are proven currently calibrated is SDOC authorized for use.
F. All single and multimode fiber optic strands for all fiber optic cables installed at all locations for every technology project shall be tested using an “OTDR” to verify the integrity of the cabling termination process and the overall transmission loss.

G. Only “OTDR” equipment proven as currently calibrated is authorized for use. Test results shall be provided by all contractors for approval in printed format displaying all tests. The OTDR trace output shall become a part of the as-built documentation.

H. At the construction scheduled Substantial Inspection for all architect and project engineer designed and managed projects it is the responsibility of the project engineer to conduct a 10% Technology Installation retest and Inspection for all Category Six communications outlet terminations and fiber optic cable terminations using the same equipment the original testing was conducted with.

I. All technology contractors at the time of the retest and inspection shall provide written test results for comparisons.

J. A thorough inspection of all MDF, IDF and all other technology related installations including hardware, cabling and pathways both interior and exterior shall be inspected for issues.

K. All issues shall be documented and submitted to the Construction Services Department Project Manager and Construction Superintendent for resolution to SDOC MTS Department satisfaction.

L. If during the Substantial Inspection it becomes obvious that the Technology Contractor has too many issues to address the Substantial Inspection, shall be cancelled, rescheduled and a repeat inspection shall be conducted.

M. When Substantial Inspection is complete the report of issues shall be generated for completion.

N. When all issues are reported resolved, including testing issues, a Final Inspection shall be conducted to insure all issues have been resolved completely.

O. If during the Final Inspection other issues are noted a report of issues shall be generated for completion and a repeat inspection shall be conducted to insure the integrity of the technology installation.

P. Technology installation projects cannot be considered complete and closed until all test results are submitted in both written and electronic format to the project engineer and all test results have been reviewed and are approved as satisfactory in all respects by the project engineer.

Q. Upon receipt of all applicable technology installation warranty documentation and when all technology systems are inspected and 100% functional, with all technology inspection issues complete and resolved to the satisfaction of all SDOC Departments the project will be considered complete.
1.16 SERVICE AND MAINTENANCE:

A. All Technology Contractors shall provide a minimum fifteen (15) year certificate of warranty of the installed system against defects in workmanship.

B. All labor and materials shall be provided at no expense to the School District of Osceola County, Florida during normal SDOC established working hours. Warranty period shall commence on the SDOC documented date of acceptance of project completion by the SDOC Authorized Representatives and the Project Engineer. Warranty notices shall be addressed by the applicable technology contractor as soon as possible but, not later than two (2) business days after SDOC documented notification of SDOC documented issue.

C. It is the responsibility of the project engineer to insure that the Technology Contractor shall arrange and submit all necessary paperwork to ensure the minimum fifteen (15) year certificate of installation warranty.

D. The Technology Contractor shall make available a service contract offering continuing factory authorized service of this system after the initial warranty period at the request of authorized SDOC Representatives.

E. The technology systems installation manufacturer shall maintain engineering and service departments capable of rendering advice regarding installation and adjustment to the installed technology system.

F. One of the following technology installation minimum fifteen (15) year installation warranty packages “only” shall be provided and accepted:

COMPLETE CLOSED PANDUIT, ORTRONICS OR AMP/TYCO SOLUTION.

1.17 COMPLETION:

A. All technology project documentation and as-builts shall be provided in accordance with the guidelines outlined in the Florida Department of Education, Retrofit for Technology Guidelines latest revision.

B. Upon completion of all certified testing and before system commissioning, all Certified Communications Outlet testing shall be completed. All certified tests shall be performed with the sample 10% retesting of all installed portions of the network as determined by the SDOC Representative. The Project Engineer, Technology Contractor and SDOC MTS Department Technology Construction Manager shall conduct and witness all testing. All communications outlets including existing outlets where applicable shall be tested.
C. For existing and retrofitted sites it shall be the responsibility of the Project Engineer and the Technology Contractor to verify the condition of all spaces to include floors, paint, interior and exterior surfaces, ceiling tiles and other items prior to commencing any technology installation. It shall be the responsibility of all Technology Contractors to replace all broken or damaged ceiling tiles or other items found to be subject to damage as identified by SDOC Representatives at the completion of each project and before final payment is authorized.
1.01 – OVERVIEW

A. Section 27040 Wireless Access Point Systems of the Division 27 Standards and Specifications addresses all requirements for SDOC approved installations of wireless access point systems necessary to provide wireless network coverage for all designated interior and exterior areas. Section 27040 covers both the cabling requirements as well as hardware installation requirements to enable the proper installation and functionality of SDOC Wireless Access Point systems when installation is completed.

B. Section 27040 Wireless Access Point Systems has been divided into two (2) sub-sections:

PART 1 – CABLING REQUIREMENTS WIRELESS ACCESS POINT SYSTEMS

PART 2 – HARDWARE INSTALLATION WIRELESS ACCESS POINT SYSTEMS
PART 1 – CABLING REQUIREMENTS WIRELESS ACCESS POINT SYSTEMS

1.01 – SUMMARY

A. Section 270400 Part 1 addresses the cabling requirements that must be met prior to installing wireless access points (hereafter referred as “WAP”s). The necessary cabling infrastructure must meet these specifications in order for the WAPs to function properly and safely.

1.02 – CABLING REQUIREMENTS FOR INTERNAL INSTALLATIONS

A. The locations where the WAPs are to be installed will be determined by the ITSD department. A designated member of the ITSD department will attach a “WAP” label to the ceiling tile beam indicating where the ceiling data drop will need to be located. That member will also provide a map of the school indicating the locations where the data drops will be installed.

B. Category 6 cables are used to establish the connection between the WAP and the network gear. WAPs are supplied power through the category 6 cable using Power over Ethernet (PoE). Category 6 cable runs between the data closet patch panel ports and the ceiling location where the WAPs are to be installed must adhere to all applicable requirements stated in Section 17020-1.03. The following requirements must be implemented:

1. All category 6 cable runs are to be above the ceiling tiles. The cables must be supported above the ceiling tiles using “J” hooks in order to keep the cables elevated and to prevent them from lying on top of the ceiling tiles or ceiling insulation. A hook-and-loop fastener shall wrap around the base of each “J” hook and the cable run to secure the cabling in place.

   a. Existing “J” hooks already carrying category 6 cables can be used to carry the new cable runs if they are in the vicinity. For new cable runs bundled with existing cable runs, there must be a hook-and-loop fastener holding all the cable runs together every two (2) feet between the “J” hooks.

   b. Category 6 cable runs can only be supported in existing “J” hooks that are supporting category 6 cables. New category 6 cable runs are not permitted to run in existing “J” hooks that are supporting any other kind of cable.

   c. For cable runs in areas where there are no existing category 6 cable runs, “J” hooks must be installed.
2. The category 6 cables in the ceiling must not touch or rub against any obstructions or equipment in the ceiling. “J” hooks must be used to prevent the cables from touching or bending against any of these obstructions.

3. The category 6 cables must not be run in parallel or in close proximity to any power conduit in the ceiling.

4. For category 6 cables that must penetrate through firewalls, a conduit must be used in which the cabling will run inside of it. Furthermore, the conduit will need a fire retardant insulation that fills around the outside of the conduit. The fire retardant insulation must also be used to fill the conduit after the cable is run.

5. The terminations of the category 6 cable in the ceiling must have a “biscuit box” that includes a single female category 6 RJ-45 connector. The “biscuit box” must be labeled with the port number that corresponds to the patch panel port number in the respective data closet. The label must also include the data closet to which the cable run returns.

6. There must be a service loop on the category 6 cable of at least six (6) feet to allow flexibility as to where the WAP will be installed on the ceiling. The service loop must be installed inside a “J” hook and secured with at least two (2) hook-and-loop fasteners to prevent the service loop from unwinding.

7. The patch panel port in the data closet that corresponds to each ceiling biscuit box must be labeled with a “WAP” sticker. Additionally, the contractor must provide the ITSD department with a spreadsheet indicating the FISH building and room location of each WAP as well as the patch panel port & data closet location where each WAP connects. See Table 1 in Section 1.04-A for spreadsheet template.

a. The contractor shall be responsible for entering data for the “WAP Location (Fish#)”, “MDF/IDF (Fish#)” and “Patch Panel Port” fields of the form. For the fields that require a FISH number, enter the building and room location as it appears on the FISH sign outside of the door to enter the room.

b. The contractor shall provide the ITSD department with an electronic copy of the form in which all the data is typed. A hard copy of the form shall be accepted only IN ADDITION to the electronic copy. A hard copy of the form without the accompanying electronic copy will not be accepted. A form in which the data is hand-written will NOT be accepted.
C. For cabling installations that involve extending data ports from a Wireless Access Point Transition Point Cabinet, the same requirements that are outlined in Section 1.02 – B will need to be met for these installations. For facilities that include Wireless Access Point Transition Point Cabinets, the contractor will be provided building plans of the facility that include the locations of each Transition Point Cabinet.

1. Category 6 cable runs in the ceiling must be run to the nearest Transition Point Cabinet. The cable length between the data closet to where the respective Transition Point Cabinet connects and the end of the cable run where the biscuit box shall be installed must not exceed the maximum distance limitation of TIA/EIA-568-B. **Figure 1** provides a comparison between installations using a Transition Point Cabinet and installations that do not have a Transition Point Cabinet.

**Figure 1: Ceiling Cable Installations With and Without a Transition Point Cabinet**
D. For cabling installations in which a ceiling D2 data drop is located in the projector ceiling mount kit as shown in Figure 2, a standard pink category 6 patch cable shall be run from one (1) of the data drop ports to the location where the WAP shall be installed.

1. The patch cable connection at the D2 data drop shall be inserted into the data drop with the higher lettered label where “A” is the lowest value and “Z” is the highest value. If both data drops have the same letter value, then the patch cable connection shall be inserted in the data drop with the higher numbered label.

2. The patch cable at the ceiling data drop shall return above the ceiling through the projector mount opening as indicated in the arrow in Figure 2. There must be slack of two (2) feet on the patch cable between the data drop and the projector mount opening.

3. The patch cable slack above the ceiling must adhere to the requirements stated in Section 1.02-B-1, 2, 3.

4. The patch cable must remain within the boundaries of the room in which the data drop is located.
5. Excess slack of the patch cable shall be rolled into a service loop in the “J” hook nearest to the WAP and secured with at least two (2) hook-and-loop fasteners to prevent the service loop from unwinding. If there is only a single roll in the service loop of the patch cable, only one (1) hook-and-loop fastener will be necessary to prevent the slack of the service loop from unwinding.

6. The corresponding patch panel port in the data closet must be documented and labeled as required in Section 1.02-B-7.

1.03 - CABLING REQUIREMENTS FOR EXTERNAL INSTALLATIONS

A. The locations where the WAPs will be installed will be determined by the ITSD department. A designated member of the ITSD department will attach a “WAP” label to the ceiling tile beam indicating where the ceiling data drop will need to be located as well as where the penetration for the external antenna will be needed. That member will also provide a map of the school indicating the locations where the data drops will need to be installed.

B. For the category 6 cables, the same requirements that are outlined in Section 1.02-B, C, D will need to be met for these installations.

C. A wall penetration will be required to provide connection between the antenna on the exterior wall and the WAP on the interior wall. The antenna of the WAP will be installed on the exterior wall of the building as required in Section 17040B-1.03-B-6, 7.

1. A wall bore will need to be completed from the outside of the building into the interior where the WAP will be located. The wall bore must be large enough to support a one inch (1”) conduit.

2. If the external wall is damaged during the wall bore, it will be the contractor’s responsibility to repair the damaged area to pre-installation appearance.
3. A one (1) inch conduit will be installed inside the wall bore. Any gap between the conduit and the wall bore shall be sealed with a silicon sealant. A single gang metallic weather-proof junction box shall be installed on the external side of the conduit. A stub-out shall be installed on the internal side of the conduit. A plastic bushing will be attached to the end of the stub-out to prevent damage to the cables. Silicon and fire-retardant sealant must be installed where the antenna cables enter the junction box and exit the stub-out. The conduit running inside the wall shall be permanently affixed to the external junction box. See Figure 3, 3A and 4 for examples of an external junction box and an internal stub-out, respectively.

Figure 3: External Junction Box
Figure 3A: External Junction Box Stub out Detail “Typical”

- CAT6 patch cord routed to a communications outlet mounted above the ceiling near penetration location.
- 3/4” EMT conduit and bushing.
- 3/4” EMT conduit clamp required per penetration. Fasten to wall to stub out at wall to prevent slippage.
- Grounding lug. See Detail.
- Exterior wall surface mounted pathway.
- Wireless Access Point “WAP”
- Seal around top and sides of box but not bottom for weather-tight installation.
- Surface mounted single gang water-proof back box and cover with bottom knockout. Fasten to wall with tapcons or other SDOC approved fastener. Only applicable to retrofits and renovations. For new construction, box shall be flush mount with outdoor cable pass through connector installed on cover IAW SDOC Division 27 Technology Standards and Specifications.
- Seal interior and exterior of penetration locations 360 degrees around installed conduit using UL® approved sealants per code for applicable situations in all instances.

NOTE: Wall elevation shown is for reference only.

Figure 3A: External Junction Box Stub out Detail “Typical”
a. For flush-mounted external junction boxes, a metal 90 degree squeeze-type connector shall be affixed to the cover plate in order to feed the antenna cables inside the junction box as shown in Figure 5.
D. For each WAP antenna, there will be a grounding bar installed to support no less than six (6) lightning arrestors. The grounding bar will need to be installed against the wall and connected to a steel section of the building to ensure proper grounding as shown in Figure 6. Each lightning arrestor will need to be connected to the grounding bar. If the parts are available, the ITSD department member will provide the contractor with the lightning arrestors so that the grounding cables can be connected to the grounding rings on the arrestors.

![Figure 6: Grounding Bar Connected to Steel Section of Building](image)

E. Exterior Wireless Access Point "WAP" outlet locations shall be installed project specific with a minimum of one “WAP” penetration per exterior wall at all new construction and renovation project buildings.

F. A minimum one (1) inch conduit sleeve shall be installed through each wall penetration, attached to double gang weatherproof box with cover on exterior, secured with pipe bracket interior and installed with bushing on conduit end interior.

G. Seal all penetrations with U/L approved caulk IAW all fire and building code directives 360 degrees both interior and exterior at each penetration.

H. Minimum one exterior location shall be provided and installed by the project general contractor at each exterior wall for each project with additional locations as determined project specific by qualified SDOC Technology Services Department Representatives during each project design phase.
I. At every Wireless Access Point "WAP" exterior penetration location within twelve (12) inches parallel, the general contractor shall provide and install one (1) U/L approved copper or aluminum minimum six (6) tap ground terminal block, one (1) U/L approved I-Beam Ground Clamp and crimp Connector Kit at the closest building steel location (connection shall be tight and clean metal to metal), one (1) #6 copper stranded green jacketed grounding cable from the I-Beam Ground Clamp Crimp Connector to the six tap ground terminal block (no trimming of conductors on the cable is permitted) and shall secure the #6 ground cable run with EMT pipe straps every two feet in the shortest path possible. See Figure 6A detail in the Division 27 Technology Systems Standards and Specifications Section 27_04_00 Wireless Access Point Systems provided.

Figure 6A: WIRELESS ACCESS POINT GROUND CONNECTIONS “TYPICAL”
1.04 – DOCUMENTATION TEMPLATE

A. **Table 1** includes the template needed to satisfy requirements addressed in Section 1.02-B-7.

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<th>WAP MAC Address</th>
<th>WAP Serial Number</th>
<th>MDF/DF (Fish #)</th>
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**Submitted By:**
(Installer Signature) (Installer Printed Name) (Date)

**Received By:**
(SDOC Signature) (SDOC Printed Name) (Date)

Table 1: WAP Data Drop Location Spreadsheet
PART 2 – HARDWARE INSTALLATION WIRELESS ACCESS POINT SYSTEMS

1.01 – SUMMARY

A. Section 270400 Part 2 addresses the physical installation of all hardware necessary to provide wireless network coverage at a facility. The hardware installation must meet the required specification to ensure that maximum and reliable coverage is available for network services that will be provided by the wireless infrastructure.

1.02 – PRE-INSTALLATION PREPARATION

A. Prior to installation of the hardware, all wireless access points (WAPs) shall be inventoried. A spreadsheet shall be created that includes the eventual hostname of each WAP, the serial number and the MAC address. This information will be needed once the WAPs are discovered and added to the wireless controller. See Table 1 in Section 1.04-A for the spreadsheet template.

B. Using a label maker, each WAP shall be physically labeled with the provided District-Standard hostnames to ensure that they are all installed in the correct locations throughout the facility. A label maker must be used to create the labels. Hand-written labels are not permitted.

1.03 – PHYSICAL INSTALLATION OF EQUIPMENT

A. For indoor wireless coverage, ceiling-mount WAPs will be installed. These WAPs shall be attached to the ceiling tile beams. Figure 1 shows an example of the 1131 Series ceiling-mount WAP.

Figure 1: Ceiling-Mount WAP
1. The included mounting kit shall be used to attach the WAP to the ceiling tile beam. Figures 2, 3 & 4 show the components of the mounting hardware that must be used for proper installation; the ceiling T-rail attachment, the WAP mounting bracket & the assembly screws, respectively.

![Figure 2: Ceiling Tile Mounting Kit – Ceiling T-rail Attachment](image2)

![Figure 3: Ceiling Tile Mounting Kit – WAP Mounting Bracket](image3)
2. The WAP shall be installed in which the center of the WAP is at least two (2) feet (or one square ceiling tile length) away from any fluorescent lighting and speakers that can cause interference. Figure 5 provides examples of correctly installed WAPs and Figure 6 provides examples of incorrectly installed WAPs.
3. The ceiling T-rail attachment clamps on to the ceiling tile metal T-rail beam support as shown in Figure 7.
4. The two components of the mounting hardware are connected using four of the provided assembly screws as shown in Figure 8. The screws must be installed in the holes of the mounting bracket that are labeled “B”.

![Figure 8: WAP Mounting Hardware Attached to Ceiling](image)

5. For the 1131 series WAP, both mounting tabs on the bracket must be locked in to place on the WAP. For the 1142 series WAP, all four (4) mounting tabs on the WAP must be locked in place on the mounting bracket. The 1131 series WAP slides and locks in to place against the mounting bracket as shown in Figure 9. The 1142 series WAP slides and locks in to place against the mounting bracket as shown in Figure 10.
Figure 9: 1131 Series WAP Attached to Mounting Bracket

Figure 10: 1142 Series WAP Attached to Mounting Bracket
6. The WAP must be secured to the mounting hardware to prevent the WAP from accidentally falling off of the ceiling. The WAP is secured with a provided cable tie as shown in Figure 11. Excess slack of the cable tie shall be removed. Additionally for the 1131 series WAP, a screw shall be installed to secure the WAP to the mounting bracket as shown in Figure 12.

Figure 11: Securing WAP to Mounting Bracket with Cable Tie

Figure 12: Securing WAP to Mounting Bracket with Screw
7. The WAP shall be patched to the ceiling “biscuit box” with a pink category 6 cable per the Division 17 Appendix C Color Standard. A small notch the size of a dime shall be cut in the edge of the ceiling tile to allow the cable to feed through the ceiling. Excess slack of the patch cable must be rolled up and secured with at least one (1) hook-and-loop fasteners to prevent it from touching or lying on top of the ceiling tiles. If there is more than one (1) roll in the service loop then two (2) hook-and-loop fasteners will be required to prevent the slack from touching or lying on top of the ceiling tiles. It is not necessary to install the patch cable service loop in to the “J” hook. A pink category 6 cable must also be used to connect the data closet patch panel port to the switch port as above.

a. If the WAP is being connected to the ceiling D2 data drop near the projector mount, the patch cable to the WAP will need to be installed per the specifications documented in Section 17040A-1.02-D.

b. For outdoor wireless coverage, a wall-mount WAP will be installed above the ceiling tiles. Figure 13 shows the 1231 series wall-mount WAP.

Figure 13: Wall-Mount WAP
8. The included mounting bracket is attached to the wall using the two (2) mounting holes as indicated in Figure 14. Concrete screws must be used to attach the bracket to a concrete wall.

9. The mounting bracket must be installed so that the WAP faces upright as shown in Figure 13. The WAP may be installed sideways **ONLY IF** there is not enough room available above the ceiling tiles to install it upright. The WAP must not be mounted upside-down.
10. The WAP slides and locks in to place against the mounting bracket as shown in **Figure 15**. All mounting tabs on the WAP must be locked in place on the mounting bracket. There are three (3) mounting tabs on the 1220 & 1231 series WAP and there are four (4) mounting tabs on the 1242 series WAP. The 1242 series WAP is shown in **Figure 15** below.

![Figure 15: WAP Attached to Mounting Bracket](image-url)
11. For the 1220 and 1231 series WAP, a cable tie must be inserted in the security hasp at the bottom of the WAP as shown in Figure 16 to securely fasten the WAP to the mounting bracket.

![Figure 16: Secure WAP to Mounting Bracket](image)

12. For the 1242 series WAP, a security hasp must be inserted in the top of the WAP to secure it to the mounting bracket. The security hasp key pin will be inserted in to the key hole on the top of the WAP as shown in Figure 17. The security hasp will be pushed in to the slot in the mounting bracket as shown in Figure 18. A cable tie will be inserted in the security hasp to keep it connected to the mounting bracket.

![Figure 17: Security Hasp Inserted in WAP Key Hole](image)
Figure 18: Security Hasp Inserted in Mounting Bracket
13. The antenna for the WAP providing outdoor wireless coverage shall be installed flush against the exterior wall of the building using four concrete screws. The antenna must be installed so that the antenna connections are facing down or below the antenna to prevent moisture intrusion. The connections for the antenna shall feed into the external junction box and the penetrations must be sealed with silicon to prevent moisture intrusion into the junction box. Figure 19 shows an example of a properly installed external antenna.

Figure 19: External WAP Antenna & Junction Box
14. The connections for the antenna shall be attached to extension cables if they are required. The connections shall exit the stub-out and sealed with silicon & fire retardant sealant as shown in Figure 20.

![Figure 20: Internal Stub-Out](image-url)
15. A lightning arrestor shall be installed in between each connection of the WAP and the antenna as shown in Figure 21. The lightning arrestors must be installed with proper grounding. Antennas shall not be connected to the WAP without grounded lightning arrestors or with lightning arrestors that are not grounded.

![Lightning Arrestors Installed on the WAP](image)

**Figure 21: Lightning Arrestors Installed on the WAP**

16. The WAP is to be patched to the ceiling “biscuit box” with a pink category 6 cable per the Division 17 Appendix C Color Standard. Excess slack of the patch cable must be rolled up and secured with at least one (1) hook-and-loop fasteners to prevent it from touching or lying on top of the ceiling tiles. If there is more than one (1) roll in the service loop then two (2) hook-and-loop fasteners will be required to prevent the slack from touching or lying on top of the ceiling tiles. It is not necessary to install the patch cable service loop in to the “J” hook. A pink category 6 cable must also be used to connect the data closet patch panel port to the switch port.
1.04 – DOCUMENTATION TEMPLATE

A. Table 1 includes the template needed to satisfy requirements addressed in Section 1.02-A. The contractor responsible for the installation of the wireless hardware shall receive a partially-completed copy of this form from the ITSD department. Alternatively, the contractor can receive a partially-completed copy of the form from the contractor responsible for the cabling installation to support the wireless devices. The “WAP Location (Fish#)”, “MDF/IDF (Fish#)” and “Patch Panel Port” fields shall have data entered upon receiving the partially-completed form.

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Submitted By: [Installer Signature] (Installer Printed Name) (Date)

Received By: [SDOC Signature] (SDOC Printed Name) (Date)
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Table 1: WAP Location Spreadsheet
1.01 GENERAL REQUIREMENTS AND SUMMARY:

A. Intrusion detection systems are crucial in the protection of life and property. It is imperative they function properly and reliably. This specification is developed to ensure all intrusion detection systems are installed to provide the maximum coverage at peak operability. Section 270600 in combination with other applicable sections of the SDOC Standards and Specifications outlines the manufacturer and specific components as well as installation quality for building intrusion detection systems.

B. Section 27.06.00 in combination with other applicable sections of the SDOC Standards and Specifications details and defines SDOC expectations for quality, specifics in manufactured components and installation practices for intrusion detection system installations.

C. All schools within the district shall have an Intrusion Detection System (IDS). Overall, the same basic standard and similar intrusion detection system shall be installed at all district locations. However, each intrusion detection system installed shall have distinct and varied characteristic combinations of components and programming that comprises designed and designated devices such as zone expander panels, strobe/horn sirens, keypads, motion sensors, door contacts, access ID components etc. All devices shall connect to a single master control panel located in the school’s Main Distribution Facility (MDF).

D. For every general contractor managed SDOC new construction intrusion detection installation it shall be the responsibility of the project architect, engineer and general contractor to meet with and solicit input of authorized SDOC technology representatives experienced in addressing intrusion detection system specific needs of the district for all sites and situations to determine and establish the project parameters specific to intrusion detection system requirements.

E. For all SDOC ITSD generated, sanctioned and direct managed intrusion detection installations it shall be the responsibility of the intrusion detection contractor to meet directly with authorized SDOC technology representatives to address all intrusion detection system specific needs for all projects to determine and establish the project parameters and requirements specific to ITS Department contracted and managed intrusion detection system installations.
F. Product quality, durability, reliability, operability and ease of functionality are all key SDOC issues of concern and scrutiny for all intrusion detection installations inclusive of the installation, support, termination, programming, testing, adjustments and labeling identification for all intrusion detection head end panel assemblies, field devices, cabling and hardware, grounding, supports and pathways. For every SDOC contracted intrusion detection system project it shall be the responsibility of the general contractor or as project site specifics dictate the intrusion detection contractor or combined effort to meet and exceed all SDOC expectations for all SDOC intrusion detection installations and to comply in all respects as a minimum with all directives and details of this document with no exception.

G. In the best interest of the School District of Osceola County intrusion detection components on any scale end to end from the head end main panel assembly and zone expander equipment to the end user keypad, door contacts, motion sensors, horn/strobes or other field devices and cabling determined by SDOC Authorized Representatives as inferior in any aforementioned aspect shall be removed immediately by the contractor and replaced with SDOC approved suitable replacements at no additional cost to the School District of Osceola County with no exception. All contractor recommended changes or substitutions to the project installation shall be submitted by the contractor in writing to the SDOC ITS Department Authorized Representatives using SDOC Standards and Specifications Appendix “D” Standards Variance Sheet prior to substitution or there shall be no change or substitution. All changes or substitutions shall be approved in writing by the SDOC ITS Department or they are not considered authorized and approved and shall not occur.

H. All requirements detailed in this document are intended for compliance as applicable at all SDOC projects involving the provision and installation of new SDOC specified head end Main Panel and zone expander assemblies or upgrade of existing SDOC specified video surveillance Main Panel and zone expander assemblies affected in any aspect. All requirements listed are applicable for any SDOC specified and required combination where SDOC deems appropriate to the installation whether it is the provision and installation of a new SDOC specified Main Panel and zone expander assemblies with all field cabling and components, the installation of a new SDOC specified Main Panel and zone expander assemblies “only”, the addition of new SDOC specified keypad, door contact, motion sensor, horn/strobe or other field devices and cable locations, SDOC specified new or replaced interior and exterior individual keypad, door contacts, motion sensors, horn/strobes or other field devices, all SDOC specified cabling, keypad, door contact, motion sensor, horn/strobe or other field device or other as yet unidentified SDOC specified intrusion detection Main Panel, zone expander, field components, hardware or devices and items contracted. This document is to ensure all SDOC specified project specific details are addressed regarding but not limited to the determination of the SDOC specified need for a new Main Panel or zone expander assemblies installation, the needs to upgrade an existing Main Panel or zone expander assembly, the needs to install additional interior and exterior individual keypad, door contacts, motion sensors, horn/strobes, SDOC specified cabling or other items perhaps required. Additionally if a new Main Panel were not required to identify the SDOC specified needs to provide and install new assemblies, circuit card quantities and components or other items required to adequately support an existing installation to SDOC satisfaction. These requirements shall include the provision to SDOC satisfaction by the contractor of all programming, adjustments and testing involved to make the entire installation fully functional at all points for all newly installed items including the Main Panel, all zone expander assemblies, and all field cabling, components and devices to the complete satisfaction of
designated qualified SDOC Technology Representatives. All quotes shall be inclusive of provision and installation of all fiber or copper patch cords, connecting hardware, surge suppression and grounding U.O.N.

I. Key authorized SDOC personnel experienced in the trade of intrusion detection systems shall determine the physical locations for all system components and devices specified for the intrusion detection system during the initial design phase for each project.

J. The School District’s current intrusion detection system solution is Digital Monitoring Products (DMP). DMP is the single-source manufacturer of current SDOC Intrusion Detection Systems. No substitution is authorized. It shall be understood by all contractors that installation and programming shall only be accomplished by DMP Digital Monitoring Products Technicians of the intrusion detection contractor trained and certified to properly install and program the circuits and devices as designed with no exception.

K. It is the decision of the administration at each individual campus or other site to have the intrusion detection system monitored and to grant arm/disarm privileges to employees. Each school principal or site administrator shall determine and approve acceptable pass-codes, which shall be provided to the appropriate School District Representatives.

L. For all intrusion detection technology system installations the SDOC School Support Security Group shall meet with school principal or site administrator to determine whether the intrusion detection system shall be monitored. When the decision is made by the school principal or site administrator to have their system monitored the SDOC School Support Security Group shall make all arrangements and attend to all details required for set up and monitoring for all system installations new or existing.

M. For all intrusion detection technology system installations the SDOC School Support Security Group shall meet with the school principal or site administrator to determine and develop the site specific list of codes to grant arm/disarm privileges to employees. For all system installations the SDOC School Support Security Group shall install, program, test and adjust as necessary all school principal or site administrator approved acceptable pass-codes. The SDOC School Support Security Group shall be responsible for initial troubleshooting, system maintenance and repair and determinations for warranty work and to contract out repair and or replacement for all current existing intrusion detection systems. The SDOC School Support Security Group shall contact and monitor repair or replacement of damaged or obsolete existing intrusion detection systems components and cabling including reactivation, programming, testing and adjustments made by all security contractors.

N. The SDOC School Support Security Group shall work in conjunction with SDOC Information and Technology Services Department to determine initial system installation requirements and specification updates provided as input to architects and engineers for all projects regarding new construction, retrofitted, upgraded full or partial intrusion detection systems applicable for all SDOC Technology Systems plans. The SDOC School Support Security Group shall work in conjunction with SDOC Information and Technology Services Department to inspect and verify the proper contracted installation and operability of all new or refurbished intrusion detection technology system installations whether a full or partial installation project.
O. The SDOC Information and Technology Services Department for all new and refurbished intrusion detection system technology installations shall generate all requests to outside sources, procure, provide and make available to all selected and contracted intrusion detection security contractors for their physical installation connection and system programming all applicable dial telephone POTS lines and IP Addresses required for all new and refurbished intrusion detection security systems. The SDOC Information and Technology Services Department shall ensure all dial telephone POTS lines provided are programmed appropriately from the outside telephone services provider with no dial 9 or other functions programmed in that will impede immediate and instantaneous call out function for the installed system.

P. All selected and contracted intrusion detection security contractors shall provide evidence in writing of current DMP authorization to install DMP Products and shall ensure that all DMP Components are installed, programmed, tested, adjusted and made operational solely by current factory authorized and Certified DMP Installers only.

Q. All selected and contracted intrusion detection security contractors shall provide all intrusion detection system components, software, hardware, fasteners, supports, sleeving and all other parts, equipment, and materials and grounding as SDOC specified and or required for a complete functional, programmed, tested and operational system whether contracted for a complete new system installation or for partial system installation for existing systems as project specified. All cabling, supports, sleeving, components and grounding shall be installed in strict compliance with applicable National Electric Code requirements as well as all other applicable codes and regulations and all sections of the established SDOC Standards and Specifications.

R. All contracted Intrusion Detection Contractors shall provide all labor required for all cabling, supports and sleeving of systems, hardware, equipment and component installation, initial system functional software installation, programming and system testing and adjustments, all component, equipment and cable labeling, system testing, adjustments and certification and applicable system warranty for the complete functional, tested and overall operational new or upgraded intrusion detection system or for individual components as SDOC specified for all existing systems partial new, upgrade or repair installation projects. The scope of these specifications is to ensure the delivery of a complete and fully functional, operational and integral system installed, programmed, tested, adjusted, certified, warranted and ready for operation. Omission of any essential detail from these specifications in a scope of work does not relieve the contractor of the obligation to furnish this complete functional, tested and operational system as specified.

S. The Intrusion Detection Contractor shall be responsible for full compliance with ALL SDOC Standards and Specifications unless specific issues for each non-complying feature are identified by letter accompanying the submitted matter and are addressed and SDOC ITSD approved prior to contract with SDOC ITSD regardless of approval of samples, cut sheets, shop drawings, and other matter submitted by the contractor. A copy of SDOC Standards and Specifications shall be provided to the contractor upon request.
T. Power installation requirements for intrusion detection system installations shall be general power as the standard unless otherwise noted. Normally the intrusion detection system head end panel and zone expanders are installed on the voice data backboard at IDF and MDF locations. This location routinely has clean power receptacles installed which may be used to power the intrusion detection system equipment. However, if there is no clean power where the intrusion detection system equipment is designed for installation general power receptacles shall be installed as the standard.

U. All equipment, components, cabling and hardware shall be new, of current SDOC specified manufacture and carry standard warranties. At least two complete shop repair manuals and parts lists must be furnished with each type of equipment at the time of project closeout and delivery.

V. Intrusion Detection Contractor shall be responsible for correction of all false alarms reported and invoiced by the local Police and Sheriff’s Office during the time of installation at no expense to SDOC until the system is accepted as complete and the project is closed out and the warranty phase of the project has been authorized to commence by SDOC.

W. Intrusion Detection Contractor shall be responsible for the demolition, removal and disposal of obsolete, deadened unused IDS cabling and equipment for all replacement and retrofit upgrade projects.

X. Intrusion Detection Contractor shall provide factory certification training on all purchased equipment to SDOC video surveillance service technicians as requested at no additional charge.

Y. Intrusion Detection Contractor shall provide end user training on all purchased equipment to key campus or other staff at no additional charge for each Intrusion Detection project installation and for all other Intrusion Detection projects where requested by SDOC authorized representatives.

Z. Intrusion Detection Contractor shall provide to SDOC Intrusion Detection Service Technicians all necessary client software to manage, program, and troubleshoot Intrusion Detection Systems purchased by SDOC.

AA. Intrusion Detection Contractor shall provide to SDOC Intrusion Detection Contractor Service Technicians upon request all necessary client software upgrades and firmware updates for Intrusion Detection Systems purchased by SDOC at no additional cost to SDOC for the life of each original Main Panel Head end installation.

BB. New or refurbished repair components shall be available for all Intrusion Detection systems purchased by SDOC for a minimum of 10 years after purchase date.

CC. All items of equipment including wire, cable and hardware for every Intrusion Detection installation shall be designed by the Intrusion Detection manufacturer to function as a complete system and shall be accompanied by the manufacturer's complete service notes and drawings detailing all interconnections.
DD.  Intrusion Detection Contractor shall have local service facilities within 75 miles of the School District of Osceola County offices located at 817 Bill Beck Blvd in Kissimmee, Florida. Contractor shall in all instances be able to provide same day response to service requests as SDOC deems necessary. The Contractor shall maintain at this facility the necessary spare parts in the proper proportion as recommended by the manufacturer to maintain and service the equipment being supplied. Contractor shall show satisfactory evidence, upon request, that they maintain a fully equipped service organization with a full time staffed office capable of furnishing adequate inspection and service to the affected system(s) as follows:

- On site response within two hours for circumstances deemed urgent or emergent by authorized SDOC Representatives.
- On site response prior to close of business same day for circumstances deemed routine or of a non-emergent nature by authorized SDOC Representatives.

EE. Unless otherwise noted the installing Intrusion Detection Contractor shall provide an installation inclusive of all labor, all head end component equipment and supporting hardware and patching cables, all field devices and supporting hardware, all initial programming, testing, adjustment, training and all other materials necessary for a complete functional programmed and operational system to the complete satisfaction of SDOC. The scope of work designed with these specifications is to ensure the delivery of a complete and functional Intrusion Detection System ready for operation.

FF. Omission of any essential detail from these specifications or SDOC generated scope of work shall not relieve the installing Intrusion Detection Contractor of their obligation to provide a complete and functional Intrusion Detection System as expected by SDOC to be ready for operation at close of project.

GG.  Regardless of scope or governing authority the Intrusion Detection Contractor shall be responsible for full compliance with all Division 27 SDOC Standards and Specifications Sections for any installation where applicable.

HH.  There shall be no contractor initiated changes for SDOC specified components, devices or features without SDOC pre-approved review and discussion where written documentation as defined in SDOC Division 27 is submitted and approved for said exceptions that indicate said changes are addressed and authorization indicated prior to contract with SDOC ITSD. Regardless of approval of samples, cut sheets, shop drawings, and other matter submitted by the contractor there shall be accompanying and approved documentation supporting approval which shall be obtained or there shall be no authorized substitute.

II. All Intrusion Detection head end equipment, software, components and devices, cabling and hardware shall be contractor provided and installed and programmed. All items shall be new and where applicable shall be the most recent version and revision. All items shall be of current SDOC specified manufacture and provided with standard SDOC approved warranty. Contractor shall provide two complete shop repair manuals and parts lists shall be furnished with each equipment installation at the time of project closeout and delivery.
JJ. The exact quantity, specifications and location of intrusion detection sensors shall be site dependent as detailed and approved by SDOC ITSD Representatives and where applicable the Architect and Project Engineer. Typical locations for monitoring consideration of the intrusion detection system shall include but in no way are limited to:

- Administrative Office Areas
- Cafeteria Manager Office Kitchen Areas
- Media Center Areas
- Computer Labs
- Building Exterior Doors
- Corridors
- Other locations as specified by the SDOC MTSD Representatives.

KK. All control or zone expansion panels shall be installed in the local MDF/IDF Room. Installation shall normally be on the VDBB at a location designated by the SDOC ITSD Representatives and shall be accessible without a ladder. No equipment panels or connection points shall be installed above ceiling. The exact quantity, model and specific intrusion detection components and locations shall be dependent on the site plan as approved by authorized SDOC ITSD Representatives and where applicable the Architect and Project Engineer.

LL. During new construction design process authorized SDOC ITSD Representatives shall indicate the location and installation of numerous intrusion detection component sites at every building. The contractor shall install all indicated locations. All physical intrusion detection device installations shall be determined and specified by authorized SDOC ITSD Representatives during the construction process for installation by SDOC ITSD Representatives or each physical station designated for an intrusion detection device installation shall be indicated for installation by the general contractor and video surveillance contractor on the conformed plans.

1.02 CONTRACTOR QUALIFICATIONS:

A. All SDOC selected Intrusion Detection Contractors shall provide documented proof as evidence of the ability, capacity, and skill of the Firm to be able to provide all services specified and here in addressed. Selected Contractor shall produce substantiating evidence they are an established operated business for a minimum five (5) years and are a licensed, bonded low voltage company and a duly authorized distributor with full manufacturer's warranty privileges for a minimum of five (5) years with a minimum of three (3) years’ experience in the educational market.

B. Intrusion Detection Contractor shall be qualified to provide design and consulting services for intrusion detection distribution systems. Contractor shall have the ability to provide Auto CAD drawings of the system design and as-built drawings upon project completion in addition to PDF, VISIO or other format as SDOC requested.
C. All SDOC selected Intrusion Detection Contractors as proof and evidence of the following documentation shall furnish to SDOC and maintain current the following specified SDOC licenses, certifications and requirements:

- Current State of Florida Low Voltage Contractor’s License specific for the low voltage systems being installed.

- Current documented manufacturer installation and warranty authorization certification from the selected Intrusion Detection Manufacturer DMP Digital Monitoring Products approving the contractor for installation and warranty of the selected Intrusion Detection System installed in the State Of Florida.

- Video Surveillance Contractors inclusive of their associated sub-contractors at any SDOC location for any purpose shall be in complete compliance with all SDOC requirements with regard to the Jessica Lunsford Act prior to acceptance of any SDOC contract. Failure in compliance shall result in disqualification of approved quote and award to compliant contractor as defined in section 270200.

- Shall provide current documentation and certification in the form of Intrusion Detection Manufacturer DMP Digital Monitoring Products authorized and trained installation and maintenance technicians. All Intrusion Detection Contractor technicians dispatched to service SDOC video surveillance system equipment shall be factory trained with current certification. Proof shall be required to be produced on demand.

- Intrusion Detection Contractor shall read, understand and comply in all respects with the directives contained in the School District of Osceola County, Florida Division 27 Technology Standards and Specifications as written and modified regardless of intent of their company to directly install copper or fiber optic cabling or to accomplish cable installation through a technology systems cabling sub-contractor.

- Intrusion Detection Contractor understands that the most current version of these Technology Standards and Specifications may be located at the SDOC Website under the Media and Technology Services Department section at (http://www.osceola.k12.fl.us/depts/IMC/Index.asp).

- Intrusion Detection Contractor further understands that in any question or exception as to the validity of current posted Division 27 Technology Standards and Specifications they may contact the SDOC Information and Technology Services Department for updates and verification. Contact may be established directly with the department at 407-870-4050 to either receive verification or clarification information, or to be provided the most current and up to date version of the standards and specification or both. Points of contact for information shall be directed through the SDOC Media and Technology Services Department to the Technology Construction Project Managers.

- **SPECIFIC NOTE TO ALL SELECTED INTRUSION DETECTION CONTRACTORS:**
a. For any cabling installation to be accomplished directly by any selected Intrusion Detection Contractor the contractor shall provide to SDOC Information and Technology Services Department Construction Project Manager(s) and authorized SDOC Representatives current documentation and certification that the company retains on permanent staff a current and certified BICSI RCDD (Registered Communications Distribution Designer.) providing name and current certification for all RCDD’s assigned to SDOC Intrusion Detection System project installations.

b. If the selected Intrusion Detection Contractor cannot produce a current and certified BICSI RCDD (Registered Communications Distribution Designer.) on staff the Intrusion Detection Contractor shall not be authorized to install any Intrusion Detection System cable in any instance.

c. In such instances where cable installation is required by the selected Intrusion Detection Contractor it shall be the sole responsibility of the selected Intrusion Detection Contractor to contract and provide the services of an SDOC approved certified and qualified technology services cabling sub-contractor with the require certificates and qualifications and forward proof as evidence to the satisfaction of SDOC Technology Construction Project Manager(s) and authorized SDOC Representatives of current documentation and certification prior to commencement of cable installation.

d. Further, If the selected Intrusion Detection Contractor cannot provide documented current structured cable installation certification authorizing the installing agent/company to offer one of “ONLY” the following selected technology manufacturers COMPLETE CLOSED PANDUIT, ORTRONICS or AMP/TYCO SOLUTION Extended Product warranty for a minimum fifteen years from date of installation acceptance for properly registered and approved projects in the State of Florida to include product installation of fiber optic and up to Category Six termination, testing and warranty per SDOC standards and specification with manufacturer certifications for all trained and approved installation and maintenance technicians assigned to SDOC Intrusion Detection projects the Intrusion Detection Contractor shall not be authorized to install any intrusion detection system project specific cabling required.

e. In those instances where fiber optic and up to Category Six UTP copper cable installation, support, termination, testing and warranty of cable installations is required of the selected Intrusion Detection Contractor it shall be the sole responsibility of the selected Intrusion Detection Contractor to contract and provide a sub-contractor having all required certifications, qualifications and manufacturer cabling warranty authorization and forward proof as evidence to the satisfaction of SDOC Technology Construction Project Manager(s) and authorized SDOC Representatives of current documentation and certification prior to commencement of any cable installation.

D. NOTE: All documentation and certifications required of the Project Intrusion Detection Contractor apply and shall be produced for verification and approval by SDOC ITS Department regarding both their company and any and all Technology Cabling Sub-Contractors intended to assist the Intrusion Detection Contractor in performance of any and all SDOC project work.
a. No technology cabling installation shall be contracted in SDOC to technology contractors that do not produce valid current documented proof of qualifications and certifications satisfying SDOC requirements.

b. Regardless of SDOC approval and authorization of the use of any technology services cabling sub-contractor by the Intrusion Detection Contractor, the Intrusion Detection Contractor shall always be held liable for any and all aspects, issues, certifications and warranties regarding the entire scope inclusive of cabling installed by any technology services cabling sub-contractor for each Intrusion Detection project contracted with no exception.

E. Intrusion Detection Contractors shall be a qualified DMP Intrusion Detection Systems Integrator with local service facilities within 25 miles of the School District offices located at 817 Bill Beck Blvd in Kissimmee, Florida.

F. Intrusion Detection Security Contractors shall have and provide written evidence of DMP Factory Trained and Currently Certified Technicians on staff.

G. Intrusion Detection Security Contractors shall have sufficient personnel and facilities to be able to provide 2 hour on-site response to any and all situations involving the intrusion detection system. The contractor must provide 24 hour on-call service via a toll free number. Additionally, the contractor must be able to provide full alarm monitoring at a UL certified Central Station.

H. A resume of qualification shall be submitted with the Contractor's bid indicating the following:

1. Intrusion Detection Contractors shall have performed work of comparable scope at educational facilities within the last two years and submit proof of exemplary performance on demand as required at the request of School District Representatives and if required shall arrange site visits for review of installed systems.

2. Contractor or their designated SDOC approved sub-contractor shall have available current calibrated SDOC approved test equipment to verify the integrity of all newly installed metallic cable or fiber optic cable systems as SDOC specified for every project. The following is a list of required test equipment necessary for certification of all premise wiring installations and intercom cabling system installations.
   
   i. OTDR for Multi-Mode Fiber Optics
   ii. OTDR for Single Mode Fiber Optics
   iii. Light Source Power Meter
   iv. Volt/Ohm Meter
   v. LAN Cable Certification Meter- 350 MHz

3. Test Results Documentation: For all UTP copper cable, Category Six and Fiber Optic cable installation all Intrusion Detection Contractors shall provide cabling test results to owner for retention in both printed and electronic format.
4. All test equipment utilized shall have a current valid legible, permanent, indelible and unaltered calibration sticker on the equipment. Test results provided that have been documented utilizing test equipment that has no calibration sticker, that is uncalibrated or utilizing test equipment indicating that the test equipment is not within current calibration time limits on sticker shall not be accepted and shall result in the contractor provisioning acceptable calibrated test equipment retesting and resubmission of all test results using said test equipment.

I. Intrusion Detection Contractors shall have the ability to provide Auto CAD drawings of the system design and provide as-built drawings at project close out for owner retention in both electronic and paper format.

J. SDOC ITS Department representatives determine and specify all intrusion detection system equipment provided and installation labor related to the intrusion detection system end to end shall be provided and installed only by the SDOC specified and approved selected intrusion detection system contractor(s). There shall be no deviation from this stipulation other than through prior written approval submitted and obtained previous to commencement of applicable work from the SDOC ITS Department. Deviation from this stipulation by the intrusion detection system contractor not SDOC approved or sanctioned shall result in removal of all applicable intrusion detection system installation configurations and the appropriate replacement all within specified project time constraints by the contractor at no additional cost to the School District of Osceola County with no exception. No SDOC intrusion detection system project regardless of complexity shall be sub-contracted for accomplishment by another contractor by the contractor U.O.N. The intrusion detection system contractor shall be responsible to provide, install, terminate, label, program, test, adjust end to end and warranty through the manufacturer all installed intrusion detection systems inclusive of all cabling installed as contracted for all locations by SDOC ITS Department based on approved recommendations.

1. **Intrusion detection systems** backbone and infrastructure cabling, door contacts, motion sensors, horn/strobes installed:
   - Shall be of simple and non-proprietary design, types and adequate quality as specified and or preapproved for installation by School District of Osceola County Information and Technology Services Department.
   - Shall be readily replaced with similar items of differing brands available for purchase on the open market where damaged items require replacement.

2. **Intrusion detection systems** Main Panel head end, zone expander and keypad assemblies:
   - Shall be wall mountable components inclusive of all hardware easily installed on standard voice and data backboards.
   - At existing campus locations all new replacement intrusion detection head end, zone expander and keypad assembly installations shall integrate seamlessly and perform functionally with existing SDOC installed door contacts, motion sensors, horn/strobes, cabling and other field devices including all network systems as connected.
3. **Intrusion detection systems** head end systems installed:

- Shall be capable of easy interface and connection to SDOC/ITSD campus network electronics via IP address interface.
- Shall be capable of providing availability and accessibility to operating system via installed software to enable SDOC technician programming of features for routine maintenance and system troubleshooting.

4. **Intrusion detection systems** installation:

- Shall be designed with head end, cabling and field components specified and indicated on conformed documents, plans and as-builts.
- The intrusion detection systems shall provide a quality monitoring system for all circumstances as required to the satisfaction of SDOC ITS Department based on their review and approval of the proposed system.
- All intrusion detection systems installations shall address the site specific needs of all campus or other site locations for which they are installed to the complete satisfaction of SDOC ITS Department.

1.03 NEW CONSTRUCTION, RETROFIT AND RENOVATION INSTALLATIONS:

A. The installation of intrusion detection systems shall be site dependent based on numerous factors. System configuration shall be determined in the planning and design phase of the project by the SDOC ITS Department representatives based on the number of site specific buildings, and building use as well as other possible site specific considerations. All factors shall be reviewed and discussed by SDOC representatives experienced in determining the intrusion detection system needs of the location during planning and design phase of the infrastructure prior to the system selection for each project.

B. For new construction projects it shall be the responsibility of the project specific architect, engineer, general contractor and intrusion detection systems contractor to ensure all site specific details and specialized requirements are identified, discussed and addressed with SDOC Representatives for any location requiring the installation of intrusion detection systems for new construction and more importantly retrofitted sites.

C. As SDOC directed for new construction the general contractor shall provide the selected intrusion detection systems contractor to install an intrusion detection system which shall include a complete programmed, operational and ready intrusion detection system with all SDOC specified Main Panel head end and zone expander components, keypads, horn/strobes and field devices determined necessary to address all requirements, events and circumstances.

D. All SDOC intrusion detection system head end component assemblies shall be self-contained assemblies ready for installation in SDOC specified and provided or SDOC specified and contractor provided voice and data backboard designated areas in technology systems MDF and IDF Spaces. Unless SDOC
E. Intrusion Detection Contractor Capabilities:

- Shall provide and install the selected intrusion detection system for all new construction, renovation or retrofit projects. All installation in part or in whole shall be a comprehensive thorough installation determined as satisfactory and complete only by authorized SDOC Representatives.

- Shall provide and install selected whole new system installations, partial system additions or system upgrades contracted at a cost deemed reasonable by authorized SDOC Representatives regardless of circumstance. Increase in cost of installation and equipment resultant of an emergent and unforeseen circumstance is not an acceptable practice. Additionally, cost for all installations shall always provide secure, reliable, integrated intrusion detection systems that are flexible and user-friendly with all SDOC detailed, selected and approved features to extend protection and control. Reducing availability of features and or equipment to shave costs is not an acceptable practice.

- Provide and install all SDOC specified panel assemblies and connecting hardware, SDOC approved fiber optic and UTP copper patch cables, all associated mounting support material.

- Provide and install all SDOC approved surge suppression and power supply components as required for a complete turnkey SDOC selected intrusion detection system installation.

- Provide and install all SDOC ITS Department specified UTP copper and or fiber optic backbone and field device cabling (whether directly authorized for cable installation or by authorized technology services cabling sub-contractor), DMP interior and exterior keypads, door contacts, motion sensors, horn/strobes and all other SDOC specified intrusion detection field device equipment and components inclusive of all mounts, grid brackets, ceiling plates, domes, brackets, cable supports, stub outs and back boxes and pull string.

- Provide and install all cable support systems, conduit pathways, sleeving, interior and exterior wall and floor penetrations, vaults, manholes, pedestals, pull boxes and other items of a hardware nature as SDOC contracted and to SDOC satisfaction IAW Division 27 Standards and Specifications.

- All parts utilized for all installations and in all aspects of any project shall always be new, of excellent quality and of most current version or model with no exception. Use of refurbished or used / pre-owned parts is unacceptable unless authorized for use by SDOC ITSD Technology Construction Project Managers or other Authorized and qualified SDOC Representatives.
F. Beyond new construction intrusion detection system installations SDOC managed retrofit and renovation construction projects shall require careful and in-depth discussion and consideration of details regarding existing special site specific configurations and coordination to ensure all existing connections and needs are adequately identified, addressed and coordinated while retrofitting and installing a new intrusion detection system and components. Examples of the site specific although not all inclusive issues for coverage may include the following:

- Identification of any previously established site specific keypad, door contact, motion sensor, horn/strobe locations not identified at various areas as the local administration requires.
- Provision of programming to accommodate established requirements for other locations as the local administration requires.
- Other established details not routinely covered or addressed under new installation of basic intrusion detection systems to ensure all issues are thoroughly identified, discussed, coordinated and addressed.

G. Detail specific notes covering the specifics of these issues and engineered resolutions are to be inserted on the plan design pages for each project.

H. Intrusion detection system contractors shall ensure all intrusion detection systems shall be assembled, installed and tested in compliance with all manufacturer recommendations and installed to the complete satisfaction of authorized SDOC Representatives in strict accordance with all applicable SDOC Division 27 Technology Standards and Specifications.

1.04 INTRUSION DETECTION SYSTEM EQUIPMENT:

A. As previously stated in Section 27.00.02 Design Requirements it is the responsibility of the site specific project architect and engineer to conduct a meeting to address all project specifications and the needs of SDOC MTSD. Regarding the Intrusion Detection Security System design shall include but not be limited to site dependent variations of the following cabling and components:

B. Main Intrusion Detection Control Panel:

1. The IDS control panel with Ethernet connectivity shall be DMP XR550NL as manufactured by Digital Monitoring Products. The IDS control panel shall be of modular design for ease of future system extension and/or modification. Zones shall be configured for ease of operation and servicing.

2. Unless otherwise noted the Intrusion Detection Control Panel for the security system shall be provided and installed by a DMP Certified and qualified Security Contractor under the site specific General Contractor (GC).
3. Under the General Contractor an SDOC approved current Digital Monitoring Products “DMP” certified and qualified security contractor shall provide and install one (1) each Control Panel - (DMP-DIGITAL MONITORING PRODUCTS) DMP XR550NL “ONLY” (L – ON THE END OF 550NL MEANS “LARGE” CABINET/ENCLOSURE).

4. The General Contractor shall provide and install all EMT sleeving, EMT conduit stub out and box pathways and two (2) 18/4 unshielded West Penn AQ244 Security Cables from the MDF location to each IDF location where cables pass below slab and underground campus wide as security systems backbone cabling.

5. The General Contractor shall provide and install all EMT sleeving, EMT conduit stub out and box pathways and two (2) 18/4 unshielded indoor security cables from the MDF location to each IDF location where cables pass in the interior overhead locations as security systems backbone cabling.

6. The General Contractor shall for all installed cabling provide and install a ten (10) foot service slack at all MDF and IDF locations and a ten (10) foot service slack at all field device locations. All cable runs shall be labeled on both ends of each cable with typewritten, permanent, indelible wrap around labels, supported with “J” hooks supports every five (5) feet end to end, bundled for fan out prevention end to end with Velcro wraps every two (2) feet, sleeved as appropriate (with SDOC approved sleeving) and all cabling shall be tested for continuity, pair sequence, shorts, opens and grounds end to end throughout each run. All cable runs shall be installed IAW and in full compliance with all applicable areas of the SDOC Division 27 Technology Systems Standards and Specifications regarding cable installation with no exception. The door of each panel shall be labeled with a typewritten card indicating all zones to the satisfaction of the SDOC Technology Construction Project Manager.

C. Intrusion Detection Zone Expander Panel(s):

1. Where SDOC specified to support IDS components expansion IDS DMP Zone Expander Panel(s) shall be installed. Only DMP Zone Expander Panels manufactured by Digital Monitoring Products shall be installed with no exception. Zone Expander Panels shall be of modular design for ease of future system expansion. Zones shall be configured for ease of operation and servicing.

2. All Zone Expander Panels for the security system shall be provided and installed by a proven DMP current certified and qualified Security Contractor under the site specific General Contractor.

3. Under the General Contractor an SDOC approved current DMP certified and qualified security contractor shall provide and install a minimum one (1) each DMP “only” Zone Expander Panel at all IDF and MDF locations campus wide.

4. The capacity of all Zone Expander Panels for all locations shall be site dependent based upon component installation driven count requirements.
5. The following part numbers and panel specifics are provided for reference: Part Number 714 (Four Zone Expander), Part Number 714-8 (Eight Zone Expander) and Part Number 714-16 (Sixteen Zone Expander). All Zone Expanders shall be sized appropriately to cover one (1) zone for each device fed from that IDF or MDF location and allowing minimum two (2) spare zones for each zone expander panel installed for all completed installations. Note: All component cabling shall be homerun individual cables. The practice of “piggy backing” and or “daisy chaining” of components is not SDOC authorized or approved without exception.

6. Each IDF and MDF Zone Expander shall have an auxiliary power supply with battery backup installed. All device cables shall be labeled with typewritten labels and the door of each panel shall be labeled with a typewritten card indicating all zones.

7. All intrusion detection backbone cabling installed between buildings shall be installed in SDOC specified and approved conduit and vault / pull box pathways.

8. The General Contractor shall provide and install all between building and inter-building conduit pathways, all EMT sleeving, cable supports and the installation of two (2) 18/4 unshielded West Penn AQ244 Security Cables from the MDF location to each IDF location where cables pass below slab and underground campus wide as security systems backbone cabling.

9. All intrusion detection backbone cabling installed interior between floors in multi-story buildings shall be installed in SDOC specified and approved sleeved and supported cabling pathways.

10. The General Contractor shall provide and install all pathway components and two (2) 18/4 unshielded indoor security cables from the MDF location to each IDF location where cables pass in the interior overhead locations as security systems backbone cabling.

11. The General Contractor shall provide and install a ten (10) foot service slack for all backbone cables at all MDF and IDF locations below ceiling on the security voice and data backboard. All cable runs shall be coiled in a wide circular manner, supported at a minimum three (3) equal distant locations with “J” Hook supports and Velcro wraps insuring that the manufacturer bend radius is never exceeded; all cables shall be labeled on both ends of each cable with typewritten, permanent, indelible wrap around labels, supported, sleeved as appropriate and tested throughout each run.

12. All cable runs shall be General Contractor provided and installed according to SDOC cable installation specifications with no exception. The door of the main panel and each zone expander panel shall be labeled with a typewritten card indicating all zones to the satisfaction of the SDOC Information and Technology Services Department Construction Project Manager and the School Support Security Group Network Analyst.
D. Motion Sensors:

1. Motion Sensors shall be dual-technology employing microwave motion detection combined with passive infra-red heat detection to minimize false alarms.

2. Individual motion sensors shall be corner mounted or 360 degree ceiling mounted units. Motion detectors intended for use outdoors shall be designed for external use and shall be mounted using industry standard weather-resistant materials and methods.

3. The intrusion detection contractor shall mount motion detectors in accordance SDOC Technology Systems Division 27 Standards and Specifications and all manufacturer installation directives and requirements. Unless otherwise SDOC specified or noted selected motion sensors shall be ROKONET 115FC or ROKONET 150T as application dictates. (Typical for all motion sensors).

4. The General Contractor provided intrusion detection contractor shall provide and install specified motion detectors and (as SDOC specified for cabling installation) all 22/4 unshielded cable to each motion detector location with a ten (10) foot service slack on the field end and a ten (10) foot service slack at all MDF and IDF locations.

5. All cable runs shall be labeled on both ends of each cable with typewritten, permanent, indelible wrap around labels, supported, sleeved as appropriate and tested throughout each run. All cable runs shall be installed according to SDOC cable installation specifications with no exception.

E. Door Contacts:

1. The General Contractor at all new construction site installations shall provide and install all exterior doorframes with pre-drilled holes and EMT conduit stub out and box feed-throughs as intrusion detection door contact conduit and device cable pathways.

2. The General Contractor shall provide an SDOC approved verified certified and qualified intrusion detection contractor and shall provide and install all pre-drilled exterior doorframes with intrusion detection door contacts at all new construction site installations in which shall be designed to incorporate ¾ inch flush mounted contacts. Door contact manufacturer and part number shall be GE SENTROL 1078C or SDOC approved equal “only”.

3. General Contractor Specific Note: It is recommended that particular attention be directed to the sizing of the pre-drilled door contact hole for all exterior door frames. Drilling the hole to ¾ inch size is too large to accommodate the installation of door contacts that are sized at ¾ inch. Therefore, all pre-drilled door frame holes will be required to be a contractor specified smaller diameter in order for the SDOC specified ¾ inch door contacts to seat properly.

4. For existing retrofit site installations “ONLY” it will possibly be necessary to install surface mounted door contacts. Surface mount door contact manufacturer and part number shall be GE SENTROL 2500 SERIES CONTACT ASSEMBLY 2505A-L or SDOC approved equal “only”.
5. Instances where door frames are not pre-drilled and it is cost prohibitive to get cabling to the connection point or the installation would require substantial labor costs SDOC ITSD Representatives shall be contacted to determine the need and approve on an as-needed basis “only” to install surface mounted contacts. However, flush mount door contacts are the preferred selection whenever possible.

6. For roll-up doors, the door contact manufacturer and part number shall be GE SENTROL 2207AU-L or SDOC approved equal “only”.

7. The General Contractor shall provide an SDOC approved verified certified and qualified intrusion detection contractor and shall provide and install ¼ inch flush mounted door contacts (or other where SDOC approved only) and (as SDOC specified for cabling installation) all 22/2 unshielded cable to each door contact location with a ten (10) foot service slack on the field end and a ten (10) foot service slack above ceiling at all MDF and IDF locations.

8. All cable runs shall be labeled on both ends of each cable with typewritten, permanent, indelible wrap around labels, supported, sleeved as appropriate and tested throughout each run.

9. All cable runs shall be installed according to SDOC cable installation specifications with no exception.

10. See Figure 25 – Single Door Contact Installation “Typical” and Figure 26 – Double Door Contact Installation “Typical”. (Typical for all door contacts).

F. Keypads:

1. The General Contractor shall provide an SDOC approved verified DMP certified and qualified intrusion detection contractor and shall provide and install the product specified for all keypads which shall be DMP model 690 Keypad “only” manufactured by Digital Monitoring Products.

2. Keypads shall be located at primary entrances as determined by SDOC MTSD Representatives.

3. Keypads shall be installed at a standard height of sixty (60) inches A.F.F.U.O.N for convenient reading of the LCD to meet all applicable codes.

4. The General Contractor shall provide an SDOC approved verified DMP certified and qualified intrusion detection contractor to provide, install, program test and adjust all Intrusion Detection Keypads for the security system.

5. For new construction and retrofits under management by a General Contractor an SDOC approved current DMP certified and qualified security contractor shall provide and install one (1) each KEYPAD – DMP 690 “ONLY” at all designated keypad locations. Keypad stub outs shall be installed at sixty (60) inches A.F.F.U.O.N.
6. The General Contractor shall provide and install ¾ inch EMT conduit (reamed, bushed and sealed around surface penetration above ceiling) to accessible ceiling locations and all 4-inch by 4-inch (4” X 4”) back boxes at each designated keypad location.

7. The General Contractor shall (as SDOC specified for intrusion detection cabling installation) provide and install one (1) 22/4 unshielded security cable to each designated keypad location with a ten (10) foot service slack on the field end and a ten (10) foot service slack above ceiling at all MDF and IDF locations.

8. All cable runs shall be labeled on both ends of each cable with typewritten, permanent, indelible wrap around labels, supported, sleeved as appropriate and tested throughout each run.

G. Siren and Strobe Assembly:

1. Siren and Strobe assemblies (aka Horn and Strobe – “HS”) shall be located at primary entrances as determined by SDOC ITS Department Representatives during the design phase of each project.

2. Strobe and Siren assemblies shall routinely be mounted at a height of ten feet above finished grade or as determined by SDOC ITS Department and School Support Security Group Representatives at a height which shall be in compliance with all applicable codes.

3. The General Contractor shall provide an SDOC approved verified DMP certified and qualified intrusion detection contractor to provide and install Siren and Strobe assemblies in accordance with SDOC Division 27 Technology Systems Standards and Specifications and manufacturer installation requirements and directives.

4. SDOC designated Siren and Strobe assembly manufacturer and part number shall be ELK 150 RT SIREN with ELK SL1 STROBE LIGHT. (Typical for all Siren and Strobe assemblies).

5. The General Contractor shall provide and install the specified Siren and Strobe assemblies and (as SDOC specified for intrusion detection cabling installation) provide and install one (1) 18/2 unshielded cable to each Siren and Strobe location with a ten (10) foot service slack on the field end and a ten (10) foot service slack installed above ceiling at all MDF and IDF locations.

6. All cable runs shall be labeled on both ends of each cable with typewritten, permanent, indelible wrap around labels, supported, sleeved as appropriate and tested throughout each run.

7. All cable runs shall be installed according to SDOC cable installation specifications with no exception.
H. Intrusion Detection Power Specifications and Power Supply:

1. Power provided and installed for all intrusion detection systems installations shall be general power as the standard U.O.N.

2. Intrusion Detection Power supplies shall be manufactured by DMP unless otherwise approved by the School District Representative in writing.

3. All power supplies shall have a continuous rating adequate to power all zones and functions in full alarm indefinitely.

4. Unless otherwise noted all Intrusion Detection Power supplies for the security system shall be provided and installed by a DMP Certified and qualified Security Contractor under the site specific General Contractor (GC) at all SDOC designated locations.

5. General Contractor and Intrusion Detection Contractor shall be responsible for the mating of the transformer to the power receptacle.

6. If the power receptacle will not allow for the proper mounting of the transformer then the general contractor shall provide and install an SDOC approved receptacle replacement. (Typical for all Intrusion Detection Power supplies).

7. As a routine the Main Panel DMP XR550NL head end system is installed the MDF at a designated voice and data backboard wall field location. This location routinely has SDOC provided and installed general power receptacles available where the intrusion detection head end electronics shall be connected to power the intrusion detection head end system equipment electronics.

8. The Intrusion Detection System Contractor shall by SDOC ITS Department Personnel be provided an IP address and outside telephone connection for new construction and renovation locations and the Intrusion Detection System Contractor shall program and patch panel connections to SDOC network switch electronics for operation testing. SDOC ITSD Installation personnel shall be responsible to witness connection at designated port and Intrusion Detection System Contractor shall provide a patch cord of SDOC designated color “ORANGE” labeled on both ends for installation specifically for the Intrusion Detection System.

9. SDOC MTSD Installation personnel shall be responsible to report to the SDOC ITSD Technology Construction Project Manager(s) and all authorized SDOC Representatives that all connections and testing were satisfactory and report any issues regarding testing affecting the intrusion detection system equipment requiring resolution.
1.05  CABELING, RACEWAY, CONDUIT AND SUPPORT:

A. General contractor and intrusion detection contractor shall provide, install, terminate and test all cabling, conduit, sleeving, cable supports and labeling which shall comply in all respects with all SDOC Division 27 Technology Systems Standards and Specifications sections as detailed for all cabling installations outlined in Section 27.02.00 and Section 27.06.00. All intrusion detection components, hardware and cabling shall be as SDOC detailed and specified.

B. The General Contractor and intrusion detection contractor shall be responsible to provide, install, terminate, test and label all SDOC specified intrusion detection system cabling, voice and data backboards, racks, patch panels, terminations, conduit, junction boxes, cabling supports, sleeving, pathways, panels and field devices and make all items ready not later than four weeks prior to the time of SDOC scheduled substantial inspection for all SDOC projects and installations.

C. Cabling in metal conduit or surface metal raceway shall have copper conductors, sized in accordance with the equipment manufacturer’s recommendations.

D. In no case shall intrusion detection circuit cabling be less than 22 AWG stranded/solid, or alarm circuits less than 18 AWG. All junction boxes that are visible or accessible shall be marked as intrusion detection systems IDS.

E. All devices (keypads, motion detectors, etc.) shall be installed with the cabling concealed in the wall unless otherwise SDOC approved. In instances where cabling cannot be concealed in the wall the security contractor shall submit a method of concealment to the SDOC ITSD Representative for approval prior to installation.

F. All cabling to devices shall be home-run back to the local MDF and IDF locations. The keypad and LX buss cabling between buildings shall be two (2) 18 gauge 4 conductor wet location cables minimum. The product specified shall be West Penn AQ244 manufactured by CDT or SDOC approved equal.

G. All wiring shall be appropriately color-coded, and permanent cable labels shall be used to identify the terminations for each circuit at the control panel and all zone expander panels.

H. Intrusion Detection System backbone cables shall be installed from the main site location to each building and IDF location although security devices for that building may not be installed. At existing as well as new construction installation sites Security Contractors shall make all necessary efforts to protect all existing equipment, wiring, fixtures and building materials from damage during installation of equipment required. All cabling installed and not placed into operation shall be properly terminated and protected regardless of functionality. There shall be no splicing of any cabling for any SDOC technology systems with no exception.

I. All Intrusion Detection System cables for underground installation shall be outdoor rated cables of SDOC specification.
J. All Intrusion Detection System cables installed in PLENUM Air spaces shall be PLENUM CABLES and shall be readily identifiable on all cable jackets as PLENUM cable. It shall be the responsibility of the installing general contractor and intrusion detection contractor to identify the proper riser or plenum air space and determine, provide and install the appropriate riser or plenum cable for all installations and circumstances. Evidence of installation of improper cable type shall be required for immediate replacement of all effected cable by intrusion detection contractor at no additional cost or expense incurred to SDOC. Change order or additional work and material requests of this nature are not acceptable and shall not be approved. All infractions and corrective work of this nature shall be accomplished by the contractor for expected installation completion and shall not impede the scheduled substantial completion for any project.

K. All intrusion detection system cabling to both interior and exterior device locations shall be home run installed back to the local MDF and IDF locations for connection to the Main Panel or zone expander panels where the intrusion detection device signal shall be transmitted back to the Main Panel head end location in the MDF Space.

L. Copper and fiber optic backbone intrusion detection cabling between the MDF and each IDF space shall be of sufficient quantities to service all intrusion detection requirements with minimum twenty percent (20%) spare for future expansion in the building or area installed unless otherwise noted. For new construction projects it is the responsibility of the site specific architect and project engineer to ensure adequate backbone intrusion detection copper cables or backbone fiber optic cable and strand quantities are designed for each SDOC project to support not only current needs but to provide reasonable expansion capability as well. Otherwise it shall be the responsibility of the intrusion detection contractor to determine site specific needs in discussion with the SDOC ITS Department Technology Construction Project Managers and other Authorized SDOC Department Representatives and then to insure the required types and amounts of cable required are installed to SDOC satisfaction.

M. All building field intrusion detection cabling shall be neatly and professionally installed and routed by the intrusion detection contractor in accordance with all guidelines established in Section 27.02.00 of the SDOC Technology Standards and Specifications document in addition to adherence to all details as described and outlined in this document.

N. All intrusion detection cabling shall be installed at the highest ceiling point available to ensure no interference with other types of technology cables or mechanical, electrical, fire alarm and plumbing building services and their associated cabling as installed.

O. There shall be no free wired intrusion detection cables installed across bar joists where the joists are the means of support. Bar joists may be utilized for installation of SDOC approved and sanctioned cable supports with all intrusion detection cabling installed in these supports as SDOC approved for cable installations. Intrusion detection system building field infrastructure and backbone cabling:

1.) Shall not be installed across any electrical fixture or fastened or secured to any EMT conduit.

2.) Shall not be installed within 18” of fluorescent lighting.
3.) Shall not lie on or against any HVAC equipment or ducting.

4.) Shall not be fastened or secured to vent duct straps.

5.) Shall not lie on or against and shall not be fastened or secured to any sprinkler piping, copper piping, mechanical, electrical, fire alarm and plumbing building services conduit, piping, cabling or other systems and devices or their supports.

6.) Shall not be fastened or secured to existing ceiling grid hangars intended for the support of the ceiling grid at any location. Shall not be fastened or secured to existing ceiling grid hangars intended for the support of any other technology systems or other systems cable runs installed at any location. Installation of intrusion detection contractor installed ceiling grid hangars intended for installation of supports for intrusion detection system cable runs is acceptable and encouraged. All grid hangars installed for such use shall be “swatch” painted blue in color to identify their intended use when installed.

7) Cable support fastening devices shall not be clamped to any existing equipment, threaded rods, ceiling grid hangars, straps, etc. “J” hook support systems shall be installed using manufacturer supplied clamps and attachments for grid hangar installations and when drilled for installation on drywall or concrete shall be installed with SDOC approved and sanctioned fasteners “ONLY”.

P. Intrusion detection cable bundles shall be bundled together using Velcro wraps only. Intrusion detection cable bundles shall be kept in physically separate cable runs from all other technology cables and shall not touch other cable runs in any manner. Intrusion detection cable bundles shall be installed away from vibrating machinery, power cords, plug strips or other circuits with a difference of potential. All intrusion detection cabling from single runs to bundles shall be supported with SDOC approved supports including J-Hooks every five (5) feet with a Velcro wrap installed at all “J” hook stations. J-Hooks shall be at the highest accessible point in the building ceiling.

Q. Where two or more video surveillance cables are run together they shall be Velcro wrapped every 2 feet. Intrusion detection cable bundles or individual cables shall be neatly secured with Velcro wraps.

R. Fanned out cable runs or excessive drooping of cable runs is not permissible or acceptable in any instance. Excessive drooping shall be by determination of SDOC MTSD Technology Construction Project Managers. Cable ties are not an SDOC approved means of support or bundling for intrusion detection cable installations. Lacing of intrusion detection cables shall not be permitted.

S. An SDOC determined and defined amount of service slack shall be installed at all MDF and IDF locations and at field device locations. All service slack shall be neatly but not tightly coiled and shall be secured above ceiling with Velcro wraps at minimum three points on each coil and with the finished coil secured to “J” hooks.

T. At existing as well as new construction installation sites general contractors and or the intrusion detection contractor shall make all necessary efforts to protect all existing equipment, wiring, fixtures and building materials from damage during installation of equipment including provisioning of adequate
VENTILATION if covered during construction. All intrusion detection cabling installed and not placed into operation such as spare cables for future expansion shall be properly terminated, labeled on both ends to identify far end and protected regardless of functionality. All intrusion detection cable bundles or runs being installed in construction yet not currently finished and terminated shall be lifted and supported off the floor of closets in a manner to prevent any damage to sheathing. Any and all cabling damaged in any manner shall be the sole responsibility of the intrusion detection contractor to replace the entire run at no additional cost to SDOC with no exception.

U. **Warning to all contractors:** There shall be no splicing of any intrusion detection or other associated contractor installed cabling at any SDOC technology installation with no exception. Violations will not be tolerated. Do not splice a damaged cable and attempt to hide it to complete an installation. Take the time to demo out and install a new cable. It will not be viewed in a favorable light when an unauthorized splice infraction is discovered.

V. **Connector Tooling:** Tooling used to provide connectors shall be specifically designed for the connector being used. Utilization of non-specified tools shall be considered as grounds for cease and desist as well as possible grounds for termination of contract. Twist on style connectors are not acceptable for SDOC installations and shall not be installed.

W. General contractor and the intrusion detection contractor shall ensure all intrusion detection cabling passing through any wall at all locations shall be properly sleeved with SDOC UL approved sleeves and devices. Conduit sleeves shall be carefully reamed and installed with plastic bushings on both ends. All sleeving shall be installed in compliance with guidelines detailed in Section 27020 and Appendix “G” Fire and Smoke Rated Wall Penetrations of the SDOC Technology Standards and Specifications document with no exception.

X. Contractor installed equipment cabinets, panels or free standing equipment racks shall have EMT conduit sleeving installed from the equipment cabinet or panel stubbed out to the above ceiling space. The EMT conduit sleeving shall be carefully reamed and terminated with plastic bushings at all open ends. Free standing equipment racks shall have EMT conduit sleeving installed to transition cabling from above ceiling space to the interior of each space. The EMT conduit sleeving shall be carefully reamed and terminated with plastic bushings on all open ends. EMT conduit sleeving shall also be bonded to the ground bus installed in as short an installation run as possible at the local IDF or MDF as applicable on one (1) end as appropriate to comply with NEC directives in all instances. All ground cable shall be installed by the contractor and shall be strapped in its own separate run with no other cabling. All ground cables shall be installed in a separate pathway and shall not transition through technology systems conduits or sleeving.

Y. Where interior wall mounted intrusion detection system motion sensors are installed all cabling locations shall be connected to camera via single gang back boxes installed flush mount at six (6) inches below finished ceiling at the spot selected for motion sensor installation. Single gang back boxes shall be in wall flush mount and coupled to minimum 3/4 inch EMT conduit stubbed out above ceiling with bushing installed at stub out end. For locations where in wall installation is not possible or practical as deemed so by SDOC MTSD Technology Construction Project Manager surface mount is permissible as SDOC approved “ONLY”.
Z. General contractor and the intrusion detection contractor as contracted shall as a minimum ensure all intrusion detection pathway penetrations shall be properly sleeved and sealed in compliance with guidelines detailed in Section 27020 and Appendix “G” Fire and Smoke Rated Wall Penetrations of the SDOC Technology Standards and Specifications document and in accordance with all applicable fire and safety directives and codes. Example: Fire Wall penetration must be resealed using an SDOC approved and more importantly UL approved non-flammable Fire Proof/Resistant material to ensure the Fire Wall/floor/ceiling maintains original fire rating at completion of installation. The same directives apply for all smoke ratings as well.

AA. Upon completion of all intrusion detection projects a certified statement is to be submitted by the contractor assuring SDOC that all interior and exterior wall and floor penetrations whether new or existing have been sleeved and sealed in compliance with fire codes and SDOC Standard and Specifications. It shall be the contractors sole responsibility to insure any existing penetrations authorized by SDOC for use by the contractor are restored to fire and smoke rating as applicable even in instances where these penetrations may not have been properly sealed prior the contractors use.

BB. Contractors shall not utilize any existing installed technology system sleeve with or without other technology cables installed without prior permission requested and granted in writing from SDOC MTSD Technology Construction Project Manager or authorized representative. Failure to comply shall result in removal of all installed cables at the sole expense of the contractor. Upon SDOC MTSD inspection after removal of unauthorized cable installation if it is determined any existing original communications cables have sustained “burning” resultant of installation of new cables or other damage is sustained as determined by SDOC MTSD Technology Construction Project Manager or authorized representative all suspect cables shall be replaced at no additional cost to SDOC by approved technology contractors at the sole expense of the intrusion detection contractor originally incurring the initial damages.

CC. For all exterior horn/strobe or other intrusion detection installations the General Contractor shall provide and install at all exterior intrusion detection field device locations exterior to interior wall penetrations shall be 4” X 4” inch watertight double gang back boxes with weatherproof covers located on exterior surface of each building installed through wall penetration to a minimum ¾ inch EMT conduit attached and installed from back box at exterior to interior of building as sleeving into accessible interior ceiling space where conduit sleeves shall be carefully reamed to remove all burrs and sharp edges and installed with bushing or coupler IAW SDOC Division 27 Technology Systems Standards and Specifications applicable sections. All penetrations shall be sealed around sleeve surface and after cable is installed the interior assembly shall be plugged with waterproof fire retardant U/L approved and code compliant fire stopping material. All exterior box locations shall be fastened and secured to ensure compliance with applicable codes and SDOC Division 27 Technology Systems Standards and Specifications.

DD. All intrusion detection sleeves shall be properly strapped and secured to SDOC satisfaction to prevent slippage and wobbling of conduit sleeve stub outs.
EE. All intrusion detection system horn/strobes or other intrusion detection devices installed on the exterior at any location shall be installed at a minimum height of ten (10) feet above surface of the exterior of the building with the exception being in instance where covered walkways or other constructed surface will impede normal and intended functional operation of the installed device. In this exception the architect, engineer, general contractor and intrusion detection contractor shall in design phase identify the issue and adjust mounting and installation height to accommodate highest possible installation while working with SDOC ITS Department Technology Construction Project Managers to determine a different and suitable installation location to relocate the device to. This solution is also applicable for exceptions where this was not identified until time of installation where the architect, engineer, general contractor and intrusion detection contractor shall identify the issue during construction and adjust mounting and installation height to accommodate highest possible installation while working with SDOC ITSD Technology construction Project Managers to determine a different and suitable installation location to relocate the device to.

FF. All cable exposed to the exterior shall be installed in an SDOC approved appropriately sized PVC or EMT conduit pathway as SDOC specified. All conduit raceways shall be carefully reamed to remove all burrs and sharp edges. Plastic bushings shall be installed at all open conduit end terminations. All video surveillance conduits shall be properly supported, bushed and strapped to SDOC satisfaction rule of thumb being one conduit strap within two feet of beginning and end of each conduit with a conduit strap every two feet in between the entire run. This rule of thumb for strapping is applicable for all surface mount armored MC type door contact cabling installed. All exterior penetration intrusion detection system conduits shall be properly sealed around both the interior and exterior walls of the conduit with UL approved materials installed as manufacturer specified and as SDOC specified.

GG. All intrusion detection system cable connectors exposed to the weather at horn/strobe and other intrusion detection exterior device locations shall be filled with an insert of silicon ‘grease’ equal to Dow Corning DC #5 compound before mating with opposite connector half. The connection shall then be completely covered with heat shrink tubing and the cable shall be tested end to end for continuity upon completion of assembly. No taping of electrical connections is acceptable in lieu of heat shrink.

1.06 INTRUSION DETECTION SYSTEM LABELING:

A. All intrusion detection system cable runs shall be labeled with general contractor and intrusion detection contractor provided and installed labels on both ends of each cable with typewritten permanent labels, supported, sleeved as appropriate and tested throughout each run. All cable runs shall be installed according to SDOC cable installation specifications with no exception. Typical for all intrusion detection system cable installations.

B. All system panels, devices, housings, cables and power supplies shall be labeled as SDOC approved and detailed on the conformed plans. All system panels, housings, field devices, all cables (on both ends and all points of termination) and power supplies shall be labeled with legible, permanent, indelible typewritten labels with identification numbers corresponding to device numbers indicated on the conformed drawings or as SDOC specified.
C. Consult SDOC ITSD Technology Construction Project Manager(s) in the event there is no numbering system indicated or identified for appropriate number plan which shall require prior SDOC ITSD clarification and approval. Failure to label at all or gain prior approval for label plan shall result in removal of the installed labeling and replacement with SDOC ITSD approved suitable selection at the sole expense of the installing contractor.

D. Main Control Panel and Zone Expanders: A permanent typewritten schedule card listing all device zone numbers and their locations shall be installed in clear plastic and fastened in each IDS control zone expansion panel to the satisfaction of SDOC Representatives.

E. A campus map identifying all device locations shall be fastened in a clear protective cover at each IDS panel.

F. Contact the SDOC Information and Technology Services Department Construction Project Manager for amplifying information and clarification where uncertain on how to proceed regarding labeling. This includes labeling specifics for any site specific device and to determine site specific cable labeling location requirements not clarified. Contact shall be made for label scheme approval prior to installation labeling. Failure to gain prior approval shall result in removal of the installed labeling and replacement with SDOC ITSD approved suitable selection at the sole expense of the installing contractor.

G. SDOC approved identification numbers shall be permanently labeled and installed on each device and all cable ends and points of termination. Labeling descriptions for all intrusion detection system devices and cable shall be as follows:

- Door Contacts and cables shall be labeled - DC1 through DC#? Whatever the number of door contacts there are on the conformed plans.
- Motion Sensors and cables shall be labeled - MS1 through MS#? Whatever the number of motion sensors there are on the conformed plans.
- Strobe and Sirens and cables shall be labeled - SS1 through SS#? Whatever the number of Strobe and Sirens there are on the conformed plans.
- Security Backbone Cables shall be labeled - SECBB1 through SECBB#? Whatever the number of Security Backbone Cables there are on the conformed plans.
- Keypads and cables shall be labeled - KP1 through KP#? Whatever the number of Keypads there are on the conformed plans.
- Main Security Panel Chassis shall be labeled Main Intrusion Detection Security Panel
- All Zone Expander Security Panel Chassis shall be labeled - Intrusion Detection Zone Expander #1, #2 etc.
1.07 INTRUSION DETECTION SYSTEM SURGE SUPPRESSION:

A. The Intrusion Detection System shall be equipped with protective devices to prevent damage or false alarms from local lighting strikes, stray current surges, or line voltage fluctuations. Surge suppressors shall be provided for each exterior cable run as designed and installed for each exterior mounted device for associated equipment. All cables exiting any building shall be protected with SDOC approved properly installed and grounded voltage and surge suppression devices. At all locations where cables enter a building surge protection devices shall be installed. Surge protection devices shall also be installed at the Main Panel head end location. Both ends of the power and device cable shall be protected.

1. The Ditek DTK-1FS is the SDOC specified surge suppression device at all AC input installations or SDOC approved equivalent “only”.

2. The DITEK DTK-LVLP is the SDOC specified surge suppression device for installation at all DC circuits extending to the exterior of buildings SDOC approved equivalent “only”.

B. All surge suppression devices are required to be grounded and shall be bonded to a local ground bus block by a minimum home-run #10 stranded copper, green jacketed ground cable. Crimp style terminal lugs are SDOC approved and shall be installed as required. The ground bus block shall be homerun bonded to a properly grounded telecommunications ground bus bar (TGBB) by a #6 stranded copper, green jacketed ground cable. Absolutely no ‘looping’ of ground bonding cables is SDOC approved or accepted with no exception.

1.08 INTRUSION DETECTION SYSTEM PERFORMANCE:

A. Intrusion Detection Systems shall be provided, installed, terminated, tested, adjusted, programmed and documented by a qualified and certified “DMP” intrusion detection system security contractor to provide superior quality protection and optimum feature performance IAW manufacturer installation specifications to ensure highest possible quality of system performance and optimal efficient utilization of the system and all features to the complete satisfaction of the SDOC School Support Security Group Representatives.

B. The DMP intrusion detection system shall have the ability to be auto-armed according to a schedule determined by the school principal and or administration and the SDOC School Support Security Group Representative, or, armed and disarmed via access code. As well as the alternative ability to utilize proximity technology and eliminate the use of access codes.

C. When armed, the intrusion detection system shall respond immediately to alarm activation. No dialer delay is permissible or acceptable. Upon activation, the system shall be designed to activate blue siren and strobe assemblies installed at select exterior building locations. If the intrusion detection system is monitored the Main Panel or Central Station may be programmed to dial the district based on the SDOC direction provided at installation programming for completion of the project.
D. All intrusion detection systems shall be installed, programmed, configured and made ready for remote programming capability via Ethernet.

E. The main panel shall be programmed to require a closing code to prevent false alarms due to unauthorized arming of the system.

F. Each zone shall be titled in programming with an appropriate and easily understood identity as well as the zone number.

1.09 INTRUSION DETECTION COMPLETION REQUIREMENTS:

A. The Intrusion detection System installation shall be considered complete when all of the following requirements have been achieved to the complete satisfaction of all authorized SDOC School Support Security Group Representatives associated with all aspects of the site specific project installation:

1. Main Panel head end, all zone expander panels, keypads, components and field devices are installed IAW the conformed construction plans, all applicable SDOC Division 27 Technology Systems Standards and Specifications and all manufacturer installation requirements and directives.

2. The system has been verified and detects and responds to alarm activations at all connected devices.

3. The system activity is logged and visible at the SDOC Representative’s central monitoring server.

4. All new installed dead end intrusion detection cables and their unused ports are terminated, tested and identified with typewritten labels on all ends and points of termination and test results for all cables installed provided for owner retention in printed and electronic format for owner retention.

5. All Intrusion detection System head end panels and equipment are installed programmed, adjusted and tuned to manufacturers' specifications and IAW Division 27 Standards and Specifications.

6. All field and backbone intrusion detection system cabling installed to each device, enclosure, cabinet and MDF and IDF location is terminated and identified with typewritten labels on all ends including all interim points of connection to SDOC satisfaction.

7. Demolition and removal of all dead end and obsolete or replaced pre-existing cabling and equipment hardware has been accomplished by the general contractor and the Intrusion detection Contractor to the complete satisfaction of all authorized SDOC ITS Department Representatives associated with the site specific project. Removal of any SDOC identified cable of this nature is required per NEC directives and cost for removal shall be included by all contractors in all initial project quotes and bids with no exception. Accomplishment of this work line item is expected by SDOC for any and all projects as required. “After the fact” additional work change requests submitted for completion of this work are not acceptable and are expected to be accomplished under the scope of every SDOC project.
8. An as built plan in CADD, VISIO, PDF or other SDOC designated approved format indicating the Main Panel head end location, all zone expander locations, key pad locations and all interior and exterior field devices and cabling with any and all changes from the "original design configuration" has been submitted to the owner for review and retention and has been final owner approved.

9. It shall be the responsibility of the Intrusion detection security contractor to verify the condition of all ceiling tiles and the work spaces prior to installation. All broken, gouged, cracked or otherwise damaged ceiling tiles, gouged or otherwise damaged walls, gouged or otherwise damaged flooring carpet and tile or other damages not previously documented that are later identified by any authorized SDOC Representative to be caused by the Intrusion detection Contractor at the end of each project shall be repaired and or replaced as applicable by the contractor at no expense to SDOC prior to final payment authorization.

10. It shall be the responsibility of the Intrusion detection security contractor to repair any exposed surface which has been scratched or damaged during project installation to like-new condition to the satisfaction of SDOC Authorized Representatives. Upon completion of project all exterior surfaces of equipment and construction areas shall be cleaned of fingerprints, paint splatters, and other foreign substances. All construction debris such as wire trimmings, mortar, cable spools and boxes and foreign debris shall be removed from equipment areas and any area directly affected during the installation or service of equipment. All trenches shall be filled in and firmly tamped down until smooth and level with surrounding surface. All affected landscape shall be replaced and restored to previous pre-construction state.

11. The Intrusion detection security contractor shall provide a bound document complete with the as-built drawings, warranty information, installed programming, component cut-sheets for all equipment installed and completed training documentation information. For cable installed by the Intrusion detection Contractor they shall provide all fiber optic and copper cable test results in printed and electronic format for owner review and retention.

1.10 INTRUSION DETECTION ACCEPTANCE INSPECTION:

A. Project Engineer, general contractor, intrusion detection security contractor for each site specific project and the SDOC School Support Security Group Representative and ITSD Technology Construction Project Manager as site representatives shall conduct both a substantial and final inspection of all intrusion detection system installations to ensure they are in compliance with all SDOC Standards and Specifications as well as those requirements specific to the installation of intrusion detection systems. At substantial inspection all contractors shall demonstrate to the complete satisfaction of SDOC Authorized Representatives the functionality and operation of the complete installed system in the following manner:

1. Inspection and observation of the arming and disarming of the system with no zone faults. Inspection and observation of the activation of randomly selected alarms quantity determined by SDOC. Inspection and observation verifying the intrusion detection system transmits to applicable monitoring stations as appropriate. Observe device installation quality at all locations and where software interfaces are installed. All system installation devices shall be clean, tight fitting, neatly
installed, adjusted and tuned free of distortion or interruption or any unacceptable condition and
directed at the appropriate SDOC designated target. All field devices shall have SDOC designated
location identification.

2. Inspection and observation of intrusion detection Main Panel head end, all zone expanders, keypads
and field device terminations, grounding, surge suppression and labeling. All shall be satisfactory
and complete. Support systems and cable runs inspected above and below ceiling for compliance
with SDOC standards and specifications in addition to all intrusion detection areas in each MDF and
IDF space being inspected for neatness and cleanliness shall be satisfactory and complete in all areas
of each cable run.

3. Inspection and observation of other tests deemed necessary by SDOC authorized representatives to
establish proper system operability shall be satisfactory and complete to the full satisfaction of
SDOC Authorized Representatives.

4. Verification that the installed intrusion detection system Main Panel head end is programmed and
operating IAW SDOC established programming guidelines and that the system Main Panel head end
can be remotely accessed for programming information, and observation of system operability for
maintenance, troubleshooting and remote programming by SDOC Intrusion Detection System
Maintenance Technicians.

5. Verification that the above tests and measurements are documented in the operation and
maintenance manuals as as-built conditions.

6. A written report shall be provided at substantial inspection for owner’s retention and for random
testing and comparison during substantial inspection detailing all testing and operability results for
all individual installed field devices in all buildings and floors identifying each device status
inclusive of cabling with respect to all installed interior and exterior devices.

7. Verification of documented formal instruction given to owner designated key personnel at a time
selected by owner and that said instruction consists of a minimum of not less than two (2) hours
training delivered in two (2) separate sessions for a minimum total of four (4) hours training.

8. Verification of documented training covering operation, programming, troubleshooting and
maintenance for applicable SDOC Intrusion detection Maintenance Technicians. Included for
owner’s retention for each Main Panel head end project installation shall be two (2) installation and
service manuals for the applicable model of DMP Main Panel head end and all other components,
equipment assemblies and devices installed.

9. Verification in the form of formal written report, signed by the intrusion detection contractor
instructor and submitted to the owner with copies to the architect, and project engineer detailing
subjects covered, attendance sheet with signature and printed names of persons instructed, dates and
amount of instruction each person has received. This report shall be submitted within one week
following the instruction, prior to Warranty Period and prior to final project payment.
10. Upon completion of all issues identified as not complete during Substantial Inspection a Final Inspection shall be conducted by SDOC ITSD Technology Construction Project Manager(s) or Authorized Representative(s) to verify all issues have been completed to SDOC satisfaction. At this time the intrusion detection contractor shall also deliver the installation warranty certificate and all documentation for owner retention. Closeout documentation from contractor shall include a final SDOC verified Intrusion Detection Worksheet containing the following information:

- All applicable device model numbers
- All applicable device serial numbers
- All applicable device MAC Address(s)
- All applicable device IP address(s)
- All device locations
- Device installations with Building Number
- Device installations with IDF or MDF location room number
- All applicable IDF or MDF network switch number(s)
- All applicable network switch port number(s)
- All applicable IDF or MDF patch panel number(s) and port number(s).

11. Upon completion of Final Inspection issues and receipt of all project documentation inclusive of warranty certificates for both DMP Intrusion Detection System and any applicable cable warranty to SDOC satisfaction final payment for the project shall be authorized and a contractor evaluation sheet shall be completed by the SDOC ITSD Technology Construction Project Manager or Authorized Representative to record the contractor’s performance. This evaluation sheet shall be submitted to the contractor for their retention and shall be retained in the project records by SDOC.

12. All documentation required and specified in this document as well as all other applicable sections and appendixes of the SDOC Standards and Specifications shall be provided for completion to SDOC ITS Department Technology Construction Project Manager or Authorized Representative for owner retention.

1.11 INTRUSION DETECTION SYSTEM WARRANTY:

A. For a period of one year from the date of SDOC approved and documented final inspection completion the installed intrusion detection system as detailed shall be guaranteed free of defects in materials and workmanship by the general contractor and installing intrusion detection contractor for all intrusion detection system panels, equipment, programming, components, field devices and cabling.

B. Any intrusion detection system panel assembly, device or component inclusive of all cabling indicating evidence of failure, improper or incorrect operation during this one (1) year warranty period shall be repaired or replaced by the intrusion detection contractor at no expense to SDOC as specified in the contract documentation.
C. All intrusion detection system equipment and cabling shall be guaranteed by the installing intrusion detection contractor for a period of five (5) years from the date of SDOC approved and documented final inspection completion for the installed intrusion detection system to be free of defects in materials and workmanship at no cost to SDOC for labor to repair.

D. The installing intrusion detection contractor shall guarantee availability of all intrusion detection system main panel and zone expander parts and equipment including all assemblies, circuit cards and devices for a period of ten (10) years from the date of SDOC approved and documented final inspection completion for the installed intrusion detection system.

E. During the course of any SDOC project where Category 6 copper and fiber optic data cabling as well as for all other copper coaxial and cables required for provision and installation by the intrusion detection contractor during the installation of the intrusion detection system or as otherwise required in support of the installation are subject to the requirements of SDOC Division 27 Technology Systems Standards and Specifications guidelines defined in Section 270200 for installation of all cabling. Cabling installation requirements, certifications and warranty specifics apply for all technology and technology related cable installations. The certifications, installation specific requirements and warranty for these installations are defined in section 27020 of the SDOC Technology Systems Standards and Specifications. The technology systems cabling warranty for all such contractor installed applicable installations shall be provided by the intrusion detection contractor at Final Inspection and shall accompany the applicable Intrusion Detection System Warranty documentation for owner retention inclusive of all cabling test results in both written and electronic format for all such installations prior to final payment.

1.12 INTRUSION DETECTION SYSTEM AS-BUILT DRAWINGS:

A. General: A comprehensive intrusion detection system as-built drawing of all project red lines shall be provided in CADD, VISIO, PDF or other SDOC requested format for owner retention at substantial inspection containing at a minimum the following information:

1. A block diagram of the installed system indicating cables, cable types, active and passive components.

2. A block diagram of the building or campus sites indicating the Main Panel head end location, all zone expander locations newly installed all motion sensor types, door contact types, keypad types, horn/strobe types at all locations interior and exterior for the new installed system.

3. A block diagram of the building or campus sites indicating the zone/area layout of the system.

4. If the site has as built CAD drawings available the intrusion detection contractor shall update the intrusion detection system as-built to match the installed system as approved by authorized SDOC ITSD Representatives.
1.13 TYPICAL DETAIL DRAWINGS FOR INTRUSION DETECTION INSTALLATION:

Figure 25 – Single Door Contact Installation “Typical”

SECURITY SINGLE DOOR – MAGNETIC DOOR POSITION SWITCH (DPS)

Figure 25 – Single Door Contact Installation “Typical”
Figure 26 – Double Door Contact Installation “Typical”

SECURITY DOUBLE DOOR – MAGNETIC DOOR POSITION SWITCH (DPS)
Figure 27 – Surface Mount Door Contact Installation “Typical”
Figure 28 – Motion Sensor Installation “Typical”
Figure 29 – Intrusion Detection Installation “Typical”

DETAIL NOTES:

1. 22/4 UNSHIELDED CABLE FOR KEYPAD WITH A 10' SERVICE LOOP AT EACH END
2. 22/2 UNSHIELDED CABLE FOR DOOR CONTACTS WITH A 10' SERVICE LOOP AT THE DOOR AND A 20' SERVICE LOOP AT THE MDF/IDF LOCATION
3. 22/4 UNSHIELDED CABLE FOR MOTION SENSOR WITH A 10' SERVICE LOOP AT THE DOOR AND A 20' SERVICE LOOP AT THE MDF/IDF LOCATION
4. 18/2 UNSHIELDED CABLE FOR STROBE AND SIREN WITH A 10' SERVICE LOOP AT THE DOOR AND A 20' SERVICE LOOP AT THE MDF/IDF LOCATION
5. CABLES SHALL BE PROPERLY LABELED AND TERMINATED IN MAIN PANEL, ALL ZONE EXPANDER CABINETS, ALL FIELD DEVICES AND CABLE ENDS
6. MAIN PANEL AND ALL ZONE EXPANDER PANELS SHALL HAVE TWO SPARE PORTS FOR EXPANSION AT COMPLETION OF ALL NEW CONSTRUCTION AND RENOVATION PROJECTS.

INTRUSION DETECTION BUILDING WIRING
NOT TO SCALE

Figure 29 – Intrusion Detection Installation “Typical”
1.01 GENERAL REQUIREMENTS AND SUMMARY:

A. Video Surveillance systems are crucial in the protection of life and property. It is imperative they function properly and reliably. This specification is developed to ensure all Video Surveillance systems are installed to provide the maximum coverage at peak operability.

B. Section 270700 in combination with other applicable sections of the SDOC Standards and Specifications details and defines SDOC expectations for quality, specifics in manufactured components and installation practices for video surveillance system installations.

C. All schools within the district shall have a Video Surveillance System. Overall, the same basic standard and similar video surveillance system shall be installed at all district locations. However, each video surveillance system installed shall have distinct and varied characteristic combinations of components and programming that comprises the head end, cameras and all other designated components as designed for either an ANALOG or DIGITAL video surveillance system.

D. For every general contractor managed SDOC new construction video surveillance installation it shall be the responsibility of the project architect, engineer and general contractor to meet with and solicit input of authorized SDOC technology representatives experienced in addressing video surveillance system specific needs of the district for all sites and situations to determine and establish the project parameters specific to video surveillance system requirements.

E. For all SDOC MTSD generated, sanctioned and direct managed video surveillance installations it shall be the responsibility of the video surveillance contractor to meet directly with authorized SDOC technology representatives to address all video surveillance system specific needs for all projects to determine and establish the project parameters and requirements specific to MTS Department contracted and managed video surveillance system installations.

F. Product quality, durability, reliability, operability and ease of functionality are all key SDOC issues of concern and scrutiny for all video surveillance installations inclusive of the installation, support, termination, programming, testing, adjustments and labeling identification for all video surveillance head end assemblies, field devices, cabling and hardware, grounding, supports and pathways. For every SDOC contracted video surveillance system project it shall be the responsibility of the general
contractor or as project site specifics dictate the video surveillance contractor or combined effort to meet and exceed all SDOC expectations for all SDOC video surveillance installations and to comply in all respects as a minimum with all directives and details of this document with no exception.

G. In the best interest of the School District of Osceola County video surveillance components on any scale end to end from the head end assemblies and equipment to the end user field camera devices and cabling determined by SDOC Authorized Representatives as inferior in any aforementioned aspect shall be removed immediately by the contractor and replaced with SDOC approved suitable replacements at no additional cost to the School District of Osceola County with no exception. All contractor recommended changes or substitutions to the project installation shall be submitted by the contractor in writing to the SDOC MTS Department Authorized Representatives using SDOC Standards and Specifications Appendix “D” Standards Variance Sheet prior to substitution or there shall be no change or substitution. All changes or substitutions shall be approved in writing by the SDOC MTS Department or they are not considered authorized and approved and shall not occur.

H. All requirements detailed in this document are intended for compliance as applicable at all SDOC projects involving the provision and installation of new SDOC specified head end and assemblies or upgrade of existing SDOC specified video surveillance head end and assemblies affected in any aspect. All requirements listed are applicable for any SDOC specified and required combination where SDOC deems appropriate to the installation whether it is the provision and installation of a new SDOC specified head end and assemblies with all field cabling and components, the installation of a new SDOC specified head end and assemblies “only”, the addition of new SDOC specified camera and cable locations, SDOC specified new or replaced interior and exterior individual cameras, all SDOC specified cabling, cameras or other as yet unidentified SDOC specified video surveillance head end or field components, hardware or devices and items contracted. This document is to ensure all SDOC specified project specific details are addressed regarding but not limited to the determination of the SDOC specified need for a new head end installation, the needs to upgrade an existing head end, the needs to install additional interior and exterior individual cameras, SDOC specified cabling or other items perhaps required. Additionally if a new head end were not required to identify the SDOC specified needs to provide and install new assemblies, circuit card quantities and components or other items required to adequately support an existing installation to SDOC satisfaction. These requirements shall include the provision to SDOC satisfaction by the contractor of all programming, adjustments and testing involved to make the entire installation fully functional at all points for all newly installed items including the head end, all assemblies, and all field cabling, components and devices to the complete satisfaction of designated qualified SDOC Technology Representatives. All quotes shall be inclusive of provision and installation of all fiber or copper patch cords, connecting hardware, surge suppression and grounding U.O.N.

I. Key authorized SDOC personnel experienced in the field of video surveillance systems shall determine the physical locations for all system components and devices specified for the video surveillance system during the initial design phase for each project.

J. It shall be understood by all contractors that installation and programming shall only be accomplished by technicians of the video surveillance contractor trained and certified to properly install and program the circuits and devices as designed.
K. It is the decision of the administration at each individual campus or other site to grant access and monitoring privileges to employees. Each school principal or site administrator shall determine and approve acceptable pass-codes, which shall be provided to the appropriate School District Representatives.

L. Video surveillance contractor shall provide factory certification training on all purchased equipment to SDOC video surveillance service technicians as requested at no additional charge.

M. Video surveillance contractor shall provide end user training on all purchased equipment to key campus or other staff at no additional charge for each Video surveillance project installation and for all other Video surveillance projects where requested by SDOC authorized representatives.

N. Video surveillance contractor shall provide to SDOC video surveillance service technicians all necessary client software to manage, program, and troubleshoot Video surveillance systems purchased by SDOC.

O. Video surveillance contractor shall provide to SDOC video surveillance service technicians upon request all necessary client software upgrades and firmware updates for video surveillance systems purchased by SDOC at no additional cost to SDOC for the life of each original head end installation.

P. New or refurbished repair components shall be available for all video surveillance systems purchased by SDOC for a minimum of 10 years after purchase date.

Q. All items of equipment including wire, cable and hardware for every video surveillance installation shall be designed by the video surveillance manufacturer to function as a complete system and shall be accompanied by the manufacturer's complete service notes and drawings detailing all interconnections.

R. Video Surveillance contractor shall have local service facilities within 75 miles of the School District of Osceola County offices located at 817 Bill Beck Blvd in Kissimmee, Florida. Contractor shall in all instances be able to provide same day response to service requests as SDOC deems necessary. The Contractor shall maintain at this facility the necessary spare parts in the proper proportion as recommended by the manufacturer to maintain and service the equipment being supplied. Contractor shall show satisfactory evidence, upon request, that they maintain a fully equipped service organization with a full time staffed office capable of furnishing adequate inspection and service to the affected system(s) as follows:

- On site response within two hours for circumstances deemed urgent or emergent by authorized SDOC Representatives.
- On site response prior to close of business same day for circumstances deemed routine or of a non-emergent nature by authorized SDOC Representatives.

S. Unless otherwise noted the installing video surveillance contractor shall provide an installation inclusive of all labor, all head end component equipment and supporting hardware and patching
cables, all field devices and supporting hardware, all camera licenses, programming, testing, adjustment, training and all other materials necessary for a complete functional programmed and operational system to the complete satisfaction of SDOC. The scope of work designed with these specifications is to ensure the delivery of a complete and functional video surveillance system ready for operation.

T. Omission of any essential detail from these specifications or SDOC generated scope of work shall not relieve the installing video surveillance contractor of their obligation to provide a complete and functional integral analog or digital video surveillance system as expected by SDOC to be ready for operation at close of project.

U. Regardless of scope or governing authority the video surveillance contractor shall be responsible for full compliance with all Division 27 SDOC Standards and Specifications Sections for any installation where applicable.

V. There shall be no contractor initiated changes for SDOC specified components, devices or features without SDOC pre-approved review and discussion where written documentation as defined in SDOC Division 27 is submitted and approved for said exceptions that indicate said changes are addressed and authorization indicated prior to contract with SDOC MTSD. Regardless of approval of samples, cut sheets, shop drawings, and other matter submitted by the contractor there shall be accompanying and approved documentation supporting approval which shall be obtained or there shall be no authorized substitute.

W. All video surveillance head end equipment, software, components and devices, cameras, cabling and hardware shall be contractor provided and installed and programmed. All items shall be new and where applicable shall be the most recent version and revision. All items shall be of current SDOC specified manufacture and provided with standard SDOC approved warranty. Contractor shall provide two complete shop repair manuals and parts lists shall be furnished with each equipment installation at the time of project closeout and delivery.

X. The Analog DVR Main Unit(s) or Digital IP Server Main Unit(s) shall as a routine be installed in the MDF Space in a free standing two post equipment rack or server cabinet solely for that purpose and where designated for installation by authorized SDOC Technology Area Supervisors and Project Managers as determined during the construction design and planning process.
Y. The exact quantity, specifications and location of video surveillance cameras shall be site dependent as detailed and approved by SDOC MTSD Representatives and where applicable the Architect and Project Engineer. Typical locations for monitoring consideration of the video surveillance system shall include but in no way are limited to:

- Reception areas
- Main lobby area
- Cafeteria Dining and Serving areas
- Bus loop drop off and pick up areas
- Parent drop off and pick up areas
- Courtyards
- Play areas
- Stairwells
- Parking areas
- Corridors
- Entrance gates
- Community areas and other locations as specified by the Principal, School Administration and authorized SDOC MTSD Representatives.

The exact quantity, model and specific camera locations shall be dependent on the site plan as approved by authorized SDOC MTSD Representatives and where applicable the Architect and Project Engineer.

During new construction design process authorized SDOC MTSD Representatives shall indicate the location and installation of numerous camera sites interior and exterior at every building. The contractor shall install all indicated locations. Still and all this does mean that every camera location installed will initially be utilized with a camera installed. There shall be locations installed for future installation that by virtue of the cost effectiveness to install the cabling and camera station infrastructure now this is accomplished for future. All physical camera installations shall be determined and specified by authorized SDOC MTSD Representatives during the construction process for installation by SDOC MTSD Representatives or each physical station designated for a camera installation shall be indicated for installation by the general contractor and video surveillance contractor on the conformed plans.

All video surveillance cameras installed on the exterior surface of any building whether new construction or existing retrofitted building at any location shall be installed at a minimum height of ten (10) feet above surface of the exterior of the building with the exception being in instance where covered walkways or other constructed surface will impede normal and intended functional view and operation of the installed device as determined by SDOC Authorized Representatives inclusive of SDOC Technology Construction Project Managers. In this exception the architect, engineer, general
contractor and intercom contractor shall in design phase identify the issue and adjust mounting and installation height to accommodate highest possible installation below covered walkways or other constructed surfaces while working with SDOC MTSD Technology Construction Project Managers to determine the most suitable new installation location to relocate the camera. This solution is also applicable for exceptions where this was not identified in the design process and only identified at time of installation where the architect, engineer, general contractor and intercom contractor shall identify the issue during construction and adjust mounting and installation height to accommodate highest possible installation below covered walkways or other constructed surface working in conjunction with SDOC MTSD Technology construction Project Managers to determine the most suitable new installation location to relocate the device. In all instances relocation in these circumstances shall be at no additional cost to the school district as it is the responsibility of the architect, engineer and the general contractor to identify all such design considerations and construction related issues and anticipate these items by adjusting and making corrective action in advance of construction and any installation.

1.02 VIDEO SURVEILLANCE CONTRACTOR QUALIFICATIONS AND REQUIREMENTS:

A. All SDOC selected Video Surveillance Contractors shall provide documented proof as evidence of the ability, capacity, and skill of the Firm to be able to provide all services specified and here in addressed. Selected Contractor shall produce substantiating evidence they are an established operated business for a minimum five (5) years and are a licensed, bonded low voltage company and a duly authorized distributor with full manufacturer's warranty privileges for a minimum of five (5) years with a minimum of three (3) years’ experience in the educational market.

B. Video Surveillance Contractor shall be qualified to provide design and consulting services for video surveillance distribution systems. Contractor shall have the ability to provide Auto CAD drawings of the system design and as-built drawings upon project completion in addition to PDF, VISIO or other format as SDOC requested.

C. All SDOC selected Video Surveillance Contractors as proof and evidence of the following documentation shall furnish to SDOC and maintain current the following specified SDOC licenses, certifications and requirements:

1. Current State of Florida Low Voltage Contractor’s License specific for the low voltage systems being installed.

2. Current documented manufacturer installation and warranty authorization certification from the selected video surveillance manufacturer approving the contractor for installation and warranty of the selected video surveillance system installed in the State Of Florida.

3. Video Surveillance Contractors inclusive of their associated sub-contractors at any SDOC location for any purpose shall be in complete compliance with all SDOC requirements with regard to the Jessica Lunsford Act prior to acceptance of any SDOC contract. Failure in
compliance shall result in disqualification of approved quote and award to compliant contractor as defined in section 270200.

4. Shall provide current documentation and certification in the form of video surveillance manufacturer authorized and trained installation and maintenance technicians. All video surveillance contractor technicians dispatched to service SDOC video surveillance system equipment shall be factory trained with current certification. Proof shall be required to be produced on demand.

5. Contractor shall read, understand and comply in all respects with the directives contained in the School District of Osceola County, Florida Division 27 Technology Standards and Specifications as written and modified regardless of intent of their company to directly install copper or fiber optic cabling or to accomplish cable installation through a technology systems cabling sub-contractor.

6. Contractor understands that the most current version of these Technology Standards and Specifications may be located at the SDOC Website under the Media and Instructional Technology Services Department section at [http//www.osceola.k12.fl.us/depts./IMC/Index.asp](http://www.osceola.k12.fl.us/depts./IMC/Index.asp).

7. Contractor further understands that in any question or exception as to the validity of current posted Division 27 Technology Standards and Specifications they may contact the SDOC Media and Technology Services Department for updates and verification. Contact may be established directly with the department at 407-870-4669 to either receive verification or clarification information, or to be provided the most current and up to date version of the standards and specification or both. Points of contact for information shall be directed through the SDOC Media and Technology Services Department to the Technology Construction Project Managers.

8. **SPECIFIC NOTE TO ALL SELECTED VIDEO SURVEILLANCE CONTRACTORS:**

   a. For any cabling installation to be accomplished directly by any selected video surveillance contractor the contractor shall provide to SDOC Technology Construction Project Manager(s) and authorized SDOC Representatives current documentation and certification that the company retains on permanent staff a current and certified BICSI RCDD (Registered Communications Distribution Designer.) providing name and current certification for all RCDD’s assigned to SDOC video surveillance system project installations.

   b. If the selected video surveillance contractor chooses not to provide a current and certified BICSI RCDD (Registered Communications Distribution Designer.) on staff that video
surveillance contractor shall not be authorized to install any video surveillance system cable in any respect.

c. In such instances where cable installation is required by the selected video surveillance contractor it shall be the sole responsibility of the selected video surveillance contractor to contract and provide a sub-contractor with the require certificates and qualifications and forward proof as evidence to the satisfaction of SDOC Technology Construction Project Manager(s) and authorized SDOC Representatives of current documentation and certification prior to cable installation.

d. Further, If the selected video surveillance contractor chooses not to provide documented current structured cable certification authorizing the installing agent/company to offer one of “ONLY” the following selected technology manufacturers COMPLETE CLOSED PANDUIT, ORTRONICS or AMP/TYCO SOLUTION Extended Product warranty for a minimum fifteen years from date of installation acceptance for properly registered and approved projects in the State of Florida to include product installation of fiber optic and up to Category Six termination, testing and warranty per SDOC standards and specification with manufacturer certifications for all trained and approved installation and maintenance technicians assigned to SDOC video surveillance projects that video surveillance contractor shall not be authorized to install any video surveillance system cable in this respect.

e. In such instances where fiber optic and up to Category Six termination, testing and warranty cable installation is required by the selected video surveillance contractor it shall be the sole responsibility of the selected video surveillance contractor to contract and provide a sub-contractor with the require certificates, qualifications and warranty authorization and forward proof as evidence to the satisfaction of SDOC Technology Construction Project Manager(s) and authorized SDOC Representatives of current documentation and certification prior to cable installation.

D. NOTE: All documentation and certifications required of the Project Video Surveillance Contractor apply and shall be produced for SDOC regarding both their company and any and all Technology Sub-Contractors intended to assist the Video Surveillance Contractor in performance of any and all SDOC project work.

1. No technology work shall be contracted in SDOC to technology contractors that do not produce valid current documented proof of qualifications and certifications satisfying SDOC requirements.

2. Prior approval to utilize video surveillance sub-contractors shall be obtained in written format from authorized SDOC representatives or they shall not be SDOC approved and authorized to proceed at any SDOC contracted project.

3. In rare instances where SDOC approved all Video Surveillance sub-contractors shall be required to provide to SDOC as evidence of proof the same certification documentation required of the SDOC approved selected Video Surveillance Contractor prior to approval and authorization to proceed.
4. Regardless of SDOC approval and authorization of the use of any Video Surveillance subcontractor by the Video Surveillance Contractor, the Video Surveillance Contractor shall always be held liable for any and all aspects, issues, certifications and warranties regarding the entire scope of each video surveillance project contracted with no exception.

E. Video Surveillance Contractors shall have sufficient personnel and facilities to be able to provide two hour on-site response time for all circumstances involving the installed video surveillance system. The contractor shall provide a toll free number for twenty-four hour on-call support service.

F. Video Surveillance Security Contractors shall have performed work of comparable scope at educational facilities within the last two years and submit proof of exemplary performance on demand as required at the request of School District Representatives and if required shall arrange site visits for review of installed systems.

G. A resume of qualification shall be submitted with the Contractor's bid indicating the following:

1. A list of like completed projects for the past three (3) to Five (5) years of similar type and size with contact names and telephone numbers for each. Previous experience with similar projects for the School District of Osceola County. (If any.)

2. Contractor or their designated SDOC approved sub-contractor shall have available current calibrated SDOC approved test equipment to verify the integrity of all newly installed metallic cable or fiber optic cable systems as SDOC specified for every project. The following is a list of required test equipment necessary for certification of all premise wiring installations and intercom cabling system installations.
   i. OTDR for Multi-Mode Fiber Optics
   ii. OTDR for Single Mode Fiber Optics
   iii. Light Source Power Meter
   iv. Volt/Ohm Meter
   v. LAN Cable Certification Meter- 350 MHz

3. Test Results Documentation: For all Category Six and Fiber Optic cable installation all Video Surveillance System Contractors shall provide to owner for retention in-depth cable test results in both printed and electronic format. All test equipment utilized shall have a current valid legible and unaltered calibration sticker on the equipment. Test results provided that have been documented utilizing test equipment that has no sticker, is uncalibrated or utilizing test equipment indicating that the test equipment is not within current calibration time limits on sticker shall not be accepted and shall result in the contractor provisioning acceptable calibrated test equipment retesting and resubmission of all test results using said test equipment.
1.03  **IP BASED DIGITAL AND ANALOG VIDEO SURVEILLANCE SYSTEM OPERATION:**

A. SDOC MTS Department representatives determine and specify all video surveillance system equipment provided and installation labor related to the video surveillance system end to end shall be provided and installed only by the SDOC specified and approved selected video surveillance system contractor(s). There shall be no deviation from this stipulation other than through prior written approval submitted and obtained previous to commencement of applicable work from the SDOC MTS Department. Deviation from this stipulation by the video surveillance system contractor not SDOC approved or sanctioned shall result in removal of all applicable video surveillance system installation configurations and the appropriate replacement all within specified project time constraints by the contractor at no additional cost to the School District of Osceola County with no exception. No SDOC video surveillance system project regardless of complexity shall be sub-contracted for accomplishment by another contractor by the contractor U.O.N. The video surveillance system contractor shall be responsible to provide, install, terminate, label, program, test, adjust end to end and warranty through the manufacturer all installed video surveillance systems inclusive of all cabling installed as contracted for all locations by SDOC MTS Department based on approved recommendations.

B. For day-to-day operation **digital and analog video surveillance systems:**
   
   1. Shall operate on a third party server.
   2. Support multiple remote clients.
   4. Support PDA or TABLET applications.
   5. Support MPEG-4 and H.264 Compression.

C. **Digital and analog video surveillance systems** backbone and infrastructure cabling, interior and exterior cameras installed:
   
   1. Shall be of simple and non-proprietary design, types and adequate quality as specified and or preapproved for installation by School District of Osceola County Media and Technology Services Department.
   
   2. Shall be readily replaced with similar items of differing brands available for purchase on the open market where damaged items require replacement.
   
   3. A comprehensive yet not all inclusive list of SDOC approved and specified non-proprietary cabling and components are included in this document for reference.

D. **Digital and analog video surveillance systems** head end assemblies:
1. Shall be rack mountable components inclusive of all hardware capable of switched operability on 208 VAC 30 amp 60 HZ power and easily installed in standard free standing nineteen (19) inch two post rack assemblies.

2. At existing campus locations all new replacement video surveillance head end installations shall integrate seamlessly and perform functionally with existing SDOC installed cabling, surge suppression and intercom field components including all existing installed interior and exterior cameras, cabling and network systems.

E. Digital and analog video surveillance systems head end systems installed:

1. Shall be capable of easy interface and connection to SDOC/MTSD campus network electronics via IP address interface.

2. Shall be capable of providing availability and accessibility to operating system via installed software to enable SDOC technician programming of features for routine maintenance and system troubleshooting.

F. Digital and analog video surveillance systems installation:

1. Shall be designed with head end, cabling and field components specified and indicated on conformed documents, plans and as-builts.

2. The video surveillance system shall provide a quality video output for all circumstances as required to the satisfaction of SDOC MTS Department based on their review and approval of the proposed system.

3. All video surveillance system installations shall address the site specific needs of all campus or other site locations for which they are installed to the complete satisfaction of SDOC MTS Department.

1.04 NEW CONSTRUCTION, RETROFIT AND RENOVATION INSTALLATIONS:

A. The selection process for installation of either a complete analog video surveillance system or a complete IP based digital video surveillance system shall be site dependent based on numerous factors. System selection shall be determined in the planning and design phase of the project by the SDOC MTS Department representatives based on the number of site specific buildings, distance between buildings with other possible site specific considerations. All factors shall be reviewed and discussed by SDOC representatives experienced in determining the video surveillance system needs of the location during planning and design phase of the infrastructure prior to the system selection for each project.

B. For new construction projects it shall be the responsibility of the project specific architect, engineer, general contractor and video surveillance contractor to ensure all site specific details and specialized requirements are identified, discussed and addressed with SDOC Representatives for
any location requiring the installation of video surveillance system for new construction and more importantly retrofitted sites.

C. As SDOC directed for new construction the general contractor shall provide the selected video surveillance system contractor to install a video surveillance system which shall include a complete programmed, operational and ready Analog or IP based digital video surveillance system with all SDOC specified head end components, specified features and field devices determined necessary to address all routine requirements, events and emergent circumstances.

D. All SDOC video surveillance system head end component assemblies shall be self-contained assemblies ready for installation in SDOC specified and provided or SDOC specified and contractor provided free standing nineteen (19) inch two post technology systems racks. Unless SDOC specified special circumstance is approved in writing SDOC Division 27 specifications dictate no video surveillance system cabinet enclosure either wall mount or free standing shall be installed. Still and all, when SDOC specified special circumstance is pre-approved the SDOC specified cabinet enclosure shall be a free standing Chatsworth Series “M” Mega Frame cabinet enclosure “only” and of the size and configuration as SDOC dictates.

E. Video Surveillance Contractor Capabilities:

1. Shall provide and install the selected digital or analog video surveillance system for all new construction, renovation or retrofit projects. All installation in part or in whole shall be a comprehensive thorough installation determined as satisfactory and complete only by authorized SDOC Representatives.

2. Shall provide and install selected whole new system installations, partial system additions or system upgrades contracted at a cost deemed reasonable by authorized SDOC Representatives regardless of circumstance. Increase in cost of installation and equipment resultant of an emergent and unforeseen circumstance is not an acceptable practice. Additionally, cost for all installations shall always provide secure, reliable, integrated video surveillance systems that are flexible and user-friendly with all SDOC detailed, selected and approved features to extend protection and control. Reducing availability of features and or equipment to shave costs is not an acceptable practice.

3. Provide and install all SDOC specified head end assemblies and connecting hardware, SDOC approved fiber optic and copper patch cables, all associated mounting support material.

4. Provide and install all SDOC approved surge suppression and power supply components as required for a complete turnkey SDOC selected video surveillance system installation.

5. Provide and install all SDOC specified copper and or fiber optic backbone, field device cabling, interior and exterior cameras and all other SDOC specified video surveillance field device equipment and components inclusive of all mounts, grid brackets, ceiling plates, domes, stub outs and back boxes and pull string.

6. Provide and install all cable support systems, conduit pathways, sleeving, interior and exterior wall and floor penetrations, vaults, manholes, pedestals, pull boxes and other items of a
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hardware nature as SDOC contracted and to SDOC satisfaction IAW Division 27 Standards and Specifications.

7. All parts utilized for all installations and in all aspects of any project shall always be new, of excellent quality and of most current version or model with no exception. Use of refurbished or used / pre-owned parts is unacceptable unless authorized for use by SDOC MTSD Technology Construction Project Managers or other Authorized and qualified SDOC Representatives.

F. Beyond new construction video surveillance system installations SDOC managed retrofit and renovation construction projects shall require careful and in-depth discussion and consideration of details regarding existing special site specific configurations and coordination to ensure all existing connections and needs are adequately identified, addressed and coordinated while retrofitting and installing a new video surveillance system and components. Examples of the site specific although not all inclusive issues for coverage may include the following:

1. Identification of any previously established site specific camera locations not identified at various areas as the local administration requires.
2. Provision of programming to accommodate established requirements for other locations as the local administration requires.
3. Other established details not routinely covered or addressed under new installation of basic video surveillance systems to ensure all issues are thoroughly identified, discussed, coordinated and addressed.

G. Detail specific notes covering the specifics of these issues and engineered resolutions are to be inserted on the plan design pages for each project.

H. Video surveillance system contractors shall ensure all video surveillance systems shall be assembled, installed and tested in compliance with all manufacturer recommendations and installed to the complete satisfaction of authorized SDOC Representatives in strict accordance with all applicable SDOC Division 27 Technology Standards and Specifications.

1.05 VIDEO SURVEILLANCE SYSTEM POWER SPECIFICATIONS:

A. Power installed for all Analog and IP Digital video surveillance head end systems installations shall be clean power as the standard unless otherwise noted. For all field cameras devices general power shall be provided and installed.

B. As a routine the Analog and IP Digital Video Surveillance head end system is installed the MDF at a designated two post free standing rack location. This location routinely has SDOC provided and installed UPS equipment powered by the campus clean power system where the video surveillance head end electronics shall be connected to power the video surveillance head end system equipment electronics.
C. SDOC MTSD shall provide and install all APC UPS equipment appropriately sized for one (1) hour up time including SNMP Module for the general contractor provided and installed video surveillance system.

D. SDOC MTSD is responsible for the procurement, installation and testing of the appropriate UPS equipment prior to the connection and testing of the video surveillance equipment.

E. Each interface connection and associated testing between the video surveillance contractor provided and installed video surveillance head end electronics and the SDOC Media and Technology Services Department provided and installed UPS equipment shall be witnessed by authorized technician’s representative of both the video surveillance contractor and SDOC Media and Technology Services Department. Upon satisfactory completion of all connections and testing both representative technicians shall sign a UPS Confirmation Ticket verifying both the UPS and the video surveillance head end are functioning properly at the time of installation.

F. The Analog PELCO DVR System shall be set to receive power and connected to operate from an SDOC MTSD installed APC UPS rated at 208VAC 30amp from a connection designated and labeled by SDOC MTSD personnel on the UPS as specifically for the DVR System.

G. SDOC MTSD Representatives shall be responsible to be on site during installation and testing of the installed video surveillance system for initial connection and powering up of the UPS equipment, to provide connection assistance and witness the initial installation testing of the video surveillance system when connected to the UPS equipment to ensure there are no issues with the UPS equipment when connected to the video surveillance system.

H. SDOC MTSD Installation personnel shall be responsible to report to the SDOC MTSD Technology Construction Project Manager(s) and all authorized SDOC Representatives that all connections and testing were satisfactory and report any issues regarding testing affecting the video surveillance system or the UPS equipment requiring resolution.

I. The Video Surveillance System Contractor shall by SDOC MTS Department Personnel be provided all IP addresses and any outside telephone connections for new construction and renovation locations and the Video Surveillance System Contractor shall program and patch all connections to SDOC network switch electronics for operation testing. SDOC MTSD Installation personnel shall be responsible to witness connection at designated port and Video Surveillance System Contractor shall provide a patch cord of SDOC designated color “ORANGE” labeled on both ends for installation specifically for the Intrusion Detection System.
1.06 IP DIGITAL VIDEO SURVEILLANCE SYSTEM EQUIPMENT AND INSTALLATION:

A. As previously stated in Section 270002 Design Requirements it is the responsibility of the site specific project architect and engineer (or the video surveillance contractor for SDOC managed projects) to conduct a meeting to address all project specifications and the needs of SDOC ITSD authorized Representatives. The Video Surveillance System design shall include but not be limited to site dependent variations of the following cabling and components as defined:

1. SDOC IP Digital video surveillance installations shall be a non-proprietary IP based digital video surveillance platform U.O.N. by authorized SDOC Representatives at all new construction and major renovation school sites. All physical components installed shall be reasonably priced, durable and reliable of high quality and of a “non-proprietary” nature readily available on open market for separate purchase as and where deemed prudent by SDOC. The only authorized proprietary area shall be the operational software and licensing platform.

2. NOTE: Regardless of the performance of the servers installed based on the fact that CompleteView is an open architecture application utilizing non-proprietary Windows tools and plug-ins the SALIENT recommendation is not to exceed 75 cameras per server. Therefore the established SDOC MTSD ceiling for each digital video surveillance server shall be not more than a maximum of seventy five (75) cameras per server. That said for any new construction site a complete basic minimum setup for any system installed shall start with an installation capable of provisioning and supporting a minimum initial capacity of seventy five (75) cameras.

3. In the best interest of the School District of Osceola County, Florida, the following base list of SDOC selected IP Digital video surveillance components, hardware, software and cabling is designated and specified below. All items shall be adjusted to add, delete or upgrade components, services and quantities as and where applicable for the specific design configuration at any installation at any time where deemed necessary by authorized SDOC Representatives “ONLY” in the future:

NOTE: The base equipment list below that shall be contractor provided, installed, terminated, tested, programmed, labeled and warranted to SDOC satisfaction is to support a minimum seventy five (75) camera platform to be the initial installation installed at all new construction and new renovation sites. For sites requiring more than the initial seventy five (75) camera ceiling and platform Actual field component quantities and server platform components will vary based on requirements for each specific site. The video surveillance contractors will be required to quote and provide all equipment to the satisfaction of qualified SDOC Representatives. Quantities and amounts of any combination of components listed below shall be adjusted as needed based on site specific needs of the installation under construction to be in conformance with all SDOC Standards and Specifications requirements for each individual installation.

a. Minimum one (1) SDOC specified Server(S): HP ProLiant DL180 Server.
b. As SDOC determined project specific minimum required number of SDOC specified Processor(S) Dual Six core Intel Xeon Processor X5650 (2.66GHz, 12M L3 Cache.95 Watts, DDR3-1333, HT, Turbo 2/2/3/3).

c. Minimum SDOC specified quantity of RAM (Random Access Memory): 16 GB (Gigabytes).

d. Minimum one (1) SDOC specified Storage Controller: Embedded SATA Controller HP P410/ZM Smart Array Controller.

e. SDOC specified Hard Drive(s): HP 600GB Hot Plug 2.5 SAS Dual Port 10K rpm Enterprise. Minimum one (1) 600 GB hard drive(s) installed per every five cameras.

f. SDOC specified Network Card: Embedded HP NC362i Dual Port Gigabit Server Adapter and HP NC360T PCI Express Dual Port Gigabit Server Adapter.

g. SDOC specified Salient Server platform software (capable of support for minimum sixty (60) cameras with three (3) terabyte video storage (or storage as SDOC modified future) or NVR (capable of support for minimum thirty (30) cameras with one (1) terabyte video storage (or storage as SDOC modified future): Contractor shall provide and install inclusive of all tasks associated with successful full network integration and user interface capability with all SDOC programs, network, system configuration, testing, adjustments and all programming to the complete satisfaction of SDOC with no exception.

h. SDOC specified Salient System Camera Connection License – PRO Level “ONLY”: Contractor provided and installed. Contractor shall provide notification to SDOC of license upgrades when available and provision to SDOC as requested and required.

i. INTERIOR DIGITAL IP CAMERA - SDOC specified PANASONIC i-Pro Smart HD Mfg.# WV-SF332 | CDW#: 2189149 Network Camera - dome - color (Day & Night) – auto iris – optical zoom: 3.6x – vari-focal – audio – 10/100 DC 12 V / PoE (WV-Q174 ceiling mount) or SDOC approved equal.


l. SDOC specified PANASONIC Metal Drop in Tile Mount for Interior ceiling grid mounted Cameras – (2’X2’ PAN-TILE or SDOC approved equal.)
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m. SDOC specified PANASONIC Wall Mount for WV-SF332 / WV-SW352E / WV-NW502S for installation of standard digital or megapixel camera DOMES. Panasonic Security & Digital or SDOC approved equal.

4. At existing sites where only the failed analog head end equipment is being replaced conversion of the analog head end for the system to a digital head end for the system is necessary. For the overall configuration then to be utilized for these locations the base equipment list below will need to be installed for this conversion that shall be contractor provided, installed, terminated, tested, programmed, labeled and warranted to SDOC satisfaction. In support of this converted system SDOC has established a differing server and component configuration with an SDOC set minimum fifty (50) camera ceiling server platform. The components applicable for these scenarios will be the installation of:

   a. Minimum one (1) SDOC specified SALIENT RM 2500 XMP SERVER(s) WITH NOT MORE THAN FIFTY CAMERAS per server with a minimum one (1) 600 GB hard drive(s) installed per every five cameras.

   b. SDOC specified Hard Drive(s): HP 600GB Hot Plug 2.5 SAS Dual Port 10K rpm Enterprise. Minimum one (1) 600 GB hard drive(s) installed per every five cameras.

   c. Additional field equipment to be installed at existing IDF and MDF locations at the site being converted where analog camera head end systems are being retrofitted and converted to digital IP systems where existing campus analog cameras and cabling are to be utilized shall be:

       i. SDOC specified AXIS COMMUNICATIONS INC. - 291-1U Rack Video Server (Holds 3 Blade Servers) for analog to digital camera system conversion at retrofit sites. Or SDOC approved equal.

       ii. SDOC specified AXIS COMMUNICATIONS INC. - 243Q Blade Server (4 Channel – up to 30FPS per channel) Or SDOC approved equal.

   d. Actual field component quantities and server platform components will vary based on requirements for each specific site. The video surveillance contractors will be required to quote and provide all equipment to the satisfaction of qualified SDOC Representatives. Quantities and amounts of any combination of components listed below shall be adjusted as needed based on site specific needs of the installation under construction to be in conformance with all SDOC Standards and Specifications requirements for each individual installation.

   e. For existing sites requiring more than the initial fifty (50) camera ceiling and platform actual component quantities will vary and are determined based on requirements for each site. Quantities and amounts of any combination of components listed below shall be increased as needed based on site specific needs of the installation under construction to be in conformance with all SDOC Standards and Specifications requirements for each individual installation.
5. SDOC shall at their discretion shall purchase, provide, install and test any or all digital cameras, servers, video storage, network switches, software, and licenses.

1.07 IP BASED DIGITAL VIDEO SURVEILLANCE SYSTEM TESTING AND ADJUSTMENT:

A. All equipment shall be installed as a minimum requirement to manufacturers’ installation specifications.

B. All cameras shall be installed to manufacturers’ specifications and shall be tested and adjusted to SDOC satisfaction.

C. All equipment settings shall be set to SDOC Standards for scheduled recording time activated from 5:00am to 6:00pm daily.

D. All equipment settings shall be set to SDOC Standards for scheduled recording set at one (1) FPS (frame per second)

E. All equipment settings shall be set to SDOC Standards for recording time as motion activated twenty-four hours a day.

F. All equipment settings shall be set to SDOC Standards with motion set at ten (10) FPS (frames per second) with five (5) seconds pre event and five (5) seconds post event.

G. All equipment settings shall be set to SDOC Standards with sensitivity set at sixty-five percent (65%) for all camera locations.

H. Internal system programming shall be accomplished to include site mapping to identify all camera locations and shall be been accomplished and verified to SDOC Standards with grouping accomplished as ADMIN Group and all others for accessing system and with layered mapping indicating each camera location including site map, building map and building floor map for multi floor buildings.

I. All cameras shall be internally system programed for identification specific to physical location in addition to numeric identification visible when viewing cameras.

1. Example: If camera #32 is located in building two (2) second floor corridor this camera will be programmed internally and viewed in the system as C32 - BLDG 2 / FL 2 Corridor.
1.08 ANALOG VIDEO SURVEILLANCE SYSTEM AND EQUIPMENT:

A. Digital Video Recorder (DVR) – SDOC Specified for SDOC Installation shall be:

1. PELCO “ONLY” DX8132-3000 (32 CHANNEL DVR WITH 3TB STORAGE)
   Or as SDOC Specified,

2. PELCO “ONLY” DX8116-1000 (16 CHANNEL DVR WITH 1TB STORAGE)

3. These components, cable and equipment are SDOC designed and specified. They shall be General Contractor provided, installed, tested and warranted at time of substantial for all SDOC Projects.

4. Digital Video Recorder associated components - Specified for SDOC Installation shall be:

5. General Contractor shall provide and install one (1) each DVR SHELF – CPI 11054-719 Double-Sided Shelf “ONLY”.

6. General Contractor shall provide and install one (1) each DVR MONITOR – CPI 13390-729 LCD Monitor “ONLY”.

7. General Contractor shall provide and install one (1) each DVR KEYBOARD – CPI 13490-719 Keyboard and Mouse Shelf “ONLY”.

B. C1 Cameras - Specified for SDOC Exterior Installation are Designated C1 and shall be installed as follows:

1. General Contractor shall provide install, test, label and warranty one (1) each PELCO CAMCLOSURE IS110-DWV9 VIDEO SURVEILLANCE CAMERA at all exterior locations indicated on conformed plans.

2. Parts associated that shall be installed with the PELCO CAMCLOSURE IS110-DWV9 VIDEO SURVEILLANCE CAMERA for a complete assembly are:
   a. Pendant Adapter P/N#ICS110-PG
   b. Wall Mount P/N#SWM-G4
   c. See Figure 30 - C1 Camera Exterior Installation Detail “Typical”
   d. All Cameras shall be installed per manufacturer’s recommendations with no exception utilizing SDOC approved OEM mounts and hardware. Exterior cameras shall be secured to exterior walls with Tap cons or SDOC approved fastening devices only.
   e. For exterior camera installations General Contractor shall provide and install all cabling, 4” X 4” inch back boxes with weatherproof covers located on exterior surface of the building with three (3) foot length of LIQUIDTIGHT FLEX installed, minimum ¾ inch EMT conduit attached and installed from back box at exterior to interior of building as sleeving into
accessible ceiling space with bushing of coupler installed. All penetrations shall be sealed and assemblies secured.

3. For each individual camera from the camera location to the local MDF or IDF space as applicable the GENERAL CONTRACTOR shall provide and install:

   a. One (1) 18/2 unshielded power cable.
   b. One (1) RG59 coaxial cable 100% copper braid “ONLY”
      i. Note: SIAMESE (combination 18/2 unshielded power cable and RG59 coaxial cable 100% copper braid “ONLY”) are acceptable as substitute for the previously specified cables as long as both cables in the SIAMESE cable satisfy all specifications of the individual cables.
   c. One (1) Category 6 UTP cable dead ended at each location and labeled for identification purposes on both ends of each cable.
   d. General Contractor shall provide a ten (10) foot service slack on the field end and a (20) foot service slack at all MDF and IDF locations. All cable runs shall be labeled on both ends of each cable with typewritten permanent labels, supported, sleeved as appropriate and tested throughout each run. All cable runs shall be installed according to SDOC cable installation specifications with no exception. (Typical for all C1 Camera installations).
   e. Note: Site dependent other camera types may be selected for substitution or inclusion in unusual or unique circumstances. Applicable part numbers for such unusual or unique circumstances shall be called out as required and submitted by SDOC on a situational basis.
   f. General Contractor is responsible for installation of all pathways, cabling cameras, mounts and associated equipment, final cross connection to all equipment and adjustments to SDOC Satisfaction. General Contractor shall terminate, test, and label all cables IAW SDOC Standards and Specifications and on VSS coaxial cable shall install Ultimate Snap-N-Seal BNC connectors on both ends of each cable.

C. C2 Cameras - Specified for SDOC Interior Installation are Designated C2 and shall be installed as follows:

1. General Contractor shall provide install, test, label and warranty one (1) each PELCO CAMCLOSURE IS150-DWV9 VIDEO SURVEILLANCE CAMERA at all interior locations indicated on conformed plans.

2. Parts associated that shall be installed with the PELCO CAMCLOSURE IS150-DWV9 VIDEO SURVEILLANCE CAMERA for a complete assembly are:

   a. Metal Ceiling Plate P/N#ICS150-P
   b. See Figure 31 – C2 Camera Interior Ceiling Grid Installation Detail “Typical”
   c. See Figure 32 – C2 Camera Interior Hard Ceiling Installation Detail “Typical”
   d. All Cameras shall be general contractor provided and installed per manufacturer’s recommendations with no exception utilizing SDOC approved OEM mounts and hardware. Exterior cameras shall be secured to exterior walls with Tapcons or SDOC approved fastening devices only.
e. For each individual camera from the camera location to the local MDF or IDF space as applicable the GENERAL CONTRACTOR shall provide:

1. One (1) 18/2 unshielded power cable
2. One (1) RG59 coaxial cable 100% copper braid “ONLY”
3. Note: SIAMESE (combination 18/2 unshielded power cable and RG59 coaxial cable 100% copper braid “ONLY”) are acceptable as substitute for the previously specified cables as long as both cables in the SIAMESE cable satisfy all specifications of the individual cables.
4. One (1) Category 6 UTP cable dead ended at each location and labeled for identification purposes on both ends of each cable.
5. General Contractor shall provide and install a ten (10) foot service slack on the field end and a (20) foot service slack at all MDF and IDF locations. All cable runs shall be labeled on both ends of each cable with typewritten permanent labels, supported, sleeved as appropriate and tested throughout each run. All cable runs shall be installed according to SDOC cable installation specifications with no exception. (Typical for all C2 Camera installations).
6. Note: Site dependent other camera types may be selected for substitution or inclusion in unusual or unique circumstances. Applicable part numbers for such unusual or unique circumstances shall be called out as required and submitted by SDOC on a situational basis.

General Contractor is responsible to provide and install all pathways, cabling cameras, mounts and associated equipment, final cross connection to all equipment and adjustments to SDOC Satisfaction. General Contractor shall terminate, test, and label all cables IAW SDOC Standards and Specifications and on VSS coaxial cable shall install Ultimate Snap-N-Seal BNC connectors on both ends of each cable.

D. Fiber Optic Converter/ Transmitter/ Receiver: The Product specified shall be Fiber options models S700VT-MST and S7011/2R-RST manufactured by GE Security. Receivers shall be rack mounted at the MDF in a 515R1, 15 slot card chassis, with an appropriately rated power supply. The card chassis shall be installed in the same equipment rack as the DVR.

E. Camera Power Supply: The General Contractor shall provide and install appropriately sized, wall mounted, multi-camera power supplies for utilization on all camera installations.

1. The specified product shall be the MCSx-xE series power supply manufactured by PELCO or SDOC approved equal “ONLY”. The use of individual transformers is not acceptable or authorized by SDOC ITSD.

2. A centralized Low Voltage power supply with Low Voltage wiring distribution to cameras for each building shall be included for installation. Designs may vary and shall require prior SDOC ITSD approval. Failure to gain prior approval shall result in removal of the installed equipment and replacement with SDOC ITSD approved suitable selection at the sole expense of the installing contractor with no additional cost to SDOC.
3. These power supplies shall be located in the appropriate MDF and IDF spaces in each building where video surveillance cameras are installed.

1.09 ANALOG AND DIGITAL CABLING, RACEWAY, CONDUIT AND SUPPORT:

A. General contractor and video surveillance contractor shall provide, install, terminate and test all cabling, conduit, sleeving, cable supports and labeling which shall comply in all respects with all SDOC Division 27 Standards and Specifications sections as detailed for all cabling installations outlined in Section 270200 and Section 270700. All video surveillance components, hardware and cabling shall be SDOC detailed and specified.

B. The General Contractor and video surveillance contractor shall be responsible to provide, install, terminate, test and label all SDOC specified analog and digital video surveillance system cabling, voice and data backboards, racks, patch panels, terminations, conduit, junction boxes, cabling supports, sleeving, pathways, cameras and devices and make all items ready not later than four weeks prior to the time of SDOC scheduled substantial inspection for all SDOC projects and installations.

C. ANALOG VIDEO SURVEILLANCE SYSTEM FIELD CABLES:

1. Analog Video coaxial cables shall be one (1) RG59U equivalent or better up to 500FT, RG6 up to 750FT and RG11 up to 1500FT.

2. All coaxial video cabling shall have 95% copper braid shielding and a solid copper center conductor.

3. All coaxial / BNC type connectors shall be ULTIMATE SNAP-N-SEAL COMPRESSION CONNECTORS.
   a. For analog video surveillance installations all analog field cables shall be:

4. Homerun installed from the closest individual local MDF or IDF location nearest each individual video surveillance camera device installed.

5. Installed with One (1) 18/2 unshielded power cable.

6. Shall be alternately installed as a single SIAMESE (combination 18/2 unshielded power cable and RG59 coaxial cable 100% copper braid “ONLY”) 

7. All analog coaxial video surveillance cables installed shall be installed with one (1) Category Six UTP cable dead ended at the field location and MDF or IDF location.

8. Each Category Six cable shall be labeled for identification purposes on both ends of each cable.

9. All Category Six cables shall be bundled and installed and coiled at both the field camera device end and at the voice and data back board in each individual local MDF or IDF location.
10. Each Category Six cable shall be installed with adequate service slack installed to bring each run to and MDF or IDF free standing rack location and on the field end to extend to the camera location for future termination to a Category Six patch panel and to be placed into future operation for upgrade to IP Digital video surveillance camera systems.

11. When terminated all Category Six cable installation parameters and guidelines and length compliance as defined in SDOC MTSD Division 27 Standards and Specifications for contractor provision of Category Six cable test results in printed and electronic format.

D. **IP DIGITAL VIDEO SURVEILLANCE SYSTEM FIELD CABLES:**

1. IP Digital Video cables shall be one (1) contractor provided, installed, terminated and tested Category Six cable with RJ45 Modular Connector for each individual digital video surveillance camera location.

2. For each individual interior and exterior IP Camera from the camera field location to the local MDF or IDF space as applicable the General Contractor and the video surveillance contractor shall provide and install:

   a. One (1) Category 6 UTP cable terminated labeled (on both ends of each cable) and tested to SDOC standards and specification in the same manner as all Category Six cabling infrastructure installed for the campus. The Category Six cables shall be terminated on a separate contractor provided, installed, terminated and tested Category 6 patch panel labeled and designated installed solely for video surveillance cabling where all parts from the field end to the patch panel shall be of the exact same manufacturer as the Category Six infrastructure installed for the network at the campus location. Each patch panel and all camera cabling shall be labeled and designated solely as intended for video surveillance cabling.

   b. All Category 6 cabling at all exterior camera locations shall be terminated to general contractor provided female Category 6 RJ45 jacks/modules (not connectors) labeled with patch panel port number inside the general contractor and video surveillance contractor provided and installed weather-proof 4” X 4” back boxes with no less than six (6) inches of service slack for the device (camera) end and no less than twenty (20) feet of service slack at the device/camera field end interior stub out at all specified locations.

   c. All Category 6 cabling at all interior camera locations shall be terminated to general contractor provided female Category 6 RJ45 jacks/modules (not connectors) labeled with patch panel port number above ceiling coiled and strapped with Velcro and supported on a “J” Hook support with no less than twenty (20) feet of service slack at the device/camera field end at all specified locations.
E. All IP Digital Video Surveillance camera cables:

1. Shall be individual homerun installed on Category Six patch panel ports from the closest individual local MDF or IDF location nearest each individual video surveillance camera device with Category Six RJ45 Modular Connector installed.

2. Each Category Six cable shall be labeled for identification purposes on both ends of each cable.

3. All Category Six cables shall have twenty (20) feet service slack coiled at both the field camera device end and at each individual local MDF or IDF location.

4. Each Category Six cable shall be installed, terminated and tested in compliance with all Category Six cable installation parameters and guidelines defined in SDOC MTSD Division 27 Standards and Specifications inclusive of length compliance and contractor compliance for provision of Category Six cable test results in printed and electronic format.

F. All analog and digital video surveillance system copper cables for underground installation shall be flooded/outdoor rated cables regardless their installation in conduit.

G. All analog and digital video surveillance cables installed in PLENUM Air spaces shall be PLENUM CABLES and shall be readily identifiable on all cable jackets as PLENUM cable. It shall be the responsibility of all installing general contractors and video surveillance contractors to identify the proper riser or plenum air space and provide and install the appropriate cable for all installations and circumstances. Evidence of improper type cable installation shall be replaced by the video surveillance contractor at no expense to SDOC. Change order or additional work and material requests of this nature are not acceptable and shall not be approved. All infractions and corrective work of this nature shall be accomplished by the contractor for expected installation completion and shall not impede the scheduled substantial completion for any project.

H. All analog and digital video surveillance system cabling to both interior and exterior camera locations shall be home run installed back to the local MDF and IDF locations for connection to the analog or digital video surveillance system where the video signal shall be converted to run on fiber optic cabling to be connected back to the analog or digital video surveillance system head end location in the MDF Space. Existing spare fiber optic backbone cable strands shall be utilized for this purpose.

I. Copper and fiber optic backbone video surveillance cabling between the MDF and each IDF space shall be of sufficient quantities to service all video surveillance requirements with minimum twenty percent (20%) spare for future expansion in the building or area installed unless otherwise noted. For new construction projects it is the responsibility of the site specific architect and project engineer to ensure adequate backbone video surveillance copper cables or backbone fiber optic cable and strand quantities are designed for each SDOC project to support not only current needs but to provide reasonable expansion capability as well. Otherwise it shall be the responsibility of the video surveillance contractor to determine site specific needs in discussion with the SDOC/MTSD Technology Construction Project Managers and other Authorized SDOC Department
Representatives and then to insure the required types and amounts of cable required are installed to SDOC satisfaction.

J. All building field video surveillance cabling shall be neatly and professionally installed and routed by the video surveillance contractor in accordance with all guidelines established in Section 27_02_00 of the SDOC Technology Standards and Specifications document in addition to adherence to all details as described and outlined in this document.

K. All video surveillance cabling shall be installed at the highest ceiling point available to ensure no interference with other types of technology cables or mechanical, electrical, fire alarm and plumbing building services and their associated cabling as installed.

L. There shall be no free wired video surveillance cables installed across bar joists where the joists are the means of support. Bar joists may be utilized for installation of SDOC approved and sanctioned cable supports with all video surveillance cabling installed in these supports as SDOC approved for cable installations. Video Surveillance system building field infrastructure and backbone cabling:

1. Shall not be installed across any electrical fixture or fastened or secured to any EMT conduit.

2. Shall not be installed within 18” of florescent lighting.

3. Shall not lie on or against any HVAC equipment or ducting.

4. Shall not be fastened or secured to vent duct straps.

5. Shall not lie on or against and shall not be fastened or secured to any sprinkler piping, copper piping, mechanical, electrical, fire alarm and plumbing building services conduit, piping, cabling or other systems and devices or their supports.

6. Shall not be fastened or secured to existing ceiling grid hangars intended for the support of the ceiling grid at any location. Shall not be fastened or secured to existing ceiling grid hangars intended for the support of any other technology systems or other systems cable runs installed at any location. Installation of video surveillance contractor installed ceiling grid hangars intended for installation of supports for video surveillance system cable runs is acceptable and encouraged. All grid hangars installed for such use shall be “swatch” painted blue in color to identify their intended use when installed.

7. Cable support fastening devices shall not be clamped to any existing equipment, threaded rods, ceiling grid hangars, straps, etc. “J” hook support systems shall be installed using manufacturer supplied clamps and attachments for grid hangar installations and when drilled for installation on drywall or concrete shall be installed with SDOC approved and sanctioned fasteners “ONLY”.
M. Video surveillance cable bundles shall be bundled together using Velcro wraps only. Video surveillance cable bundles shall be kept in physically separate cable runs from all other technology cables and shall not touch other cable runs in any manner. Video surveillance cable bundles shall be installed away from vibrating machinery, power cords, plug strips or other circuits with a difference of potential. All video surveillance cabling from single runs to bundles shall be supported with SDOC approved supports including J-Hooks every five (5) feet with a Velcro wrap installed at all “J” hook stations. J-Hooks shall be at the highest accessible point in the building ceiling.

N. Where two or more video surveillance cables are run together they shall be Velcro wrapped every 2 feet. Video Surveillance cable bundles or individual cables shall be neatly secured with Velcro wraps.

O. Fanned out cable runs or excessive drooping of cable runs is not permissible or acceptable in any instance. Excessive drooping shall be by determination of SDOC MTSD Technology Construction Project Managers. Cable ties are not an SDOC approved means of support or bundling for video surveillance cable installations. Lacing of video surveillance cables shall not be permitted.

P. An SDOC determined and defined amount of service slack shall be installed at all MDF and IDF locations and at field device locations. All service slack shall be neatly but not tightly coiled and shall be secured above ceiling with Velcro wraps at minimum three points on each coil and with the finished coil secured to “J” hooks.

Q. At existing renovations and new construction installation sites general contractors and or the video surveillance contractor shall make all necessary efforts to protect all existing equipment, wiring, fixtures and building materials from damage during installation of equipment including provisioning of adequate ventilation if covered during construction.

R. All new construction and renovation video surveillance camera cabling installations at all locations designed for a camera outlet installation both interior and exterior including those locations not planned for immediate use and or operation such as spare outlet cables for future expansion shall be properly terminated, labeled on both ends to identify far end point of termination and protected regardless of current plan for use. All video surveillance camera outlet cables and connectors installed at exterior building locations shall further be protected where installed in exterior outlet boxes with the installation of a contractor provided and installed stainless steel cover at each outlet box to preserve these locations until utilized. All video surveillance cable bundles or runs being installed in construction yet not currently finished and terminated shall be lifted and supported off the floor of closets in a manner to prevent any damage to sheathing. Any and all cabling damaged in any manner shall be the sole responsibility of the video surveillance contractor to replace the entire run at no additional cost to SDOC with no exception.
S. **Warning to all contractors:** There shall be no splicing of any video surveillance or other associated contractor installed cabling at any SDOC technology installation with no exception. Violations will not be tolerated. Do not splice a damaged cable and attempt to hide it to complete an installation. Take the time to demo out and install a new cable. It will not be viewed in a favorable light when an unauthorized splice infraction is discovered.

T. **Connector Tooling:** Tooling used to provide connectors shall be specifically designed for the connector being used. Utilization of non-specified tools shall be considered as grounds for cease and desist as well as possible grounds for termination of contract. Analog BNC or other Coaxial Cable Terminals shall be bayonet style two-piece connectors matched to the coaxial cable wire diameter in use. Twist on style connectors are not acceptable for SDOC installations and shall not be installed.

U. General contractor and the video surveillance contractor shall ensure all video surveillance cabling passing through any wall at all locations shall be properly sleeved with SDOC UL approved sleeves and devices. Conduit sleeves shall be carefully reamed and installed with plastic bushings on both ends. All sleeving shall be installed in compliance with guidelines detailed in Section 27020 and Appendix “G” Fire and Smoke Rated Wall Penetrations of the SDOC Technology Standards and Specifications document with no exception.

V. Contractor installed equipment cabinets, panels or free standing equipment racks shall have EMT conduit sleeving installed from the equipment cabinet or panel stubbed out to the above ceiling space. The EMT conduit sleeving shall be carefully reamed and terminated with plastic bushings at all open ends. Free standing equipment racks shall have EMT conduit sleeving installed to transition cabling from above ceiling space to the interior of each space. The EMT conduit sleeving shall be carefully reamed and terminated with plastic bushings on all open ends. EMT conduit sleeving shall also be bonded to the ground bus installed in as short an installation run as possible at the local IDF or MDF as applicable on one (1) end as appropriate to comply with NEC directives in all instances. All ground cable shall be installed by the contractor and shall be strapped in its own separate run with no other cabling. All ground cables shall be installed in a separate pathway and shall not transition through technology systems conduits or sleeving.

W. Where interior wall mounted video surveillance system cameras are installed all cabling locations shall be connected to camera via single gang back boxes installed flush mount at six (6) inches below finished ceiling at the spot selected for camera installation. Single gang back boxes shall be in wall flush mount and coupled to minimum 3/4 inch EMT conduit stubbed out above ceiling with bushing installed at stub out end. For locations where in wall installation is not possible or practical as deemed so by SDOC MTSD Technology Construction Project Manager surface mount is permissible as SDOC approved “ONLY”.

X. General contractor and the video surveillance contractor as contracted shall as a minimum ensure all video surveillance pathway penetrations shall be properly sleeved and sealed in compliance with guidelines detailed in Section 27_02_00 and Appendix “G” Fire and Smoke Rated Wall Penetrations of the SDOC Technology Standards and Specifications document and in accordance with all applicable fire and safety directives and codes. Example: Fire Wall penetration must be resealed using an SDOC approved and more importantly UL approved non-flammable Fire
Proof/Resistant material to ensure the Fire Wall/floor/ceiling maintains original fire rating at completion of installation. The same directives apply for all smoke ratings as well.

Y. Upon completion of all video surveillance projects a certified statement is to be submitted by the contractor assuring SDOC that all interior and exterior wall and floor penetrations whether new or existing have been sleeved and sealed in compliance with fire codes and SDOC Standard and Specifications. It shall be the contractors sole responsibility to insure any existing penetrations authorized by SDOC for use by the contractor are restored to fire and smoke rating as applicable even in instances where these penetrations may not have been properly sealed prior the contractors use.

Z. Contractors shall not utilize any existing installed technology system sleeve with or without other technology cables installed without prior permission requested and granted in writing from SDOC MTSD Technology Construction Project Manager or authorized representative. Failure to comply shall result in removal of all installed cables at the sole expense of the contractor. Upon SDOC MTSD inspection after removal of unauthorized cable installation if it is determined any existing original communications cables have sustained “burning” resultant of installation of new cables or other damage is sustained as determined by SDOC MTSD Technology Construction Project Manager or authorized representative all suspect cables shall be replaced at no additional cost to SDOC by approved technology contractors at the sole expense of the video surveillance contractor originally incurring the initial damages.

AA. For all exterior camera installations General Contractor and video surveillance contractor shall provide and install all cabling, 4” X 4” inch back boxes with weatherproof covers located on exterior surface of the building with three (3) foot length of LIQUIDTIGHT FLEX installed, minimum ¾ inch EMT conduit attached and installed from back box at exterior to interior of building as sleeving into accessible ceiling space with bushing or coupler installed IAW SDOC Division 27 Standards and Specifications review all applicable sections. All penetrations shall be sealed and assemblies secured to ensure compliance with applicable codes and SDOC Division 27 Standards and Specifications. All interior to exterior wall penetrations shall be installed with conduit sleeve which shall be ¾ inch EMT coupled to a watertight double gang back box with cover installed. Plastic bushings shall be installed at all interior stub out conduit end terminations. All conduit sleeves shall be carefully reamed to remove all burrs and sharp edges.

BB. All video surveillance sleeves shall be properly supported and strapped to SDOC satisfaction to prevent slippage and wobbling of conduit sleeve stub outs. All video surveillance conduits shall be properly sealed at both the interior and exterior wall surface and around both the interior and exterior walls of the conduit sleeve with UL approved materials as SDOC specified.

CC. All video surveillance system cameras installed on the exterior at any location shall be installed at a minimum height of ten (10) feet above surface of the exterior of the building with the exception being in instance where covered walkways or other constructed surface will impede normal and intended functional operation of the installed device. In this exception the architect, engineer, general contractor and video surveillance contractor shall in design phase identify the issue and adjust mounting and installation height to accommodate highest possible installation while working with SDOC MTSD Technology construction Project Managers to determine a different and suitable
installation location to relocate the device to. This solution is also applicable for exceptions where this was not identified until time of installation where the architect, engineer, general contractor and video surveillance contractor shall identify the issue during construction and adjust mounting and installation height to accommodate highest possible installation while working with SDOC MTSD Technology construction Project Managers to determine a different and suitable installation location to relocate the device to.

DD. All cable exposed to the exterior shall be installed in an SDOC approved appropriately sized PVC or EMT conduit pathway as SDOC specified. All conduit raceways shall be carefully reamed to remove all burrs and sharp edges. Plastic bushings shall be installed at all open conduit end terminations. All video surveillance conduits shall be properly supported, bushed and strapped to SDOC satisfaction rule of thumb being one conduit strap within two feet of beginning and end of each conduit with a conduit strap every two feet in between the entire run. All video surveillance system conduits shall be properly sealed around both the interior and exterior walls of the conduit with UL approved materials installed as manufacturer specified and as SDOC specified.

EE. All analog video surveillance system BNC type connectors exposed to the weather at camera locations shall be filled with an insert of silicon ‘grease’ equal to Dow Corning DC #5 compound before mating with opposite connector half. The connection shall then be completely covered with heat shrink tubing and the cable shall be tested end to end for continuity upon completion of assembly. No taping of electrical connections is acceptable in lieu of heat shrink.

1.10 ANALOG AND IP DIGITAL VIDEO SURVEILLANCE SYSTEM LABELING:

A. All Category 6 cable and coaxial video surveillance cable runs shall be labeled with general contractor and video surveillance contractor provided and installed labels on both ends of each cable with typewritten permanent labels, supported, sleeved as appropriate and tested throughout each run. All Category 6 cable runs shall be installed according to SDOC cable installation specifications with no exception. Typical for all camera installations.

B. Cameras: all system cameras, housings, all cables (on both ends and all points of termination), power supplies, video adapters, and monitors shall be labeled with legible, permanent, indelible typewritten labels with identification numbers corresponding to camera numbers indicated on the conformed drawings or as SDOC specified.

C. Consult SDOC MTSD Technology Construction Project Manager(s) in the event there is no numbering system indicated or identified for appropriate number plan which shall require prior SDOC MTSD clarification and approval. Failure to label at all or gain prior approval for label plan shall result in removal of the installed labeling and replacement with SDOC MTSD approved suitable selection at the sole expense of the installing contractor.

D. A permanent typewritten schedule of all camera numbers and their locations shall be laminated in clear plastic and fastened where directed by SDOC Representatives in each operator’s station.

E. A campus map identifying each camera location shall be laminated and fastened where directed in each operator’s station.
F. Contact the SDOC MTSD Technology Construction Project Manager for amplifying information and clarification where uncertain on how to proceed regarding labeling. This includes labeling specifics for any site specific device and to determine site specific cable labeling location requirements not clarified. Contact shall be made for label scheme approval prior to installation labeling. Failure to gain prior approval shall result in removal of the installed labeling and replacement with SDOC MTSD approved suitable selection at the sole expense of the installing contractor.

G. SDOC approved identification numbers shall be permanently labeled and installed on each device and all cable ends and points of termination. Labeling descriptions for all video surveillance system devices and cable shall be as follows:

1. Exterior (C1) Cameras and cables shall be labeled - C1 – 1 through C1 - #? Whatever the number of Exterior (C1) Cameras there are on the conformed plans.

2. Interior (C2) Cameras and cables shall be labeled – C2 – 1 through C2 - #? Whatever the number of Interior (C2) Cameras there are on the conformed plans.

3. Analog camera power supply cables shall be labeled – C1 – 1 through C1 - #? For whatever the number of the Exterior (C1) Camera the cable feeds as indicated on the conformed plans.

4. Analog camera power supply cables shall be labeled – C2 – 1 through C2 - #? For whatever the number of the Interior (C2) Camera the cable feeds as indicated on the conformed plans.

5. Analog camera power supply chassis shall be labeled as Camera Power Supply #1, #2 etc.

1.11 ANALOG CAMERA SURGE SUPPRESSION:

A. Surge suppressors shall be provided for each analog video surveillance cable run installed for each exterior mounted camera and for the power cables to all cameras and associated equipment. All analog video surveillance cables and power circuits exiting any building shall be protected with SDOC approved properly installed and grounded voltage and surge suppression devices. At all locations where analog camera cables enter a building surge protection devices shall be installed. Surge protection devices shall also be installed at the analog DVR head end location. Both ends of the power and video cable shall be protected.

B. The installed surge protection devices shall be designed specifically for analog video surveillance use with BNC connectors. Surge protection devices installed at camera locations where the suppressor is not grounded shall utilize a suppresser that isolates the shield from ground during normal installation. SDOC approved design selection is:

1. DITEK DTK- IBNC or SDOC approved equal “only”.
C. Analog power and video surge protection devices shall protect as required the independent analog video and power cables to and from individual cameras. SDOC approved design selection is:

1. DITEK DTK- PVP or SDOC approved equal “only”.

D. As required at the analog DVR head end location where all coaxial cables terminate a rack-mountable unit shall be installed that supports the connections of up to 16 cameras with a single point ground.

1. DITEK DTK- DTK-RM8/9/16 or SDOC approved equal “only”.

E. Analog power surge suppression shall be installed for all 120V power feeds to the analog video surveillance equipment.

1. DITEK DTK- 8F-S or SDOC approved equal “only”.

F. All analog surge suppression devices are required to be grounded and shall be bonded to a local ground bus block by a minimum home-run #10 stranded copper, green jacketed ground cable. Crimp style terminal lugs are SDOC approved and shall be installed as required. The ground bus block shall be homerun bonded to a properly grounded telecommunications ground bus bar (TGBB) by a #6 stranded copper, green jacketed ground cable. Absolutely no ‘looping’ of ground bonding cables is SDOC approved or accepted with no exception.

1.12 ANALOG VIDEO SURVEILLANCE SYSTEM PERFORMANCE:

A. Analog and Digital Video Surveillance Systems shall be provided, installed, terminated, tested, adjusted, programmed and documented by the Video Surveillance contractor to provide superior quality picture and optimum feature performance. All programming, testing and adjustments shall be made by the Video Surveillance contractor shall be IAW manufacturer installation specifications to ensure highest possible quality of video and optimal efficient utilization of the system and all features to the complete satisfaction of all SDOC Representatives.

B. The Analog DVR shall be configured to support two (2) capture rates for archived video.

1. Event Mode – As triggered by motion detection sensed through pixilation.

2. Time Lapse Mode – Standard rate of capture for archived video.

C. The camera image quality and capture rates shall be optimized for the highest quality of archived video possible while maintaining a minimum 30 day archive. A return visit shall be required 45 days after substantial completion of the system. At that time the quality of archived video and storage capacity will be evaluated. Adjustments shall be made to ensure highest possible quality of video and to meet minimum archive capacity.
D. The Analog DVR shall support from five seconds of pre-event recording, maintained in a buffer, and shall append this buffer to the beginning of all recorded events. The Analog DVR shall continue to record at the event rate until the programmed post-event duration of 15 seconds expires.

E. Each camera shall be titled in the programming with an appropriate, easily understood name as well as the camera number.

F. Integrity: A time domain reflect meter (TDR) shall be used to verify the integrity of all installed video cables and connectors. Any cables or connection which exhibits a structural return loss characteristic of less than 26db (reflection coefficient of 5.1%) shall not be considered acceptable and shall be replaced.

G. Charts: A strip chart for each cable tested shall be provided to the owner for future diagnostic use. Each chart shall be marked with the following data.

1. Description of cable being measured.
2. At what point on the cable the TDR was attached.
3. The footage to each anomaly.
4. The reflection coefficient of each anomaly.
5. The overall length of the cable or circuit being measured.

H. The FM Systems Camera Master shall also be used for fine-tuning each camera. The CM-2 Camera Master shall be used to measure the five attributes of each camera’s video signal:

1. SYNC to measure the amplitude of the video synchronizing pulse and thus can be used to establish correct video level, coaxial cable continuity and correct termination impedance.
2. LUMINANCE to measure the "white level" of video thus is used to adjust the camera IRIS to the correct setting for the existing lighting conditions.
3. COMPOSITE to measure the overall amplitude of the video signal (the peak to peak level).
4. COLOR BURST to measure the Color Burst amplitude of a Color Camera and is used to correctly slope equalize coaxial cable runs for best transmission of detail and color.
5. FOCUS to set the Focus ring on the camera for the sharpest picture.
6. Provide all SDOC required test results in printed and electronic format with detail on each camera for owner’s retention.
1.13 ANALOG AND DIGITAL VIDEO SURVEILLANCE SYSTEM PROJECT COMPLETION REQUIREMENTS:

A. The video surveillance system installation shall be considered complete when all of the following requirements have been achieved to the complete satisfaction of all authorized SDOC MTS Department Representatives associated with all aspects of the site specific project installation:

1. All head end and components and field devices are installed IAW the conformed construction plans, all applicable SDOC Division 27 Standards and Specifications and all manufacturer installation specifications.

2. All new installed dead end video surveillance cables and their unused ports are terminated, tested and identified with typewritten labels on all ends and points of termination and test results for all cables installed provided for owner retention in printed and electronic format for owner retention. All exterior video surveillance outlet boxes are installed with a stainless steel cover plate.

3. All analog or digital video surveillance head end equipment is installed programmed, adjusted and tuned to manufacturers' specifications and IAW Division 27 Standards and Specifications.

4. All field and backbone intercom cabling installed to each device, enclosure, cabinet and MDF and IDF location is terminated and identified with typewritten labels on all ends including all interim points of connection to SDOC satisfaction.

5. Demolition and removal of all dead end and obsolete or replaced pre-existing cabling and equipment hardware has been accomplished by the general contractor and the video surveillance contractor to the complete satisfaction of all authorized SDOC MTS Department Representatives associated with the site specific project. Removal of any SDOC identified cable of this nature is required per NEC directives and cost for removal shall be included by all contractors in all initial project quotes and bids with no exception. Accomplishment of this work line item is expected by SDOC for any and all projects as required. “After the fact” additional work change requests submitted for completion of this work are not acceptable and are expected to be accomplished under the scope of every SDOC project.

6. An as built plan in CADD, VISIO, PDF or other SDOC designated approved format indicating the head end location and all interior and exterior cameras and cabling with any and all changes from the "original design configuration” has been submitted to the owner for review and retention and has been final owner approved.

7. It shall be the responsibility of the video surveillance contractor to verify the condition of all ceiling tiles and the work spaces prior to installation. All broken, gouged, cracked or otherwise damaged ceiling tiles, gouged or otherwise damaged walls, gouged or otherwise damaged flooring carpet and tile or other damages not previously documented that are later identified by any authorized SDOC Representative to be caused by the video surveillance contractor at the end of each project shall be repaired and or replaced as applicable by the contractor at no expense to SDOC prior to final payment authorization.
8. It shall be the responsibility of the video surveillance contractor to repair any exposed surface which has been scratched or damaged during project installation to like-new condition to the satisfaction of SDOC Authorized Representatives. Upon completion of project all exterior surfaces of equipment and construction areas shall be cleaned of fingerprints, paint splatters, and other foreign substances. All construction debris such as wire trimmings, mortar, cable spools and boxes and foreign debris shall be removed from equipment areas and any area directly affected during the installation or service of equipment. All trenches shall be filled in and firmly tamped down until smooth and level with surrounding surface. All affected landscape shall be replaced and restored to previous pre-construction state.

9. The video surveillance contractor shall provide a bound document complete with the as-built drawings, Video Surveillance Camera Matrix, license information, warranty information, installed programming, component cut-sheets for all equipment installed and completed training documentation information. For cable installed by the video surveillance contractor they shall provide all fiber optic and copper cable test results in printed and electronic format for owner review and retention.

1.14 ANALOG AND DIGITAL VIDEO SURVEILLANCE ACCEPTANCE INSPECTION:

A. Project Engineer, general contractor, video surveillance contractor or combinations as applicable for each site specific project and SDOC MTSD Technology Construction Project Manager or Authorized Representative with site representatives shall conduct both a substantial and final inspection of all video surveillance system installations to ensure they are in compliance with all SDOC Standards and Specifications as well as those requirements specific to the installation of video surveillance systems. At substantial inspection all contractors shall demonstrate to the complete satisfaction of SDOC Authorized Representatives the functionality and operation of the complete installed system in the following manner:

1. Observe picture quality at all monitor locations and where software interfaces are installed. All cameras shall have a picture and all pictures shall be clear, focused, adjusted and tuned free of snow, grain, lines, ghosts, waves and distortion of any other unacceptable condition and directed at the appropriate SDOC designated target. All camera pictures shall have programmed SDOC designated location identification, accurate and updating time and date stamp that shall be synchronized with SDOC authorized time source at analog or digital source as applicable.

2. Inspection and observation of video surveillance space head end and field terminations, grounding, surge suppression and labeling shall be satisfactory and complete. Support systems and cable runs inspected above and below ceiling for compliance with SDOC standards and specifications in addition to all video surveillance areas in each MDF and IDF space being inspected for neatness and cleanliness shall be satisfactory and complete in all areas of each cable run.
3. Inspection and observation of other tests deemed necessary by SDOC authorized representatives to establish proper system operability shall be satisfactory and complete to the full satisfaction of SDOC Authorized Representatives.

4. Verification that the installed video surveillance system head end is trapping and recording information as SDOC established programming guidelines dictate and that the analog or digital system head end can be remotely accessed for view of recorded information, retrieval of recorded information, observation of individual or multiple camera views and for maintenance, troubleshooting and remote programming by SDOC Video Surveillance Maintenance Technicians.

5. Verification that the above tests and measurements are documented in the operation and maintenance manuals as as-built conditions.

6. A written report shall be provided at substantial inspection for owner’s retention and for random testing and comparison during substantial inspection detailing all testing and operability results for all individual installed field devices in all buildings and floors identifying each device status inclusive of cabling with respect to all installed interior and exterior cameras.

7. Verification of documented formal instruction given to owner designated key personnel at a time selected by owner and that said instruction consists of a minimum of not less than two (2) hours training delivered in two (2) separate sessions for a minimum total of four (4) hours training.

8. Verification of documented training covering operation, programming, troubleshooting and maintenance for applicable SDOC Video Surveillance Maintenance Technicians. Included for owner’s retention for each head end project installation shall be two (2) installation and service manuals for the applicable model of video surveillance system head end equipment assemblies and devices installed.

9. Verification in the form of formal written report, signed by the video surveillance contractor instructor and submitted to the owner with copies to the architect, and project engineer detailing subjects covered, attendance sheet with signature and printed names of persons instructed, dates and amount of instruction each person has received. This report shall be submitted within one week following the instruction, prior to Warranty Period and prior to final project payment.

10. Upon completion of all issues identified as not completed during Substantial Inspection a Final Inspection shall be conducted by SDOC MTSD Technology Construction Project Manager(s) or Authorized Representative(s) to verify all issues have been completed to SDOC satisfaction. At this time the video surveillance contractor shall also deliver the installation warranty certificate and all documentation for owner retention. Closeout documentation from contractor shall include a final SDOC verified Video Surveillance Camera Matrix Worksheet containing the following information:

   a. Camera model number
   b. Camera serial number
   c. Camera MAC Address
d. Camera IP address  
e. Camera location  
f. Camera installation Building Number  
g. Camera installation IDF or MDF location room number  
h. IDF or MDF network switch number  
i. Network switch port number  
j. IDF or MDF patch panel number and port number.

11. Upon completion of Final Inspection issues and receipt of all project documentation inclusive of warranty certificates for both DMP Intrusion Detection System and any applicable cable warranty to SDOC satisfaction final payment for the project shall be authorized and a contractor evaluation sheet shall be completed by the SDOC MTSD Technology Construction Project Manager or Authorized Representative to record the contractor’s performance. This evaluation sheet shall be submitted to the contractor for their retention and shall be retained in the project records by SDOC.

12. All documentation required and specified in this document as well as all other applicable sections and appendixes of the SDOC Standards and Specifications shall be provided for completion to SDOC MTS Department Technology Construction Project Manager or Authorized Representative for owner retention.

1.15 ANALOG AND DIGITAL VIDEO SURVEILLANCE SYSTEM WARRANTY:

A. For a period of one year from the date of SDOC approved and documented final inspection completion the installed video surveillance system as detailed shall be guaranteed free of defects in materials and workmanship by the general contractor and installing video surveillance contractor for all video surveillance system equipment, programming, components, field devices and cabling.

B. Any video surveillance system assembly, device or component inclusive of all cabling indicating evidence of failure, improper or incorrect operation during this one (1) year warranty period shall be repaired or replaced by the video surveillance contractor at no expense to SDOC as specified in the contract documentation.

C. All video surveillance system equipment and cabling shall be guaranteed by the installing video surveillance contractor for a period of five (5) years from the date of SDOC approved and documented final inspection completion for the installed video surveillance system to be free of defects in materials and workmanship at no cost to SDOC for labor to repair.

D. The installing video surveillance contractor shall guarantee availability of all video surveillance system head end parts and equipment including all assemblies, circuit cards and devices for a period of ten (10) years from the date of SDOC approved and documented final inspection completion for the installed video surveillance system.

E. During the course of any SDOC project where Category 6 copper and fiber optic data cabling as well as for all other copper coaxial and cables required for provision and installation by the video surveillance contractor during the installation of the video surveillance system or as otherwise
required in support of the installation are subject to the requirements of SDOC Division 27 Standards and Specifications guidelines defined in Section 270200 for installation of all cabling. Cabling installation requirements, certifications and warranty specifics apply for all technology and technology related cable installations. The certifications, installation specific requirements and warranty for these installations are defined in section 27020 of the SDOC Technology Standards and Specifications. The technology systems cabling warranty for all such contractor installed applicable installations shall be provided by the video surveillance contractor at Final Inspection and shall accompany the applicable Video Surveillance System Warranty documentation for owner retention inclusive of all cabling test results in both written and electronic format for all such installations prior to final payment.

1.16 ANALOG AND DIGITAL VIDEO SURVEILLANCE SYSTEM ASBUILT DRAWINGS:

A. General: A comprehensive video surveillance system as-built drawing of all project red lines shall be provided in CADD, VISIO, PDF or other SDOC requested format for owner retention at substantial inspection containing at a minimum the following information:

1. A block diagram of the installed system indicating all cameras types, cable types, cable quantities, active and passive components and devices.

2. A block diagram of the building or campus sites indicating the head end location, newly installed camera types and locations interior and exterior for the new installed system.

3. If the site has as-built CAD drawings available the video surveillance contractor shall update the video surveillance system as-built to match the installed system as approved by authorized SDOC MTSD Representatives.

1.17 TYPICAL DETAIL DRAWINGS FOR ANALOG AND DIGITAL IP VIDEO SURVEILLANCE CAMERA INSTALLATION:
Figure 30 - C1 Analog Camera Exterior Installation Detail “Typical”

PELCO CAMCLOSURE IS110-DWV9

J-HOOK SUPPORT FOR CABLES SECURELY FASTENED TO STRUCTURE.

ONE (1) RG59 COAXIAL CABLE 100% COPPER Braid "ONLY", ONE (1) CATEGORY 6 CABLE (UNTERMINATED BUT LABELED AT BOTH ENDS) AND ONE (1) 18/2 UNSHIELDED POWER CABLE (COMBINATION 18/2 UNSHIELDED AND RG59 COAXIAL CABLES ARE ACCEPTABLE)

4 x 4 DOUBLE GANG JUNCTION BOX

FINISHED FLOOR

EXTERIOR CAMERA WALL MOUNTED
No Scale

Figure 30 - C1 Analog Camera Exterior Installation Detail “Typical”
Figure 30A - C1 IP Camera Exterior Installation Detail “Typical”

ONE (1) CATEGORY 6 CABLE TERMINATED, TESTED AND LABELED AT BOTH THE FIELD DEVICE END AND THE LOCAL MDF OR IDF SPACE ENDS
Figure 30B - C1 Camera Exterior Installation Detail “Typical”
Figure 31 – C2 Analog Camera Interior Ceiling Grid Installation Detail “Typical”

PELCO CAMCLOSURE IS150-DWV9

ONE (1) RG59 COAXIAL CABLE 100% COPPER BRAID "ONLY", ONE (1) CATEGORY 6 CABLE (UNTERMINATED BUT LABELED AT BOTH ENDS) AND ONE (1) 18/2 UNSHIELDED POWER CABLE

(CONCOMBINATION 18/2 UNSHIELDED AND RG59 COAXIAL CABLES ARE ACCEPTABLE)

SECURE SECONDARY SUPPORT CABLE FROM BUILDING STRUCTURE

SECONDARY SUPPORT TAB SELF-LOCKING TAB SCREWS "C" BRACKET AND TILE RAIL

LAY IN CEILING TILE

INTERIOR CAMERA LAY-IN CEILING MOUNTED
No Scale
Figure 31A – C2 IP Camera Interior Ceiling Grid Installation Detail “Typical”
Figure 32 – C2 Analog Camera Interior Hard Ceiling Installation Detail “Typical”

PELCO CAMCLOSURE IS150-DWV9

ONE (1) RG59 COAXIAL CABLE 100% COPPER BRAID “ONLY”, ONE (1) CATEGORY 6 CABLE (UNTERMINATED BUT LABELED AT BOTH ENDS) AND ONE (1) 18/2 UNSHIELDED POWER CABLE (COMBINATION 18/2 UNSHIELDED AND RG59 COAXIAL CABLES ARE ACCEPTABLE)

CONCRETE DECK ABOVE

CABLING

J-HOOK SUPPORT FOR CABLING, SECURELY FASTENED TO STRUCTURE.

WIRING COMPARTMENT

SECONDARY SUPPORT TAB

SELF-LOCKING TAB SCREWS

DETENTION CEILING

INTERIOR CAMERA HARD CEILING MOUNTED

No Scale

Figure 32 – C2 Analog Camera Interior Hard Ceiling Installation Detail “Typical”
Figure 32A – C2 IP Camera Interior Hard Ceiling Installation Detail “Typical”
INTERCOM SYSTEM REQUIREMENTS

1.01 GENERAL REQUIREMENTS AND SUMMARY:

A. Intercom Systems shall be installed at all SDOC campus sites as well as other locations where deemed necessary. SDOC intercom systems provide a dependable means of communications essential for emergencies and everyday use.

B. Overall, the same basic standard and similar intercom system shall be installed at all district locations. However, each intercom system installed may have distinct and varied characteristic combinations of components and programming that comprises the head end, speaker groups and all other designed and designated components as designed for either an ANALOG or DIGITAL intercom system.

C. For every general contractor managed SDOC new construction intercom installation it shall be the responsibility of the project architect, engineer and general contractor to meet with and solicit input of authorized SDOC technology representatives experienced in addressing intercom system specific needs of the district for all sites and situations to determine and establish the project parameters specific to intercom system requirements.

D. For all SDOC MTSD generated, sanctioned and direct managed intercom installations it shall be the responsibility of the intercom contractor to meet directly with authorized SDOC technology representatives to address all intercom system specific needs for all projects to determine and establish the project parameters and requirements specific to MTS Department contracted and managed intercom system installations.

E. Product quality, durability, reliability, operability and ease of functionality are all key SDOC issues of concern and scrutiny for all intercom installations inclusive of the installation, support, termination, programming, testing, adjustments and labeling identification for all intercom head end assemblies, field devices, cabling and hardware, grounding, supports and pathways. For every SDOC contracted intercom project it shall be the responsibility of the general contractor or as project site specifics dictate the primary intercom contractor or combined effort to meet and exceed all SDOC expectations for all SDOC
intercom installations and to comply in all respects as a minimum with all directives and details of this document with no exception.

F. In the best interest of the School District of Osceola County intercom components on any scale end to end from the head end assemblies and equipment to the end user field devices and cabling determined by SDOC Authorized Representatives as inferior in any aforementioned aspect shall be removed immediately by the contractor and replaced with SDOC approved suitable replacements at no additional cost to the School District of Osceola County with no exception. All contractor recommended changes or substitutions to the project installation shall be submitted by the contractor in writing to the SDOC MTS Department Authorized Representatives using SDOC Standards and Specifications Appendix “D” Standards Variance Sheet prior to substitution or there shall be no change or substitution. All changes or substitutions shall be approved in writing by the SDOC MTS Department or they are not considered authorized and approved and shall not occur.

G. All requirements detailed in this document are intended for compliance as applicable at all SDOC projects involving the provision and installation of new SDOC specified head end and assemblies or upgrade of existing SDOC specified intercom head end and assemblies affected in any aspect. All requirements listed are applicable for any SDOC specified and required combination where SDOC deems appropriate to the installation whether it is the provision and installation of a new SDOC specified head end and assemblies with all field cabling and components, the installation of a new SDOC specified head end and assemblies “only”, the addition of new SDOC specified intercom circuits, SDOC specified new or replaced interior and exterior individual speakers or speaker groups, all SDOC specified cabling, call buttons, volume controls or other as yet unidentified SDOC specified intercom head end or field components, hardware or devices and items contracted. This document is to ensure all SDOC specified project specific details are addressed regarding but not limited to the determination of the SDOC specified need for a new head end installation, the needs to upgrade an existing head end, the needs to install additional interior and exterior individual speakers or speaker groups, SDOC specified cabling, call buttons, volume controls and other items perhaps required. Additionally if a new head end were not required to identify the SDOC specified needs to provide and install new assemblies, circuit card quantities and components or other items required to adequately support an existing installation to SDOC satisfaction. These requirements shall include the provision to SDOC satisfaction by the contractor of all programming, adjustments and testing involved to make the entire installation fully functional at all points for all newly installed items including the head end, all assemblies, and all field cabling, components and devices to the complete satisfaction of designated qualified SDOC Technology Representatives.

H. It shall be understood by all contractors that installation and programming shall only be accomplished by technicians of the intercom contractor trained and certified to properly install and program the circuits and devices as designed.

I. Intercom contractor shall provide factory certification training on all purchased equipment to SDOC intercom service technicians as requested at no additional charge.
J. Intercom contractor shall provide end user training on all purchased equipment to key campus or other staff at no additional charge for each intercom project installation and for all other intercom projects where requested by SDOC authorized representatives.

K. Intercom contractor shall provide to SDOC intercom service technicians all necessary client software to manage, program, and troubleshoot intercom systems purchased by SDOC.

L. Intercom contractor shall provide to SDOC intercom service technicians upon request all necessary client software upgrades and firmware updates for intercom systems purchased by SDOC at no additional cost to SDOC for the life of each original head end installation.

M. New or refurbished repair components shall be available for all intercom systems purchased by SDOC for a minimum of 10 years after purchase date.

N. All items of equipment including wire, cable and hardware for every intercom installation shall be designed by the intercom manufacturer to function as a complete system and shall be accompanied by the manufacturer's complete service notes and drawings detailing all interconnections.

O. Intercom contractor shall have local service facilities within 75 miles of the School District of Osceola County offices located at 817 Bill Beck Blvd in Kissimmee, Florida. Contractor shall in all instances be able to provide same day response to service requests as SDOC deems necessary. The Contractor shall maintain at this facility the necessary spare parts in the proper proportion as recommended by the manufacturer to maintain and service the equipment being supplied. Contractor shall show satisfactory evidence, upon request, that they maintain a fully equipped service organization with a full time staffed office capable of furnishing adequate inspection and service to the affected system(s) as follows:

- On site response within two hours for circumstances deemed urgent or emergent by authorized SDOC Representatives.
- On site response prior to close of business same day for circumstances deemed routine or of a non-emergent nature by authorized SDOC Representatives.

P. Omission of any essential detail from these specifications or SDOC generated scope of work shall not relieve the installing intercom contractor of their obligation to provide a complete and functional integral analog or digital intercom system as expected by SDOC to be ready for operation at close of project.

Q. Regardless of scope or governing authority the intercom surveillance contractor shall be responsible for full compliance with all Division 27 SDOC Standards and Specifications Sections for any installation where applicable.

R. There shall be no contractor initiated changes for SDOC specified components, devices or features without SDOC pre-approved review and discussion where written documentation as defined in SDOC
Division 27 is submitted and approved for said exceptions that indicate said changes are addressed and authorization indicated prior to contract with SDOC MTSD. Regardless of approval of samples, cut sheets, shop drawings, and other matter submitted by the contractor there shall be accompanying and approved documentation supporting approval which shall be obtained or there shall be no authorized substitute.

S. All intercom head end equipment, software, components and devices, cameras, cabling and hardware shall be contractor provided, installed and programmed. All items shall be new and where applicable shall be the most recent version and revision. All items shall be of current SDOC specified manufacture and provided with standard SDOC approved warranty. Contractor shall provide two complete shop repair manuals and parts lists shall be furnished with each equipment installation at the time of project closeout and delivery.

T. The Analog Head end Unit or Digital IP Main Control Unit shall as a routine be installed in the MDF Space in a free standing two post equipment rack or server cabinet solely for that purpose and where designated for installation by authorized SDOC Technology Area Supervisors and Project Managers as determined during the construction design and planning process.

U. The exact quantity, specifications and location of intercom speakers, clocks, call buttons, volume controls or other field devices shall be site dependent as detailed and approved by SDOC MTSD Representatives and where applicable the Architect and Project Engineer. Typical locations for installation consideration of the intercom system shall include but in no way are limited to:

- Classrooms
- Office spaces
- Work areas
- Reception areas
- Main lobby area
- Cafeteria Dining and Serving areas
- Bus loop drop off and pick up areas
- Parent drop off and pick up areas
- Courtyards
- Play areas
- Stairwells
- Parking areas
- Corridors
- Entrance gates
- Community areas and other locations as specified by the Principal, School Administration and authorized SDOC MTSD Representatives.
The exact quantity, model and specific intercom devices and locations shall be dependent on the site plan as approved by authorized SDOC MTSD Representatives and where applicable the Architect and Project Engineer.

1.02 INTERCOM CONTRACTOR QUALIFICATIONS AND REQUIREMENTS:

A. All SDOC selected Intercom Contractors shall provide documented proof as evidence of the ability, capacity, and skill of the Firm to be able to provide all services specified and here in addressed. Selected Contractor shall produce substantiating evidence they are an established operated business for a minimum five (5) years and are a licensed, bonded low voltage company and a duly authorized distributor with full manufacturer's warranty privileges for a minimum of five (5) years with a minimum of three (3) years’ experience in the educational market.

B. Intercom contractor shall be qualified to provide design and consulting services for intercom and audio distribution systems. Contractor shall have the ability to provide Auto CAD drawings of the system design and as-built drawings upon project completion in addition to PDF, VISIO or other format as SDOC requested.

C. All SDOC selected Intercom Contractors as proof and evidence of the following documentation shall furnish to SDOC and maintain current the following specified SDOC licenses, certifications and requirements:

1. Current State of Florida Low Voltage Contractor’s License specific for the low voltage systems being installed.

2. Current documented manufacturer installation and warranty authorization certification from the selected intercom manufacturer approving the contractor for installation and warranty of the selected intercom system installed in the State Of Florida.

3. Current documentation and certification that the company retains on permanent staff a current and certified BICSI RCDD (Registered Communications Distribution Designer.) providing name and current certification for all RCDD’s assigned to SDOC intercom project installations.

4. Intercom Contractors inclusive of their associated sub-contractors at any SDOC location for any purpose shall be in complete compliance with all SDOC requirements with regard to the Jessica Lunsford Act prior to acceptance of any SDOC contract. Failure in compliance shall result in disqualification of approved quote and award to compliant contractor as defined in section 270200.

5. Shall provide current documentation and certification in the form of intercom manufacturer authorized and trained installation and maintenance technicians. All intercom contractor technicians
dispatched to service SDOC intercom and or sound system equipment shall be factory trained with current certification. Proof shall be required to be produced on demand.

6. Documented current structured cable certification authorizing the installing agent/company to offer one of “ONLY” the following selected technology manufacturers COMPLETE CLOSED PANDUIT, ORTRONICS or AMP/TYCO SOLUTION Extended Product warranty for a minimum fifteen years from date of installation acceptance for properly registered and approved projects in the State of Florida to include product installation of fiber optic and up to Category Six termination, testing and warranty per SDOC standards and specification with manufacturer certifications for all trained and approved installation and maintenance technicians assigned to SDOC intercom projects.

7. Contractor shall read, understand and comply in all respects with the directives contained in the School District of Osceola County, Florida Division 27 Technology Standards and Specifications as written and modified.

8. Contractor understands that the most current version of these Technology Standards and Specifications may be located at the SDOC Website under the Media and Technology Services Department section at (http//www.osceola.k12.fl.us/depts./IMC/Index.asp).

9. Contractor further understands that in any question or exception as to the validity of current posted Division 27 Technology Standards and Specifications they may contact the SDOC Media and Technology Services Department for updates and verification. Contact may be established directly with the department at 407-870-4669 to either receive verification or clarification information, or to be provided the most current and up to date version of the standards and specification or both. Points of contact for information shall be directed through the SDOC Media and Technology Services Department to the Technology Construction Project Managers.

D. NOTE: All documentation and certifications required of the Project Intercom Contractor apply and shall be produced for SDOC regarding both their company and any and all Technology Sub-Contractors intended to assist the Intercom Contractor in performance of any and all SDOC project work.

1. No technology work shall be contracted in SDOC to technology contractors that do not produce valid current documented proof of qualifications and certifications satisfying SDOC requirements.

2. Prior approval to utilize intercom sub-contractors shall be obtained in written format from authorized SDOC representatives or they shall not be SDOC approved and authorized to proceed at any SDOC contracted project.

3. In rare instances where SDOC approved all intercom sub-contractors shall be required to provide to SDOC as evidence of proof the same certification documentation required of the SDOC approved selected primary intercom contractor prior to approval and authorization to proceed.
4. Regardless of SDOC approval and authorization of the use of any intercom sub-contractor by the primary intercom contractor, the primary intercom contractor shall always be held liable for any and all issues and certifications regarding the entire scope of each intercom project contracted with no exception.

E. Intercom Contractors shall have sufficient personnel and facilities to be able to provide two hour on-site response time for all circumstances involving the installed intercom system. The contractor shall provide a toll free number for twenty-four hour on-call support service.

F. Intercom Contractors shall have performed work of comparable scope at educational facilities within the last two years and submit proof of exemplary performance on demand as required at the request of School District Representatives and if required shall arrange site visits for review of installed systems.

G. A resume of qualification shall be submitted with the Contractor's bid indicating the following:

1. A list of like completed projects for the past three (3) to Five (5) years of similar type and size with contact names and telephone numbers for each. Previous experience with similar projects for the School District of Osceola County. (If any.)

2. Contractor shall have available current calibrated SDOC approved test equipment to verify the integrity of all newly installed metallic cable or fiber optic cable systems as SDOC specified for every project. The following is a list of required test equipment necessary for certification of all premise wiring installations and intercom cabling system installations.
   a. OTDR for Multi-Mode Fiber Optics
   b. OTDR for Single Mode Fiber Optics
   c. Light Source Power Meter
   d. Volt/Ohm Meter
   e. LAN Cable Certification Meter- 350 MHz

3. Test Results Documentation: For all Category Six and Fiber Optic cable installation all Intercom Contractors shall provide to owner for retention in-depth cable test results in both printed and electronic format. All test equipment utilized shall have a current valid legible and unaltered calibration sticker on the equipment. Test results provided that have been documented utilizing test equipment that has no sticker, is uncalibrated or utilizing test equipment indicating that the test equipment is not within current calibration time limits on sticker shall not be accepted and shall result in the contractor provisioning acceptable calibrated test equipment retesting and resubmission of all test results using said test equipment.
1.03 IP BASED DIGITAL AND ANALOG INTERCOM SYSTEMS FUNCTIONS AND OPERATION:

A. As SDOC MTS Department representatives determine and specify all intercom system equipment provided and installation labor related to the intercom system end to end shall be provided and installed only by the SDOC specified and approved selected intercom contractor(s). There shall be no deviation from this stipulation other than through prior written approval submitted and obtained previous to commencement of applicable work from the SDOC MTS Department. Deviation from this stipulation by the intercom contractor not SDOC approved or sanctioned shall result in removal of all applicable intercom installation configurations and the appropriate replacement all within specified project time constraints by the contractor at no additional cost to the School District of Osceola County with no exception. No SDOC intercom system project regardless of complexity shall be sub-contracted for accomplishment by another contractor by the contractor. The contractor shall be responsible to provide, install, terminate, label, program, test, adjust end to end and warranty through the manufacturer all installed intercom systems as contracted for all locations by SDOC MTS Department based on approved recommendations.

1. For day-to-day communications digital and analog intercom systems:
   a. Shall be capable of stand-alone operation or of being integrated seamlessly with VoIP, PBX, Centrex®, EKSU or other telephone systems.
   b. Shall have a single button feature available to connect front office staff to the intercom head end.
   c. Classroom telephones shall be capable of functioning with the system's classroom intercom/paging speaker and call switch where required.

2. For the classroom digital and analog intercom systems:
   a. Shall provide hands-free communication with the front office from anywhere in the classroom.
   b. Shall have call switches capable of call-ins to allow teachers to quickly communicate their need for assistance with the press of a single button for emergencies or for routine day to day operations.
   c. Desktop Displays shall be available. All intercom systems shall be provided with capability of routing call-ins to desktop displays as an available component part of the installed system.
   d. Shall be capable of providing and installing multiple individual stand-alone hand operated microphone control stations and microphones for campus lockdown security events.

3. Digital and analog intercom systems:
   a. Shall be capable of providing campus/facility-wide communications through pages, music and tones.
   b. Shall be capable of simultaneous broadcast to both interior and exterior speaker locations.
c. Shall be capable of being segmented as necessity dictates for discrete interior or exterior locations either for broadcast to a single building or a single room within a single or multiple buildings.

d. Shall be capable of being programmed for schedule changes at any time for day to day communications such as bus dismissals, morning announcements and music on class change with ease.

4. Digital and analog intercom systems:

a. Shall be capable of providing time synchronization and bells with an integrated master clock which shall automatically change daily to the bell schedule for that calendar day, keeping everyone on time.

b. Shall be capable of providing time synchronization with an integrated master clock and shall automatically update all set intercom system parameters as programmed for changes to or from Daylight Savings Time for the bell schedule and other applicable settings.

c. Shall provide a selection and capability to ring different tone types as SDOC specifies to indicate changing events.

d. Tone selection shall be inclusive of warning tones for tornado alert, intruder alert and other emergent tones as deemed necessary for campus security and safety.

e. Tone and bell selections shall be capable of being programmable by SDOC Technicians for adjustments in tone frequencies and time settings for both routine and emergent selections.

f. Shall be capable of being programmed to selectively ring bells at specific multiple locations such as gymnasium or cafeteria locations.

5. Digital and analog intercom systems:

a. Shall be capable of providing a matched and seamless synchronized analog or digital clock system to eliminate logistics issues and reduce tardiness.

b. Shall be capable of synchronized clock systems being installed at the time of new intercom installation or for future installation at existing intercom sites without replacement or reconfiguration of existing cabling infrastructure.

c. All matched synchronized clock systems shall be designed for ease of installation utilizing existing intercom speaker cabling spare pairs where available and shall require minimal maintenance.

d. All matched synchronized clock systems in the installed facility shall synchronize to atomic time synchronization with an installed master clock and atomic clock which shall be an assembly available as part of the initial installed system.
6. **Digital and analog intercom systems** backbone and infrastructure cabling, interior and exterior speakers, call switches/buttons and volume controls installed:

   a. Shall be of simple and non-proprietary design, types and adequate quality as specified and or preapproved for installation by School District of Osceola County Media and Technology Services Department.
   
   b. Shall be readily replaced with similar items of differing brands available for purchase on the open market where damaged items require replacement.
   
   c. A comprehensive yet not all inclusive list of SDOC approved and specified non-proprietary cabling and components are included in this document for reference.

7. **Digital and analog intercom systems** head end assemblies:

   a. Shall be rack mountable components inclusive of all hardware capable of switched operability on 208 VAC 30 amp 60 HZ power and easily installed in standard free standing nineteen (19) inch two post rack assemblies.
   
   b. At existing campus locations all new replacement intercom head end installations shall integrate seamlessly and perform functionally with existing SDOC installed cabling, surge suppression and intercom field components including all existing installed interior and exterior speakers, cabling, synchronized clocks, call switch/buttons, volume controls, telephone and network systems.

8. **Digital and analog intercom systems** head end systems installed:

   a. Shall be capable of easy interface and connection to SDOC/MTSD campus network electronics via IP address interface.
   
   b. Shall be capable of providing availability and accessibility to operating system via installed software to enable SDOC technician programming of features for routine maintenance, system troubleshooting and VoIP telephone interface.

9. **Digital and analog intercom systems** installation:

   a. Shall be designed with head end, cabling and field components specified and indicated on conformed documents, plans and as-builds.
   
   b. The intercom system shall provide a quality audio output for all circumstances as required to the satisfaction of SDOC MTS Department based on their review and approval of the proposed system.
   
   c. All intercom system installations shall address the site specific needs of all campus or other site locations for which they are installed to the complete satisfaction of SDOC MTS Department.
1.04 NEW CONSTRUCTION, RETROFIT AND RENOVATION INSTALLATIONS:

A. The selection process for installation of either a complete analog intercom system or a complete IP based digital intercom system shall be site dependent based on numerous factors. System selection shall be determined in the planning and design phase of the project by the SDOC MTS Department representatives based on the number of site specific buildings, distance between buildings with other possible site specific considerations. All factors shall be reviewed and discussed by SDOC representatives experienced in determining the intercom needs of the location during planning and design phase of the infrastructure prior to the system selection for each project.

B. For new construction projects it shall be the responsibility of the project specific architect, engineer, general contractor and intercom contractor to ensure all site specific details and specialized requirements are identified, discussed and addressed with SDOC Representatives for any location requiring the installation of intercom systems for new construction and more importantly retrofitted sites.

C. As SDOC directed for new construction the general contractor shall provide the selected intercom contractor to install an intercom system which shall include a complete programmed, operational and ready Analog or IP based digital intercom systems with all SDOC specified head end components, specified features and field devices determined necessary to address all routine requirements, events and emergent circumstances.

D. All SDOC intercom system head end component assemblies shall be self-contained assemblies ready for installation in SDOC specified and provided or SDOC specified and contractor provided free standing nineteen (19) inch two post technology systems racks. Unless SDOC specified special circumstance is approved in writing SDOC Division 27 specifications dictate no intercom cabinet enclosure either wall mount or free standing shall be installed. Still and all, when SDOC specified special circumstance is pre-approved the SDOC specified cabinet enclosure shall be a free standing Chatsworth Series “M” Mega Frame cabinet enclosure “only” and of the size and configuration as SDOC dictates.

E. Intercom Contractor Capabilities:

1. Shall provide and install the selected digital or analog intercom system for all new construction, renovation or retrofit projects. All installation in part or in whole shall be a comprehensive thorough installation determined as satisfactory and complete only by authorized SDOC Representatives.

2. Shall provide and install selected whole new system installations, partial system additions or system upgrades contracted at a cost deemed reasonable by authorized SDOC Representatives regardless of circumstance. Increase in cost of installation and equipment resultant of an emergent and unforeseen circumstance is not an acceptable practice. Additionally, cost for all installations shall always provide secure, reliable, integrated communications that is flexible and
user-friendly with all SDOC detailed, selected and approved features to extend protection and control. Reducing availability of features and or equipment to shave costs is not an acceptable practice.

3. Provide and install all SDOC specified head end assemblies and connecting hardware, Amphenol cables, cross connect blocks, SDOC approved fiber optic and copper patch cables, all associated mounting, bridging and cross connect material.

4. Provide and install all SDOC approved surge suppression, call display stations and emergency microphone components as required for a complete turnkey SDOC selected intercom system installation.

5. Provide and install all SDOC specified copper and or fiber optic backbone, field device cabling, call switch/buttons, volume controls, interior and exterior speakers, matched synchronized clocks and all other SDOC specified intercom field device equipment and components inclusive of all mounts, grid brackets, speaker housing, stub outs and back boxes and pull string.

6. Provide and install all cable support systems, conduit pathways, sleeving, interior and exterior wall and floor penetrations, vaults, manholes, pedestals, pull boxes and other items of a hardware nature.

7. All parts utilized for all installations and in all aspects of any project shall always be new, of excellent quality and of most current version or model with no exception. Use of refurbished or used / pre-owned parts is unacceptable unless authorized for use by SDOC MTSD Technology Construction Project Managers or other Authorized and qualified SDOC Representatives.

F. Beyond new construction intercom installations SDOC managed retrofit and renovation intercom construction projects shall require careful and in-depth discussion and consideration of details regarding existing special site specific configurations and coordination to ensure all existing connections and needs are adequately identified, addressed and coordinated while retrofitting and installing a new intercom system and components. Examples of the site specific although not all inclusive issues for coverage may include the following:

1. Identification of any previously established site specific speaker zones and established cutouts for zone system speakers at various areas as the local administration requires.

2. Provision of programming or zone cutouts to accommodate established routine intercom announcement cutouts during presentations for auditorium and other locations as the local administration requires.
3. Other established details not routinely covered or addressed under new installation of basic sound systems to ensure all issues are thoroughly identified, discussed, coordinated and addressed.

G. Detail specific notes covering the specifics of these issues and engineered resolutions are to be inserted on the plan design pages for each project.

H. Intercom contractor shall ensure all intercom systems shall be assembled, installed and tested in compliance with all manufacturer recommendations and installed to the complete satisfaction of authorized SDOC Representatives in strict accordance with all applicable SDOC Division 27 Technology Standards and Specifications.

I. Intercom system cabling:

1. All intercom system cabling for installation shall be “only” SDOC approved and specified appropriate cabling designed for use with intercom systems and equipment. Note: West Penn AQC369 is the SDOC specified copper backbone cable for installation unless a differing cable is otherwise specified by Authorized SDOC Representatives qualified to determine an alternate SDOC approved choice.

2. The contractor shall submit cut sheets to SDOC MTSD for review prior to provisioning to ensure manufacturer types and quality are SDOC reviewed and approved as adequate for installation.

J. Intercom and Sound System Separation:

1. Under no circumstance shall the installed intercom system or its associated intercom system speakers be coupled for operation with any school sound system.

2. The installed intercom system and its associated speakers are intended for general announcing campus control, safety and protection. The speakers are of a different quality than that of sound system installations and not intended for that purpose.

3. By its nature the general announcing intercom system is intended to provide routine and emergent announcements and shall not be placed at risk or impairment being coupled to a potentially incompatible sound system not intended for that purpose.
1.05 INTERCOM SYSTEMS POWER SPECIFICATIONS:

A. Power installed for all intercom systems installations shall be clean power as the standard unless otherwise noted.

B. As a routine the analog or IP based digital intercom head end system is installed the MDF in a designated two post free standing rack location. This location routinely has SDOC provided and installed UPS equipment powered by the campus clean power system where the intercom electronics shall be connected to power the intercom head end system equipment electronics.

C. SDOC MTSD shall provide and install all APC UPS equipment appropriately sized for one (1) hour up time including SNMP Module for the general contractor provided and installed intercom system.

D. SDOC MTSD is responsible for the procurement, installation and testing of the appropriate UPS equipment prior to the connection and testing of the intercom equipment.

E. Each interface connection and associated testing between the intercom contractor provided and installed intercom head end electronics and the SDOC Media and Technology Services Department provided and installed UPS equipment shall be witnessed by authorized technician’s representative of both the intercom contractor and SDOC Media and Technology Services Department. Upon satisfactory completion of all connections and testing both representative technicians shall sign the attached UPS Confirmation Ticket (See Figure 33) verifying both the UPS and the intercom head end are functioning properly at the time of installation.
Figure 33 – SDOC / INTERCOM CONTRACTOR UPS VERIFICATION

UPS OPERATIONAL CONFIRMATION DOCUMENT

SDOC STAFF AND INTERCOM CONTRACTOR STAFF:

SCHOOL NAME ____________________________________________

ADDRESS ____________________________ ____________________________

Intercom system testing (systems/function performed) __________________________

UPs INSTALLATION

Date: ____________________________ ____________________________

By whom: ____________________________ ____________________________

Signature / Printed Name

Field verified proper intercom functions (All page, zone page and minimum of five (5) classroom two (2) way communications testing performed.) __________________________

____________________________

____________________________

____________________________

*If the entire site is tested attach a copy of the intercom contractor’s test results.

Confirmation by SDOC Representative: ____________________________ ____________________________

Signature / Printed Name

Confirmation by intercom contractor representative: ____________________________ ____________________________

Signature / Printed Name

*Signature above verifies the system is functioning properly after the UPS system(s) have been installed and the intercom functions as noted above were witnessed by both parties. Date: ____________________________
1.06 SDOC ANALOG AND DIGITAL INTERCOM SYSTEM FUNCTIONALITY:

A. All intercom systems both analog and digital shall be provided functionally ready when installed with the following ability and capability:

1. Ability to interoperate with Digital Key and Voice over IP Telephony systems to allow all-call, classroom calls, and tone distribution to be placed with the existing telephone handsets.
2. Ability to prioritize normal and emergency call-ins.
3. Ability for the bell clock to synchronize with the Atomic Clock or NTP Server.
4. Ability to adjust the duration of bell tones as SDOC specified.
5. Ability to automatically play music during passing periods.
6. Capable of Zoned Only Program Distribution
7. Ability to produce a minimum of eight (8) notification/emergency tones.
8. Ability to have synchronized classroom clocks that operate over the existing intercom cabling.
9. Ability to play a preprogrammed voice string on contact closure from other systems such as intrusion alarms.
10. Ability to play a preprogrammed voice string over designated speaker groups when call-ins go unanswered.
11. Ability to be managed and programmed via PC client software.
12. Ability for certain functions to be controlled by users via telephone handset, such activating different bell schedules and setting time and date.
13. Ability to program architectural / FISH numbers to match room numbers.
14. Ability to enable line supervision.
15. Ability to produce pre-announce / post announce tones.
16. Ability to allow Executive Override for key staff for emergency communications.
17. Ability to program each station port for minimum eight (8) Page Zones, eight (8) Program Zones, and eight (8) Bell Zones.
1.07 ANALOG INTERCOM SYSTEM HEAD END COMPONENTS:

A. The analog intercom system head end electronic assemblies and components shall be an all-inclusive turnkey installation. The decision for installation inclusion or deletion of any specified component / assemblies listed at each SDOC site specific location shall be determined during the design process by SDOC representatives experienced in determining the intercom needs and requirements for all site specific intercom installations.

1. Analog Base System:

a. Description: Rack-mount controller with Built-in Master Clock for class change tones and clock correction. Full feature digitally processed communication system. Integrates with telephone system or operates as stand-alone system.

b. Equipment Features and Functions include:

- Integrated master clock/internal communications system consisting of:
  - Intercom paging.
  - Evacuation tones and class change tones.
  - System provides program distribution to selected rooms, zones or all speakers.
  - Multi-level call-in with automatic routing.
  - Pocket page dial-out interface.
  - One telephone dial-in interface.
  - Intercom amplifier and power supply included with base system.
  - Base system will provide a minimum sixty (60) two-way communications circuits as well as support All-Call and zone paging.
  - System shall be capable of expansion to a minimum three-hundred fifty-eight (358) ports.

c. Additional Elective Site Dependent Components Available as Additions to Analog Base Assembly:

- EXPANDER CHASSIS
- TELEPHONE INTERFACE MODULE
- AUDIO & CONTROL MODULE- HIGH POWERED RELAY
- DESK TOP DISPLAY WITH 10 BUTTON SINGLE LINE TELEPHONE
- STATION LINE MODULE CARDS
- EACH MODULE SHALL HAVE STATION PORTS TO SUPPORT A SPEAKER, CALL-IN SWITCH AND OR NON-DIALING TELEPHONE
- AM/FM TUNER/COMPACT DISC PLAYER
1.08 IP BASED DIGITAL INTERCOM SYSTEM HEADEND COMPONENTS:

A. The IP Based Digital Intercom System head end electronic component / assemblies related to this intercom system are all inclusive for reference below. The IP based digital intercom system head end electronic assemblies and components shall be an all-inclusive turnkey installation. The decision for installation inclusion or deletion of any specified component / assemblies listed at each SDOC site specific location shall be determined during the design process by SDOC representatives experienced in determining the intercom needs and requirements for all site specific intercom installations.

1. IP Base Digital System:

   a. Description: IP Digital Intercom and Paging Main or Master IP Based GATEWAY Unit - Integrated Master Clock/Internal communications system consisting of:

   - Intercom paging.
   - Multilevel call-in, evacuation tones, class change tones, pre-recorded instructional messages and program distribution.
   - Main or Master Gateway Unit is the heart of the system and reference point for all remote IP Based Digital Gateway Units and the interconnection to the telephone system.
   - The Main Gateway/Master IP Based Digital Unit stores the system’s real-time logging information and provides 10-watts of VOX controlled Intercom Audio for each Remote IP Based Unit combination.
   - The Main or Master Gateway Unit shall provide for a minimum seventy-two (72) individual points of call switches/speakers without telephone interface and seventy one (71) individual points of call switches/speakers with telephone interface.
b. Additional Elective Site Dependent Components Available as Additions to IP Based Digital Intercom System Main or Master Gateway Unit:

- VoIP ADMINISTRATIVE PHONE WITH DISPLAY AND POWER SUPPLY
- AM/FM TUNER/COMPACT DISC PLAYER
- MP3 PLAYER INPUT MODULE
- REMOTE PROGRAM AND MICROPHONE INTERFACE-INTERFACES WITH IP DIGITAL INTERCOM HEAD END SYSTEM TO AUDIO PROGRAM
- DESK TOP MICROPHONE
- 35-WATT AMPLIFIER
- 75-WATT AMPLIFIER
- 150-WATT AMPLIFIER
- 250-WATT AMPLIFIER
- ATOMIC TO MASTER CLOCK ASSEMBLY AND SYNCHRONIZATION SYSTEM
- 16” ANALOG CLOCK WITH ENHANCEMENT MODULE
- DIGITAL SYNCHRONIZED CLOCK
- DIGITAL VOICE PROCESSOR CARD
- QUAD STATION LINE CARD
- UNIFIED DVP STATION CARD
- SINGLE LINE PHONE WITH CALLER ID
- SINGLE LINE ANALOG PHONE (NO DISPLAY)

c. REMOTE Gateway Unit Additional IP Intercom System Additional Elective Site Dependent Components Available as Additions to IP Based Digital Intercom System Main/Master IP Based Unit:

- TWELVE INTERCOM PORT IP DISTRIBUTED REMOTE UNIT
- TWENTY-FOUR INTERCOM PORT IP DISTRIBUTED REMOTE UNIT
- THIRTY-SIX INTERCOM PORT IP DISTRIBUTED REMOTE UNIT
- FORTY-EIGHT INTERCOM PORT IP DISTRIBUTED REMOTE UNIT
- SIXTY INTERCOM PORT IP DISTRIBUTED REMOTE UNIT
1.09 ANALOG INTERCOM SYSTEM “ONLY” INTERCOM BACKBONE CABLING INSTALLATION:

A. As SDOC specified the Intercom Contractor shall:

1. Provide and ensure all analog intercom system head end and field electronic equipment, components and cabling specified for installation, termination, programming, testing and labeling related to the analog intercom system shall be provided and installed directly by the intercom contractor.

2. Directly participate with SDOC Authorized Representatives in the interfacing of all SDOC provided and installed UPS, VoIP and network electronics systems with all Intercom Contractor provided Intercom head end equipment and devices.

3. Comply with all SDOC requirements in Division 27 Standards and Specifications and in particular the section relating to intercom installations when under the direct and contracted supervision of SDOC MTSD Technology Construction Project Managers or under the direct and contracted supervision of any general contractor as site specific projects dictate related to the installation and testing of analog intercom systems and the connection to SDOC installed and interfaced devices and systems.

4. In either circumstance ensure all intercom tasks and work shall be directly provided and installed by the intercom contractor.

B. In either circumstance the intercom contractor as SDOC specified and where contracted for all SDOC projects shall:

1. Provide, home-run install, terminate, test, label and surge protect as SDOC specified individual cable runs of West Penn AQC369 cable for exterior backbone from the MDF to all associated IDF locations in all associated buildings as backbone feed for individual call button, volume control, speaker / speaker group and horns for all buildings campus wide. Note: West Penn AQC369 is the SDOC specified copper backbone cable for installation unless otherwise specified by Authorized SDOC Representatives qualified to determine an alternate choice of cables.

2. Provide, home-run install, terminate, test and label as SDOC specified an additional twenty percent (20%) spare West Penn AQC369 cables with percentage based on each backbone cable run designed for each building exterior cable run installed from the MDF to each associated IDF. Additional cable percentage is intended to accommodate expansion campus wide.
3. As SDOC specified consult authorized SDOC MTS Department representatives for appropriate intercom cable pair punch down pattern or sequence for all instances where uncertain of proper SDOC specified approved pattern.

1.10 IP BASED DIGITAL INTERCOM SYSTEM “ONLY” INTERCOM BACKBONE CABLE INSTALLATION:

A. As SDOC specified the Intercom Contractor shall:

1. Provide and ensure all IP based digital intercom system head end and field electronic equipment, components and cabling specified for installation, termination; testing and labeling related to the IP based digital intercom system shall be provided and installed directly by the intercom contractor.

2. Directly participate with SDOC Authorized Representatives in the interfacing of all SDOC provided and installed UPS, VoIP and network electronics systems with all Intercom Contractor provided Intercom head end equipment and devices.

3. Comply with all SDOC requirements in Division 27 Standards and Specifications and in particular the section relating to intercom installations when under the direct and contracted supervision of SDOC MTSD Technology Construction Project Managers or under the direct and contracted supervision of any general contractor as site specific projects dictate related to the installation and testing of analog intercom systems and the connection to SDOC installed and interfaced devices and systems.

4. In either circumstance ensure all intercom tasks and work shall be directly provided and installed by the intercom contractor.

B. In either circumstance the intercom contractor as SDOC specified and where contracted for all SDOC projects requiring multimode fiber optic back bone cable to be utilized shall:

1. For existing established sites as SDOC Authorized Representatives dictate utilize two (2) strands of existing pre-installed established multimode fiber optic cable already in place between the MDF and each associated building IDF planned for Gateway Unit installation. These two (2) existing fiber optic strands shall provide the connections for each IP based digital intercom system Gateway Unit electronics installed at the MDF and all selected IDF locations.

2. For renovation sites having no current multimode fiber optic back bone cable installed or at pre-existing locations having no available multimode fiber optic back bone cable strands available the intercom contractor shall be capable to provide, home-run install, terminate, test and label all SDOC specified fiber optic exterior backbone cabling from the MDF to each associated IDF location to have a Gateway Unit installed.
3. All new installed fiber optic cable shall be required to be tested to the satisfaction of SDOC Authorized Representatives and all test results shall be provided by the installing Intercom Contractor at the completion of each project in printed and electronic format for owner retention.

C. Two strands of each existing installed campus fiber optic backbone cable shall be utilized by the intercom contractor from the MDF to each selected IDF location having a Gateway Unit installed.

D. For new construction installation sites and new installs of multimode fiber optic cable where strands are required during design for utilization by the intercom contractor these fiber optic cables shall be provided, installed, terminated, tested and labeled to SDOC Division 27 Standards and Specifications by the technology contractor under the governing general contractor for new construction and retrofit projects. All SDOC Division 27 Standards and Specifications and in particular those regarding intercom installation shall be adhered for all installations in all respects.

E. At existing sites when fiber optic strands are not available for use the intercom contractor shall install fiber optic cable as needs dictate. The intercom contractor shall be responsible for this installation. All tasks associated including terminations, testing and labeling shall be accomplished for SDOC required project specific fiber optic cable in the same manner as any and all other SDOC installed fiber optic cables and strands for all SDOC installations and projects IAW SDOC Standards and Specifications inclusive of fiber optic test results provide to SDOC at completion of the project in written and electronic format.

F. Each two strands of the installed fiber optic backbone cable utilized by the primary intercom contractor at the MDF and each IDF location shall be connected or “patched” to a remote Gateway intercom unit where installed in each IDF by the intercom contractor. All patch cords shall be intercom contractor provided and installed whether copper or fiber and shall be of SDOC approved type, quality and for copper patch cables the technology intercom system specific color of “Green”.

G. The two (2) fiber optic strands utilized at the MDF for each IDF shall be connected or “patched” at the MDF location to the intercom “MAIN / MASTER GATEWAY UNIT OR HEAD END” which shall be installed and tested by the intercom contractor including circumstances where contracted under the project specific general contractor, who shall provide, supervise and ensure the installation by the intercom contractor for new construction and retrofit projects. All patch cords shall be of SDOC approved type, quality and for copper patch cables the technology intercom system specific color of “Green”.

H. Regardless the circumstance for any site specific project installation required in support of all SDOC intercom installations whether or not directly intercom related all installations shall comply with all SDOC Technology Standards and Specifications with no exception.
1.11 IP DIGITAL INTERCOM SYSTEM BACKBONE CABLING EXCEPTIONS:

A. There are exceptions where SDOC specified AQC369 intercom copper backbone cables shall still be required on IP digital intercom system installations. These exceptions include:

1. Instances of shorter local single or limited cable runs installed to intercom stations for areas such as sports club houses, press boxes, ticket booths, concession stands, portable installations, chiller plan buildings, covered play areas, smaller local buildings and structures deemed not prudent or cost effective for the installation of a Gateway Unit during design of installation for any given project.

2. These new construction AQC369 intercom cable installation requirements shall be architect and engineer designed for installation to be fed from the closest practical local IDF location where an Intercom Remote IP Based Gateway Unit is installed.

3. For new construction and retrofit installations it shall be the responsibility of the site specific architect and project engineer to discuss and determine all such specific locations where AQC 369 cabling is more cost effective and prudent for installation as required with SDOC Technology Construction Project Managers to identify and indicate the proper cable type and counts for these installation specifications at each given site.

4. All fiber optic patch cords and copper Category Six patch cords utilized for the intercom Main / Gateway Master Unit and all associated Remote Gateway Unit(s) installation shall be contractor provided and installed SDOC approved certified patch cords provided and installed by the intercom contractor. All copper patch cords shall be of SDOC approved type, quality and the technology intercom system specific color of “Green”.

1.12 INTERCOM CONTRACTOR TASKS FOR ALL ANALOG AND IP BASED DIGITAL INTERCOM SYSTEM PROJECTS:

A. The intercom contractor shall provide, supervise and ensure all field equipment and components specified for installation, termination, testing and labeling related to the site specific intercom system to be installed shall be provided and installed by the intercom contractor. Sub-contractors for the intercom contractor are not acceptable for intercom installations.
B. The intercom contractor shall:

1. **NOTE:** Where applicable on the below listed tasks as site specific projects dictate in instances where there is a general contractor as the governing body they shall provide, supervise and ensure the intercom contractor shall provide, homerun install, terminate, test and label all head end and other assemblies, remote units, components, devices, cabling and all programming required for the intercom system installation.

2. Otherwise for SDOC contracted installation the project tasks below shall be accomplished by intercom contractor supervised by SDOC Technology Construction Project Managers and shall be installed in both instances as follows:

3. The intercom contractor shall for interior installations provide, homerun install, terminate, test and label one (1) West Penn 355 cable from the MDF and all IDF locations to each call button or volume control location project specified. West Penn 4245 cable is an SDOC approved acceptable alternative for West Penn 355 cable as cable selection for these interior installations.

4. The intercom contractor shall for interior installations provide, homerun install, terminate, test and label one (1) West Penn 291 cable from each intercom contractor provided and installed call button or volume control to all primary intercom contractor provided and installed speakers in associated interior and exterior locations and rooms project specified. West Penn 4245 cable is an SDOC approved acceptable alternative for West Penn 291 cable as cable selection for these interior installations.

5. The intercom contractor on individual singular circuits for each cable run from the intercom wall field 66 blocks at the MDF and each IDF as designed shall for interior installations provide, homerun install, terminate, test and label one (1) West Penn 291 cable to all individual or grouped intercom contractor provided and installed speakers and horns having no associated call button or volume control. All cross connects shall be installed in each MDF or IDF space. Not more than a maximum of five (5) speakers/horns per group shall be installed on any one single intercom cable run. West Penn 4245 cable is an SDOC approved acceptable alternative for West Penn 291 cable as selection for these interior installations.

6. The intercom contractor shall for interior installations provide, install, terminate, test and label one (1) West Penn 291 cable from each call button or volume control to each primary intercom contractor provided and installed synchronized intercom clock location for all identified classroom and other designated locations. West Penn 4245 cable is an SDOC approved acceptable alternative for West Penn 291 cable as selection for these interior installations.
7. The intercom contractor shall mount, program, synchronize, test and adjust all synchronized clocks at every installation for which contracted. This includes new construction intercom installations or existing sites where the head end is upgraded or replaced as contracted for an existing synchronized clock system. The intercom contractor shall ensure the program, synchronize, test and adjust of all synchronized clocks at these existing locations.

8. The intercom contractor shall provide, install, terminate, test and label either SDOC approved ATLAS interior flush mount ceiling mounted speakers for hard ceiling or ceiling grid applications or an SDOC approved non-proprietary intercom system device. Each interior flush mount speaker installation shall be installed with a ceiling grid tile bridge bracket and above ceiling a recessed enclosure.

9. The intercom contractor shall provide, install, terminate, test and label either SDOC approved ATLAS exterior weather proof flush mount wall mounted speakers for all building outdoor finished wall applications or an SDOC approved non-proprietary intercom system device. Each exterior weather proof flush mount wall mounted speaker installation shall be installed with a recessed weatherproof back box and extension ring.

10. The intercom contractor shall provide, install, terminate, test and label either SDOC approved ATLAS exterior weather proof wide angle horn loud speaker for all building outdoor sports complex and ball field type applications or an SDOC approved non-proprietary intercom system device. Each exterior weather proof wide angle horn loud speaker installation shall be installed with a weatherproof back box and extension ring. Intercom cable runs for the entire assembly shall be installed in conduit with weather proof enclosures for maintenance and repair IAW SDOC Division 27 Standards and Specifications.

11. Other SDOC speaker requirements may be applicable regardless of coverage in this document.

   a. It shall be the intercom contractor’s responsibility to ensure all items and installation questions are answered and resolved prior to installation.

   b. Failure to obtain installation specifics for areas unclear shall result in the removal of all items not to SDOC standards and approval and replacement by the primary intercom contractor with acceptable products and acceptable installation practices at no additional cost to SDOC.
12. The intercom contractor shall provide, install, terminate, test and label the associated cabling and one (1) synchronized sixteen inch analog intercom clock with enhancement module U.O.N. for all identified classroom and other designated locations.

a. Intercom contractor shall install all synchronized clocks at ninety-six (96) inches above finished floor centered above the space entrance door unless otherwise noted or required. Intercom contractor shall provide and install all SDOC approved raceway and support pathways where required as project specified.

b. Where available the intercom contractor shall install all synchronized clocks utilizing intercom cable installed from each call button or volume control in each classroom and as designated on conformed plans in office spaces and all common areas to include reception, dining room, kitchen, data entry, teacher lounge, and multipurpose areas campus wide.

c. All connection cable connections shall be made and secured using SDOC approved connectors and connection practices to the complete satisfaction of SDOC MTSD Technology Construction Project Managers.

d. All intercom installations shall include all applicable intercom contractor provided and installed intercom head end components inclusive of the ATOMIC TO MASTER CLOCK ASSEMBLY AND SYNCHRONIZATION SYSTEM, all programming, testing, adjustments, field cabling connections, labeling, supports, sleeving and stub outs to SDOC satisfaction.

13. Intercom contractor shall ensure at project substantial completion a fully operable, tested and adjusted, turnkey system complete with all clock synchronized with the installed intercom head end.

1.13 CABLING, RACEWAY, CONDUIT, SUPPORT AND LABELING:

A. All cabling, conduit, support, testing and labeling accomplished by the primary intercom contractor shall comply in all respects with SDOC specified requirements as detailed for all cabling installations in Section 27020 of the SDOC Technology Standards and Specifications document as well as for standards and specifications described and outlined in this document.

B. All intercom cables have a maximum pulling tension of seven (7) pounds which shall not be exceeded.

C. All cabling to both interior and exterior locations shall be individual home run installations installed from the field device back to each intercom system IDF and the MDF locations and ultimately back to the intercom head end for circuit connection. Specific cabling configuration details are indicated in Figure 13.
D. All cables for underground installation shall be cables manufactured for this purpose. All cables installed in PLENUM Air spaces shall be PLENUM CABLES and shall be readily identifiable on all cable jackets as PLENUM cable. It shall be the responsibility of all installing general contractors and intercom contractors to identify the proper riser or plenum air space and provide and install the appropriate cable for all installations and circumstances. Evidence of improper cable installation shall be replaced by the general contractors and intercom contractors at no expense to SDOC. Change order or additional work and material requests of this nature are not acceptable and shall not be approved. All infractions and corrective work of this nature shall be accomplished by the contractor for expected installation completion and shall not impede the scheduled substantial completion for any project.

E. Copper and fiber optic backbone intercom cabling between the MDF and each IDF space shall be of sufficient quantities to service all intercom requirements with minimum twenty percent (20%) spare for future expansion in the building or area installed unless otherwise noted. For new construction projects it is the responsibility of the site specific architect and project engineer to ensure adequate backbone intercom copper cables or backbone fiber optic cable and strand quantities are designed for each SDOC project to support not only current needs but to provide reasonable expansion capability as well. Otherwise it shall be the responsibility of the intercom contractor to determine site specific needs in discussion with the SDOC/MTSD Technology Construction Project Managers and other Authorized SDOC Department Representatives and then to insure the required types and amounts of cable required are installed to SDOC satisfaction.
F. All building field intercom cabling shall be neatly and professionally installed and routed by the intercom contractor in accordance with all guidelines established in Section 27020 of the SDOC Technology Standards and Specifications document in addition to adherence to all details as described and outlined in this document.

G. All intercom cabling shall be installed at the highest ceiling point available to ensure no interference with other types of technology cables or mechanical, electrical, fire alarm and plumbing building services and their associated cabling as installed.

H. There shall be no free wired intercom cables installed across bar joists where the joists are the means of support. Bar joists may be utilized for installation of SDOC approved and sanctioned cable supports with all intercom cabling installed in these supports as SDOC approved for cable installations. Intercom system building field infrastructure and backbone cabling:

1. Shall not be installed across any electrical fixture or fastened or secured to any EMT conduit.

2. Shall not be installed within 18” of florescent lighting.

3. Shall not lie on or against any HVAC equipment or ducting.

4. Shall not be fastened or secured to vent duct straps.

5. Shall not lie on or against and shall not be fastened or secured to any sprinkler piping, copper piping, mechanical, electrical, fire alarm and plumbing building services conduit, piping, cabling or other systems and devices or their supports.

6. Shall not be fastened or secured to existing ceiling grid hangars intended for the support of the ceiling grid at any location. Shall not be fastened or secured to existing ceiling grid hangars intended for the support of any other technology systems or other systems cable runs installed at any location. Installation of intercom contractor installed ceiling grid hangars intended for installation of supports for intercom system cable runs is acceptable and encouraged. All grid hangars installed for such use shall be “swatch” painted blue in color to identify their intended use when installed.

7. Cable support fastening devices shall not be clamped to any existing equipment, threaded rods, ceiling grid hangars, straps, etc. “J” hook support systems shall be installed using manufacturer supplied clamps and attachments for grid hangar installations and when drilled for installation on drywall or concrete shall be installed with SDOC approved and sanctioned fasteners “ONLY”.

10/13/14
I. Intercom cable bundles shall be bundled together using Velcro wraps only. Intercom cable bundles shall be kept in physically separate cable runs from all other technology cables and shall not touch other cable runs in any manner. Intercom cable bundles shall be installed away from vibrating machinery, power cords, plug strips or other circuits with a difference of potential. All intercom cabling from single runs to bundles shall be supported with SDOC approved supports including J-Hooks every five (5) feet with a Velcro wrap installed at all “J” hook stations. J-Hooks shall be at the highest accessible point in the building ceiling.

J. Where two or more intercom cables are run together they shall be Velcro wrapped every 2 feet. Intercom cable bundles or individual cables shall be neatly secured with Velcro wraps.

K. Fanned out cable runs or excessive drooping of cable runs is not permissible or acceptable in any instance. Excessive drooping shall be by determination of SDOC MTSD Technology Construction Project Managers. Cable ties are not an SDOC approved means of support or bundling for intercom cable installations. Lacing of intercom cables shall not be permitted.

L. An SDOC determined and defined amount of service slack shall be installed at all MDF and IDF locations and at field device locations. All service slack shall be neatly but not tightly coiled and shall be secured above ceiling with Velcro wraps at minimum three points on each coil and with the finished coil secured to “J” hooks.

M. At existing as well as new construction installation sites general contractors and or the intercom contractor shall make all necessary efforts to protect all existing equipment, wiring, fixtures and building materials from damage during installation of equipment including provisioning of adequate ventilation if covered during construction. All intercom cabling installed and not placed into operation such as spare cables for future expansion shall be properly terminated, labeled on both ends to identify far end and protected regardless of functionality. All intercom cable bundles or runs being installed in construction yet not currently finished and terminated shall be lifted and supported off the floor of closets in a manner to prevent any damage to sheathing. Any and all cabling damaged in any manner shall be the sole responsibility of the contractor to replace the entire run at no additional cost to SDOC with no exception.

N. **Warning to all contractors:** There shall be no splicing of any intercom or other associated contractor installed cabling at any SDOC technology installation with no exception. Violations will not be tolerated. Do not splice a damaged cable and attempt to hide it to complete an installation. Take the time to demo out and install a new cable. It will not be viewed in a favorable light if an unauthorized splice infraction is discovered.

O. Connector Tooling: Tooling used to provide connectors shall be specifically designed for the connector being used. Utilization of non-specified tools shall be considered as grounds for cease and
desist as well as possible grounds for termination of contract. Twist on style connectors are not acceptable for SDOC intercom installations and shall not be installed.

P. General contractor and the intercom contractor shall ensure all intercom cabling passing through any wall at all locations shall be properly sleeved with SDOC UL approved sleeves and devices. Conduit sleeves shall be carefully reamed and installed with plastic bushings on both ends. All sleeving shall be installed in compliance with guidelines detailed in Section 27_02_00 and Appendix “G” Fire and Smoke Rated Wall Penetrations of the SDOC Technology Standards and Specifications document with no exception.

Q. Contractor installed equipment cabinets, panels or free standing equipment racks shall have EMT conduit sleeving installed from the equipment cabinet or panel stubbed out to the above ceiling space. The EMT conduit sleeving shall be carefully reamed and terminated with plastic bushings at all open ends. Free standing equipment racks shall have EMT conduit sleeving installed to transition cabling from above ceiling space to the interior of each space. The EMT conduit sleeving shall be carefully reamed and terminated with plastic bushings on all open ends. EMT conduit sleeving shall also be bonded to the ground bus installed in as short an installation run as possible at the local IDF or MDF as applicable on one (1) end as appropriate to comply with NEC directives in all instances. All ground cable shall be installed by the contractor and shall be strapped in its own separate run with no other cabling. All ground cables shall be installed in a separate pathway and shall not transition through technology systems conduits or sleeving.

R. Where no synchronized Intercom Clock (CK) Station is installed all Call Button (CB) Stations and Volume Control (VC) Station locations shall be connected to single gang back boxes flush mount installed at 48 inches A.F.F. back boxes shall be coupled to minimum 3/4 inch EMT conduit stubbed out above ceiling with bushing installed at stub out end. For locations where in wall installation is not possible or practical as deemed so by SDOC MTSD Technology Construction Project Manager surface mount is permissible as SDOC approved “ONLY”.

S. Where Call Button (CB) Station and Intercom Clock (CK) Station combination assembly locations are installed these assemblies shall be oriented where all Call Button (CB) Station single gang back boxes shall be flush mount installed to the right or left of the entrance door to each space. Each Call Button (CB) Station single gang back box shall be flush mount installed at 48 inches A.F.F. and U.O.N. shall be coupled with minimum 3/4 inch EMT conduit to an Intercom Clock (CK) Station single gang back box which shall U.O.N. be centered above the entrance door to each space at either 96 inches A.F.F. or at six inches below finished ceiling and the clock back box shall then be connected to minimum 3/4 inch EMT conduit which shall continue to above ceiling and shall be stubbed out in the direct vicinity of the assembly with bushing installed. For locations where in wall installation is not possible or practical as deemed so by SDOC MTSD Technology Construction Project Manager surface mount is permissible as SDOC approved “ONLY”. Refer to Figure 34 for detail.
Figure 34 – Intercom Call Button / Clock Conduit Infrastructure Detail “Typical”

"CK" IS INTERCOM CLOCK WIRING RECEPTACLE. THIS SINGLE GANG BOX SHALL BE LOCATED CENTERED ABOVE DOOR TO EACH CLASSROOM SPACE AT SIX (6) INCHES BELOW FINISHED CEILING.

"C" IS INTERCOM CALL BUTTON WIRING RECEPTACLE THIS SINGLE GANG BOX SHALL BE LOCATED CENTERED TO LEFT OR RIGHT OF DOOR TO CLASSROOM SPACE AT FORTY-EIGHT (48) INCHES A.F.F.

Figure 34 – Intercom Call Button / Clock Conduit Infrastructure Detail “Typical”
T. General contractor and the intercom contractor as contracted shall as a minimum ensure all intercom pathway penetrations shall be properly sleeved and sealed in compliance with guidelines detailed in Section 27020 and Appendix “G” Fire and Smoke Rated Wall Penetrations of the SDOC Technology Standards and Specifications document and in accordance with all applicable fire and safety directives and codes. Example: Fire Wall penetration must be resealed using an SDOC approved and more importantly UL approved non-flammable Fire Proof/Resistant material to ensure the Fire Wall/floor/ceiling maintains original fire rating at completion of installation. The same directives apply for all smoke ratings as well.

U. Upon completion of all intercom projects a certified statement is to be submitted by the contractor assuring SDOC that all interior and exterior wall and floor penetrations whether new or existing have been sleeved and sealed in compliance with fire codes and SDOC Standard and Specifications. It shall be the contractors sole responsibility to insure any existing penetrations authorized by SDOC for use by the contractor are restored to fire and smoke rating as applicable even in instances where these penetrations may not have been properly sealed prior the contractors use.

V. Contractors shall not utilize any existing installed technology system sleeve with or without other technology cables installed without prior permission requested and granted in writing from SDOC MTSD Technology Construction Project Manager or authorized representative. Failure to comply shall result in removal of all installed cables at the sole expense of the contractor. Upon SDOC MTSD inspection after removal of unauthorized cable installation if it is determined any existing original communications cables have sustained “burning” resultant of installation of new cables or other damage is sustained as determined by SDOC MTSD Technology Construction Project Manager or authorized representative all suspect cables shall be replaced at no additional cost to SDOC by approved technology contractors at the sole expense of the intercom contractor originally incurring the initial damages.

W. All interior to exterior wall penetrations shall be installed with an SDOC approved appropriately sized sleeve as SDOC specified. All conduit sleeves shall be carefully reamed to remove all burrs and sharp edges. At all exterior locations the conduit sleeve shall be coupled to a watertight double gang back box with cover installed. Plastic bushings shall be installed at all interior stub out conduit end terminations. All intercom sleeves shall be properly supported and strapped to SDOC satisfaction to prevent slippage and wobbling of conduit sleeve stub outs. All intercom conduits shall be properly sealed at both the interior and exterior wall surface and around both the interior and exterior walls of the conduit sleeve with UL approved materials as SDOC specified. Refer to Figure 35 for Intercom Exterior Stub out Details for installation specific clarification.
DIVISION 27 08 00
School District of Osceola County
Technology Standards and Specifications

Figure 35 for Intercom Exterior Stub out Detail “Typical”

EXTERIOR / OUTDOOR INTERCOM HORN LOCATION IMPORTANT NOTE:

ALL BACK BOXES SHALL BE INSTALLED SQUARE WITH THE BUILDING ARCHITECTURE.

THERE IS NO MEANS OF ADJUSTMENT ON THE FACEPLATES TO COMPENSATE FOR BACKBOXES INSTALLED OUT OF SQUARE.

CORRECTION OF BOXES OUT OF SQUARE SHALL BE THE SOLE RESPONSIBILITY OF THE GENERAL CONTRACTOR.

EXTERIOR / OUTDOOR INTERCOM HORN LOCATION “TYPICAL”

Figure 35 for Intercom Exterior Stub out Detail “Typical”
X. All flush mount and surface mount intercom speakers and horns installed on the exterior surface of any building whether new construction or existing retrofitted building at any location shall be installed at a minimum height of ten (10) feet above surface of the exterior of the building with the exception being in instance where covered walkways or other constructed surface will impede normal and intended functional operation of the installed device. In this exception the architect, engineer, general contractor and intercom contractor shall in design phase identify the issue and adjust mounting and installation height to accommodate highest possible installation below covered walkways or other constructed surfaces while working with SDOC MTSD Technology construction Project Managers to determine the most suitable new installation location to relocate the device. This solution is also applicable for exceptions where this was not identified until time of installation where the architect, engineer, general contractor and intercom contractor shall identify the issue during construction and adjust mounting and installation height to accommodate highest possible installation below covered walkways or other constructed surface working in conjunction with SDOC MTSD Technology construction Project Managers to determine the most suitable new installation location to relocate the device. In all instances relocation in these circumstances shall be at no additional cost to the school district as it is the responsibility of the architect, engineer and the general contractor to identify all such construction related issues and anticipate these items ahead of time by adjusting and making corrective action prior to any installation.

Y. All cable exposed to the exterior shall be installed in an SDOC approved appropriately sized PVC or EMT conduit pathway as SDOC specified. All conduit raceways shall be carefully reamed to remove all burrs and sharp edges. Plastic bushings shall be installed at all open conduit end terminations. All intercom conduits shall be properly supported and strapped to SDOC satisfaction rule of thumb being one conduit strap within two feet of beginning and end of each conduit with a conduit strap every two feet in between the entire run. All intercom conduits shall be properly sealed around both the interior and exterior walls of the conduit with UL approved materials installed as manufacturer specified and as SDOC specified.

Z. All SDOC approved connectors/connections exposed to the weather at speaker or other component locations shall be filled with an insert of silicon ‘grease’ equal to Dow Corning DC #5 compound before mating with opposite connector half. The connection shall then be completely covered with heat shrink tubing and the cable shall be tested end to end for continuity upon completion of assembly.

AA. All interim cable run points of termination between the field device and the head end connecting ends for each cable at 66 block locations shall be bridged with appropriate bridging clips. Wire clippings; cross connect wire or other metallic connection not SDOC approved nor intended for bridging shall not be installed.
1.14 INTERCOM SYSTEM LABELING:

A. All intercom system components shall be labeled for identification and all cables shall be labeled on both ends and at all interim points of termination by the intercom contractor. All labels shall be permanent, indelible, typewritten labels with identification numbers corresponding to speaker numbers indicated on the conformed drawings. Handwritten labeling is not acceptable.

B. Consult SDOC MTSD Technology Construction Project Manager in the event there is no numbering system indicated or identified for appropriate number plan which shall require prior SDOC MTSD clarification and approval. Failure to gain prior approval shall result in removal of the installed labeling and replacement with SDOC MTSD approved suitable selection at the sole expense of the installing contractor.

1.15 INTERCOM SYSTEM SURGE SUPPRESSION:

A. Surge suppression shall be provided and installed by the intercom contractor for all analog and digital intercom system installations of copper cable runs installed for each exterior mounted speaker and other associated exposed intercom equipment U.O.N.

1. All intercom system cables and power circuits exiting any building shall be properly surge protected with grounding practices that are SDOC approved.

2. All grounding shall be properly installed and configured in full compliance with current NEC directives for all grounded voltage and surge suppression devices and systems. It shall be the intercom contractors’ responsibility to ensure compliance with NEC directives. All infractions of NEC in failure to properly install shall be the intercom contractors’ sole responsibility to correct at no additional cost to SDOC.

3. Where exterior copper backbone or other applicable exterior intercom cabling is installed SDOC approved and specified surge protection devices shall be installed at the head end device location in all instances.

4. For IP Based Digital systems remote and Main digital Gateway Units connections all copper cabling installed to exterior SDOC shall require the intercom contractor install grounding and surge protection devices to be installed at the location of every specific source Gateway Unit providing intercom service.

B. All surge suppression device installations are required to be grounded and shall be bonded to a local telecommunications grounding bus bar and as needed with grounding blocks installing home-run minimum #6 stranded copper, green jacketed ground cable.
1. Crimp style terminal ground lugs are SDOC approved and shall be installed as required for connections at all IDF and MDF telecommunication grounding bus bar locations.

2. When ground bus blocks are installed these shall be homerun bonded to a properly grounded telecommunications grounding bus bar (TGBB) via one (1) homerun installed #6 stranded copper, green jacketed ground cable.

3. All contractor installed grounding devices including crimp style or screw post connectors, clamps, fasteners and other related grounding components shall be UL approved and shall in all instance be installed IAW all NEC installation directive, methods and practices with no exception.

4. No “looping” or “Daisy Chaining” of ground blocks and bonding cables is approved or accepted as this is a violation of NEC directives.

5. No trimming of grounding conductors at lug or other points of termination is acceptable as this is a violation of NEC directives.

6. No more than one grounding cable shall be installed under one grounding lug as this is a violation of NEC directives.

7. No grounding connections shall be secured with self-tapping threaded screws.

8. All grounding connections shall be bolted tight and where field connections are installed to devices all metallic surfaces connections shall be installed on clean, unpainted metal to metal surfaces only.

9. Instances where installation and use of PE89 voice cable for intercom backbone is SDOC approved the intercom contractor shall provide and install all PE89 voice cable shields properly grounded with bullet bonds installed on both ends of each PE89 vice cable.

C. At the MDF Gateway Unit and all Gateway Unit Remote locations (as applicable) all intercom cabling shields shall be looped together on the Intercom head end side of each and all 66 blocks. The shields shall all be bridged to the field wiring side of each and all 66 blocks.
D. MGB ground rails shall be mounted behind the 66-block mounting brackets according to manufacturer installation guidelines to allow EDCO PB-CLN and PB-SPK surge suppression devices, as required to sit flush on all 66-blocks. The MGB ground bars shall be mounted on the same side of each 66 block where all outside plant trunk “backbone” cables shall be terminated. Secondary voice electronics and equipment voltage surge suppression devices shall be:

- Intercom voltage surge suppression devices and applicable components:
  
  1. Call-Button- EDCO PB-CLN
  2. Speakers- EDCO PB-SPK

- Telephone voltage surge suppression devices:
  
  1. CO Lines- EDCO HCO
  2. Analog telephones- EDCO HAE
  3. Digital telephones- EDCO HDE

- All voltage surge suppression devices shall be installed in strict compliance with manufacturer provided installation specifics.

1.16 SYSTEM PERFORMANCE:

A. Both Digital and Analog intercom systems shall be balanced, tuned and programmed by the intercom contractor to provide superior sound quality and optimum feature performance. All programming, testing and adjustments shall be made by the intercom contractor IAW manufacturer installation specifications to ensure highest possible quality of sound and optimal efficient utilization of the system and all features to the complete satisfaction of all SDOC Representatives.

1.17 PROJECT COMPLETION REQUIREMENTS:

A. The intercom system installation shall be considered complete when all of the following requirements have been achieved to the complete satisfaction of all authorized SDOC MTS Department Representatives associated with all aspects of the site specific project installation:

1. All head end and components and field devices are installed IAW the conformed construction plans, all applicable SDOC Division 27 Standards and Specifications and all manufacturer installation specifications.
2. All new installed spare dead end intercom cables and unused ports are terminated tested and identified with typewritten labels on all ends and points of termination and test results for all cables installed provided for owner retention in printed and electronic format for owner retention.

3. All intercom head end equipment both Main and remote Gateway Units are installed programmed, adjusted and tuned to manufacturers' specifications and IAW Division 27 Standards and Specifications.

4. All field and backbone intercom cabling installed to each device, enclosure, cabinet and MDF and IDF location is terminated and identified with typewritten labels on all ends including all interim points of connection to SDOC satisfaction.

5. Demolition and removal of all dead end and obsolete or replaced pre-existing cabling and equipment hardware has been accomplished by the general contractor and the intercom contractor to the complete satisfaction of all authorized SDOC MTS Department Representatives associated with the site specific project. Removal of any SDOC identified cable of this nature is required per NEC directives and cost for removal shall be included by all contractors in all initial project quotes and bids with no exception. Accomplishment of this work line item is expected by SDOC for any and all projects as required. “After the fact” additional work change requests submitted for completion of this work are not acceptable and are expected to be accomplished under the scope of every SDOC project.

6. An as built plan in CADD, VISIO, PDF or other SDOC designated approved format indicating the head end location and all speakers, devices and cabling with any and all changes from the “original design configuration” has been submitted to the owner for review and retention and has been final owner approved.

7. It shall be the responsibility of the intercom contractor to verify the condition of all ceiling tiles and the work spaces prior to installation. All broken, gouged, cracked or otherwise damaged ceiling tiles, gouged or otherwise damaged walls, gouged or otherwise damaged flooring carpet and tile or other damages not previously documented that are later identified by any authorized SDOC Representative to be caused by the intercom contractor at the end of each project shall be repaired and or replaced as applicable by the contractor at no expense to SDOC prior to final payment authorization.

8. It shall be the responsibility of the intercom contractor to repair any exposed surface which has been scratched or damaged during project installation to like-new condition to the satisfaction of SDOC Authorized Representatives. Upon completion of project all exterior surfaces of equipment and construction areas shall be cleaned of fingerprints, paint splatters, and other foreign substances. All construction debris such as wire trimmings, mortar, cable spools and boxes and foreign debris shall be removed from equipment areas and any area directly affected during the installation or service of equipment. All trenches shall be filled in and firmly tamped down until smooth and level with
surrounding surface. All affected landscape shall be replaced and restored to previous pre-construction state.

9. The intercom contractor shall provide a bound document complete with the as-built drawings, all fiber optic and copper cable test results, installed programming, component cut-sheets for all equipment installed and completed training documentation information.

1.18 ACCEPTANCE INSPECTION:

A. Project Engineer, general contractor, intercom contractor or combinations as applicable for each site specific project and SDOC MTSD Technology Construction Project Manager or Authorized Representative with site representatives shall conduct both a substantial and final inspection of all intercom system installations to ensure they are in compliance with all SDOC Standards and Specifications as well as those requirements specific to the installation of intercom systems. At substantial inspection all contractors shall demonstrate to the complete satisfaction of SDOC Authorized Representatives the functionality and operation of the complete installed system in the following manner:

1. Observe sound quality and system functionality at all system locations installed. All sound shall be clear with no crackling, humming, buzzing, distortion, feedback or any other unacceptable condition; all installed call button and volume controls shall be functional and registering at all installed call display locations, all synchronized clocks shall be synchronized displaying the correct and same time in all locations regardless of new or pre-existing clock installations, all call and all other SDOC selected features shall be accessible via installed telephone system and all bells and other functions shall be current and site specifically programmed and operable to SDOC satisfaction.

2. Inspection and observation of intercom space head end and wall field terminations, grounding, surge suppression and labeling shall be satisfactory and complete. Support systems and cable runs inspected above and below ceiling for compliance with SDOC standards and specifications in addition to all intercom areas in each MDF and IDF space being inspected for neatness and cleanliness shall be satisfactory and complete in all areas of each cable run.

3. Inspection and observation of other tests deemed necessary by SDOC authorized representatives to establish proper system operability shall be satisfactory and complete to the full satisfaction of SDOC Authorized Representatives.

4. Verification that the installed intercom system can be remotely accessed for maintenance and troubleshooting by SDOC Intercom Maintenance Technicians.

5. Verification that the above tests and measurements are documented in the operation and maintenance manuals as as-built conditions.
6. A written report shall be provided at substantial inspection for owner’s retention and for random testing and comparison during substantial inspection detailing all testing and operability results for all individual installed field devices in all buildings and floors identifying each room and device status inclusive of cabling with respect to all installed call buttons, volume controls, synchronized clocks, speaker groups and zones.

7. Verification of documented formal instruction given to owner designated key personnel at a time selected by owner and that said instruction consists of a minimum of not less than two (2) hours training delivered in two (2) separate sessions for a minimum total of four (4) hours training.

8. Verification of documented training covering operation, programming, troubleshooting and maintenance for applicable SDOC Intercom Maintenance Technicians. Included for owner’s retention for each head end project installation shall be two (2) installation and service manuals for the applicable model of intercom system head end equipment assemblies and devices installed.

9. Verification in the form of formal written report, signed by the intercom contractor instructor and submitted to the owner with copies to the architect, and project engineer detailing subjects covered, attendance sheet with signature and printed names of persons instructed, dates and amount of instruction each person has received. This report shall be submitted within one week following the instruction, prior to Warranty Period and prior to final project payment.

10. Upon completion of all issues identified as not complete during Substantial Inspection a Final Inspection shall be conducted by SDOC MTSD Technology Construction Project Manager(s) or Authorized Representative(s) to verify all issues have been completed to SDOC satisfaction. At this time the intercom contractor shall also deliver the installation warranty certificate and all documentation for owner retention.

11. Upon completion of Final Inspection issues and receipt of all project documentation to SDOC satisfaction final payment for the project shall be authorized and a contractor evaluation sheet shall be completed by the SDOC MTSD Technology Construction Project Manager or Authorized Representative to record the contractor’s performance. This evaluation sheet shall be submitted to the contractor for their retention and shall be retained in the project records by SDOC.

12. All documentation required and specified in this document as well as all other applicable sections and appendixes of the SDOC Standards and Specifications shall be provided for completion to SDOC MTS Department Technology Construction Project Manager or Authorized Representative for owner retention.
1.19 WARRANTY:

A. For a period of one year from the date of SDOC approved and documented final inspection completion the installed intercom system as detailed shall be guaranteed free of defects in materials and workmanship by the general contractor and installing intercom contractor for all intercom system equipment, programming, components, field devices and cabling.

B. Any intercom system assembly, device or component inclusive of all cabling indicating evidence of failure, improper or incorrect operation during this one (1) year warranty period shall be repaired or replaced by the intercom contractor at no expense to SDOC as specified in the contract documentation.

C. All intercom system equipment and cabling shall be guaranteed by the installing intercom contractor for a period of five (5) years from the date of SDOC approved and documented final inspection completion for the installed intercom system to be free of defects in materials and workmanship at no cost to SDOC for labor to repair.

D. The installing intercom contractor shall guarantee availability of all intercom system head end parts and equipment including all assemblies, circuit cards and devices for a period of ten (10) years from the date of SDOC approved and documented final inspection completion for the installed intercom system.

E. Intercom contractor installed technology Category 6 copper and fiber optic data cabling installations shall potentially be necessary to be provided and installed by the intercom contractor during the installation of the intercom system or as otherwise required for installation. All technology Category 6 copper and fiber optic data cabling installation requirements and warranty specifics apply for these installations as well and the installation specific requirements are defined in section 27_02_00 of the SDOC Technology Standards and Specifications. The technology systems cabling warranty for all applicable installations shall be provided by the intercom contractor at Final Inspection and shall accompany the applicable Intercom Warranty documentation for owner retention inclusive of all cabling test results for all such installations prior to final payment.

1.20 AS-BUILT DRAWINGS:

A. A comprehensive intercom system as-built drawing shall be provided in CADD, VISIO, PDF or other SDOC requested format for owner retention at substantial inspection containing at a minimum the following information:

1. A block diagram of the installed system indicating all cable types, cable quantities, active and passive components and devices.
2. A block diagram of the building or campus sites indicating the speaker and device details for the new installed system inclusive of remaining and existing pre-construction installation.

3. All intercom diagrams, details and test results shall be provided in both written and electronic format for SDOC owner’s retention.

1.21 NON-PROPRIETARY SDOC SPECIFIED INTERCOM PARTS SDOC APPROVED
FOR CONTRACTOR INSTALLATION:

A. For ease of identification the following information is a comprehensive, however, possibly not all inclusive list of non-proprietary intercom parts, devices and cables SDOC approved and specified by virtue of proven durability and enhanced performance for alternative use and installation at all SDOC intercom projects.

B. Any or all items listed shall potentially be revised, changed, deleted or upgraded at the discretion and option of authorized SDOC MTSD Personnel “ONLY” as and where deemed prudent and in the best interest of the Osceola County School District.

C. All non-proprietary device items indicated below are authorized for provision at all installations although only one brand for the entire installation shall be permitted. The practice of intermingling or mixing of multiple brands at one jobsite is not professional and not acceptable. Example: An installation where the contractor intends to install half ATLAS call buttons and half of another brand of call buttons is not acceptable. It shall be an installation of all ATLAS or all of another brand of call buttons “ONLY” not a mix. Consult SDOC Authorized Representatives for questions prior to procurement and installation. Failure can result in removal and installation of SDOC approved devices.

D. Inclusion of intercom contractor recommended additional device item changes shall be considered yet only where discussed, reviewed and approved in writing by authorized SDOC MTS Department Personnel with approved accompanying submittals documentation indicating an SDOC approved “OR EQUAL ONLY”.

E. **NOTE: To All Intercom Contractors -** All SDOC installed intercom systems shall be capable of interfacing with non-proprietary field devices such as those listed below. Head end intercom systems installed that are functional only with the specific proprietary brand of field devices associated with a certain intercom head end are counterproductive, costly and unacceptable.

F. SDOC Approved Non-Proprietary Devices – Note - Site specific intercom project design may for varying reasons preclude the use of any one or all listed non-proprietary devices at any site specific installation. This is inclusive of any as yet identified items authorized to be installed on site specific
future projects. These items too shall require the contractor to consult with SDOC Authorized Representatives to detail any specific component now or later to be later identified for use depending upon any particular scope of work:

1. ATLAS SOUND # D161-8 SPEAKER / BAFFLE PACKAGE (Wall Mounted Classroom Speaker)

2. ATLAS SOUND # SD72W SPEAKER AND BAFFLE (Ceiling Mounted Classroom/Hallway/Office Speaker)

3. ATLAS SOUND # 81-8R TILE BRIDGE (Support for Ceiling Mounted Speaker SD72W)

4. ATLAS SOUND # 95-8 ENCLOSURE (Back Box for Ceiling Mounted Speaker SD72W)

5. ATLAS SOUND # VTF-152UCN FLUSH MOUNT SPEAKER / BAFFLE (Exterior Speaker/Horn) to be installed with project specific applicable combinations as required of ATLAS SOUND “ONLY” Enclosures Model SE, SI and TVTA, Baffle Cover Model VTC, Adapter Rings Model AR, MR.

6. ATLAS SOUND # AT10 10W STAINLESS 70.7/25 VOLT COMMERCIAL ATTENUATOR (Office Volume Control)

7. ATLAS SOUND #VPB-1A VANDAL PROOF PLATE MOUNTED CALL SWITCH (Classroom Call Station)

8. SDOC standards specify the basic intercom cabling to be installed in project specific applicable combinations as SDOC specified and required shall be:

- West Penn AQC 369
- West Penn AQC 355
- West Penn 355
- West Penn 291
- West Penn 4245
- Or other cable specifications as SDOC specified and approved for circumstantial applications.

1.01 SUMMARY:

A. During the design phase for each site specific project it is the responsibility of the project specific architect and engineer to contact SDOC Media and Instructional technology Department “MITD” to verify and ensure all specified dimensions and components remain up-to-date, accurate, complete and unchanged regarding all SDOC Intelligent Board and Ceiling Mount Projector combination installations and all SDOC Intelligent Projector and Marker Board combination installations to insure the SDOC specified dimensions and components on the conformed technology documents and plans when produced are identified and specified accurately with no exception.

B. Key equipment and related products, components and devices will occasionally require change and upgrade as technology advances occur and in this regard special attention shall be required during the planning and design phase of new construction projects, renovation projects and pure technology systems upgrades required for existing technology. These potential changes could also affect (sometimes significantly) new plans in design with regard to the reference of outdated existing posted specified dimensions which may not reflect new updates in technology systems requirements of the most recent version of the SDOC Division 27 Technology Systems Standards and Specifications posted at the time of any given project conception.

C. The Technology Services Department will make every effort to insure the required Division 27 Technology Systems Standards and Specifications are updated to match upgrades in technology systems for every project although, the potential always exists that there may be changes that are not recorded and posted which is why the project specific architect and engineer shall exercise due diligence in contacting all appropriate SDOC Technology Departments to verify the latest technology systems information is incorporated in all new design plans and specifications.

D. Following are the most current specified conduits, hardware, dimensions and basic component, cabling, pathway and support system requirements for installation regarding SDOC Intelligent Board
and Ceiling Mount Projector combination installations and all SDOC Intelligent Projector and Marker Board combination installations.

E. The SDOC specified stub out pathways and supports indicated are detail specific to identify and satisfy the needs of the school district for installation purposes and shall be installed by the general contractor and their sub-contractors as SDOC specified for all Intelligent Board and Ceiling Mount Projector combination installations and all SDOC Intelligent Projector and Marker Board combination installations in preparation for SDOC specified equipment electronics, cabling and devices to be installed as SDOC contracted at the conclusion of each project.
1.02 INTELLIGENT BOARD AND INTELLIGENT PROJECTOR CONDUIT INFRASTRUCTURE:

A. The General Contractor and their sub-contractors shall provide and install all teaching wall area intelligent board “SB” outlets, intelligent projector “STSB” outlets and associated teacher station “TS” outlets inclusive of all EMT conduit stub outs, bushings, back boxes of specified sizes, intelligent projector location in-wall metal support backing for projector mount, ceiling mount projector plates, duplex general power receptacles, all specified “SB”, “STSB” and “TS” outlet faceplates and all other SDOC detailed project specific related components as specified IAW all applicable sections of the most current SDOC Division 27 Technology Systems Standards and Specifications and more specifically as identified in the specifications and detail figure pages of SDOC Division 27 Section 27_10_00.

B. The General Contractor and their sub-contractors shall in addition provide and install all associated and detailed SDOC specified items as follows:

1. At each Intelligent projector location – One (1) four foot high by six foot long “BALT” matte finish interactive projector white board part number# 2G2KG-26 w/brio trim ONLY (*unless otherwise SDOC specified for a differing marker board)
2. QUANTUM A-V CAT.5 Extender module matched sets part number# WP-CAT5-VGA-AUD-COMP and two (2) minimum fifty foot associated certified Category 5 patch cables “blue in color only” for each A/V extender set
3. One (1) six foot certified VGA patch cable “black in color only” for each projector A/V extender location
4. One (1) ten foot certified VGA patch cable “black in color only” for each teacher station A/V extender location
5. All project specified D2 and D4 data outlets
6. All project specified duplex clean and general power receptacles where specified for installation
7. Projector plate supports, applicable and required safety components, technology related devices and components detailed and intended for use and support specifically for the installation of intelligent board and intelligent projector equipment.

C. All items listed shall be provided and installed by the general contractor and their sub-contractors with one exception:

1. The “BALT” matte finish interactive projector white board part number# 2g2kg-26 w/brio trim “ONLY” shall be General Contractor provided and SDOC MIT Department contractor installed.

D. SDOC MIT Department related items provided and MIT Department contracted for installation shall include:

1. All physical interactive and other projectors and all required adjustments and alignments.
E. Basic installation scenarios applicable in differing circumstances are as follows:

1. New Construction or new construction retrofit and renovation sites involving the all new site installation of in wall conduit, outlet boxes and cabling oriented on the teaching wall and the associated installation “configuration” of Interactive Smart Boards (“SB”) and associated equipment cabling and devices inclusive of all ceiling mounted Projector Plate (“PJ”) assemblies centered with associated outlets, equipment cabling and devices on the teaching wall at all new sites.

2. New Construction or new construction retrofit and renovation sites involving the all new site installation of in wall conduit, outlet boxes and cabling oriented on the teaching wall in support of installation “configuration” of a Surface / Wall Mounted Interactive Short Throw Projector (“STPJ”) MIT Department Provided and installed to be installed centered on the teaching wall installed with a General Contractor provided and MIT Department selected contractor installed four (4) foot by six (6) foot “BALT” matte finish interactive projector white board part number# 2g2kg-26 w/brio trim “ONLY” which shall be centered on the teaching wall at MIT Department specified heights.

   i. NOTE: This “configuration” is installed without a Projector Plate assembly where all associated projector plate assembly cabling and devices are simply relocated and placed in outlet and stub out assembly build out locations installed on each teaching wall at SDOC specified heights and distances for support of the wall mounted short throw projector “STPJ” assembly installations at all new sites. For these installation “configuration” scenarios reference details in figures 46, 47, 48, 49 and 50 at the bottom of this section.

3. Existing active retrofit sites involving the installation of project and location specific surface mount or in wall installed conduit, outlet boxes and cabling in support of the associated installation “configuration” of Interactive Smart Boards (SB) and associated equipment cabling and devices inclusive of Projector Plate assemblies and associated equipment cabling and devices at non-traditional locations where open wall space is identified or where marker boards are removed to install Interactive Smart Boards (SB) inclusive of Projector Plate assemblies and associated plate equipment cabling and devices.

4. Existing active retrofit sites which may require the installation of project specific surface mount or in wall installed conduit, outlet boxes and cabling in support of the associated installation “configuration” of an Interactive Smart Board (SB) where the smart board is to be installed over an existing passive marker board or other obstruction. This site and location specific installation is inclusive of a wall mounted short throw projector arm assembly “STPJ” mounted directly above the Interactive Smart Board (SB). For installations where the smart board is to be installed over an existing passive marker board or other obstruction the Peerless IWB600-WB wall-mount bracket (reference Figure 38 pages 1 through 4 for specific details) or other SDOC approved solutions utilized for installation of the Smart Boards (SB) where attaching over a passive marker board or chalkboard. For these wall mounted short throw projector arm assembly “STPJ” installation
scenarios as well see figures 46, 47, 48, 49 and 50 at the bottom of this section for proper projector assembly and component outlet detail specifics for teaching wall installation and positioning.

5. Existing active retrofit sites involving the installation of surface mount or in wall installed conduit, outlet boxes and cabling project specific to support of the installation “configuration” of an Interactive Smart Board where Projector Plate assemblies and associated equipment cabling and devices are to be installed at locations where nontraditional open walls have been identified or where marker boards are removed to install Interactive Smart Boards inclusive of Projector Plate (“PJ”) assemblies and associated supporting equipment cabling and devices. For projector plate assembly “PJ” installation scenarios reference figures 40, 40A, 41, 42, 43, 44 and 45 at the bottom of this section for proper installation and positioning. Or, where in design the ceiling is open without ceiling grid thus prohibiting the installation of a projector plate assembly making the installation “configuration” a wall mounted short throw projector arm assembly “STSB” necessary which shall be mounted directly above the Interactive Smart Board (SB). For wall mounted short throw projector arm assembly “STSB” installation scenarios as well reference figures 46, 47, 48, 49 and 50 at the bottom of this section for proper installation and positioning.

F. INTELLIGENT BOARD AND INTELLIGENT PROJECTOR INSTALLATION NOTES: There are currently two (2) SDOC projector and board installation configuration options available for interactive (smart) boards and projector installations in the School District of Osceola County. Refer to project specific construction technology plan details and SDOC division 27 project specifications for the chosen / selected technology option to be installed for each project. Option descriptions are as follows:

G. CONFIGURATION OPTION 1 CEILING MOUNT PROJECTOR WITH SMART OR OTHER INTELLIGENT BOARD SYSTEM

1. General Contractor shall refer to details in applicable Figures 40, 40A, 41, 42, 43, 44 and 45 for in-depth installation detail specifics for the “Configuration One (1) SDOC selected project option.

2. General Contractor shall coordinate with SDOC MIT Department and shall schedule and manage all smart board installations using an owner provided designated technology smart board Installer for the installation of a General Contractor purchased and provided interactive smart board to be installed at the center of the “useable” teaching wall by and SDOC MIT Department contracted installer. Smart board bottom edge heights shall be installed as SDOC MIT Department established for each grade level intended and as the details indicate on Figure 42 of this section.

3. General contractor shall provide, supervise and ensure the selected electrical / technology systems contractor shall provide and install all pieces and parts required for a ceiling mounted projector plate assembly “PJ” installed on the ceiling grid centered on the smart board location at ten feet distance from the teaching wall at all locations.
4. General contractor shall coordinate with SDOC MIT Department and shall schedule and manage the installation of SDOC MIT Department purchased and provided projectors using an SDOC MIT Department provided designated technology projector installer for projector installation on the general contractor provided and installed projector plate assembly “PJ” at each location centered on the smart board location at the teaching wall.

5. General contractor shall provide, supervise and ensure the selected electrical contractor shall provide and install all smart board “SB” and teacher station “TS” outlet boxes and EMT conduit stub outs which shall be installed at eighteen inches A.F.F. with an interconnecting horizontal 11/4 inch EMT conduit installed between the “SB” and “TS” outlet boxes at all locations.

6. **NOTE:** Due to USB cable limitations, the distance between the “SB” outlet box stub out and the “TS” outlet box stub out above ceiling shall be no more than twelve (12) feet distance at all installation locations with no exception.

7. General Contractor shall provide and install each stub out to specification as follows:

   i. The General Contractor shall in each classroom and other locations designated by authorized SDOC Representatives on the useable teaching wall area provide and install at 18” A.F.F.U.O.N. one (1) Smart Board “SB” outlet consisting of one (1) double gang receptacle back box 4” W X 4” H X 2.5” D coupled to one (1) and one quarter (1/4) inch EMT conduit horizontally installed and extended out to a designated contractor provided and installed install at 18” A.F.F.U.O.N. Teacher Station “TS” double gang receptacle back box 4” W X 4” H X 2.5” D. It shall be the responsibility of the project architect, engineer and general contractor to insure the “SB” outlet shall always be oriented on the teaching wall to the **bottom right hand corner for every smart board location on every teaching wall location.**

   ii. The “SB” double gang back box shall be installed recessed and squared in the teaching wall at all locations designated by authorized SDOC Representatives during design and shall be complete with general contractor provided and installed “SB” outlet faceplate assembly which shall be a PASS & SEYMOUR double gang stainless steel faceplate with dual rocker panel holes **PASS & SEYMOUR Part Number# SSJ262.** The left rocker panel on each stainless steel faceplate shall be installed with a MM Electronics Decora cable pass through **MM Electronics Part Number# 50-7405** on this configuration at all locations.

   iii. The General Contractor shall in each classroom and other locations designated by authorized SDOC Representatives on the useable teaching wall area provide and install one (1) vertical Teacher Station “TS” conduit stub out consisting of a single one (1) and one quarter (1/4) inch EMT conduit coupled from the “TS” double gang receptacle back box installed to above ceiling (reamed and bushed) at all locations.

   iv. The “TS” double gang back box shall be installed recessed and squared in the teaching wall at locations designated by authorized SDOC Representatives during design and shall be
complete with general contractor provided and installed “TS” outlet faceplate assembly which shall be a PASS & SEYMOUR double gang stainless steel faceplate with dual rocker panel holes PASS & SEYMOUR Part Number# SSJ262. The left rocker panel on each stainless steel faceplate shall be installed with a MM Electronics Decora cable pass through MM Electronics Part Number# 50-7405 on this configuration at all locations. The faceplate with decora cable pass through is shown in Figure 39 of this section.

H. CONFIGURATION OPTION 2 WALL MOUNT INTELLIGENT PROJECTOR WITH BALT INTERACTIVE PROJECTOR BOARD SYSTEM

1. General Contractor shall refer to details in applicable Figures 46, 47, 48, 49 and 50 for in-depth installation detail specifics for the “Configuration Two (2) SDOC selected project option.

2. General Contractor shall coordinate with SDOC MIT Department and shall schedule and manage all SDOC MIT Department purchased and provided wall mounted short throw projector arm assembly installations installed by SDOC MIT Department contracted and designated technology wall mounted short throw projector arm assembly installers for the installation of all wall mounted short throw projector arm assemblies. Each wall mounted short throw projector arm assembly shall be positioned at the center of the “useable” teaching wall area above general contractor provided area established for the installation of General Contractor Provided four foot wide by six foot long BALT “ONLY”MATTE FINISH INTERACTIVE MARKER BOARD Part Number# 2G2KG-26 WITH BRIO TRIM. Each General Contractor Provided BALT Marker Board shall be installed by SDOC MIT Department contracted and designated technology projector arm assembly installers and shall be positioned at the center of the teaching wall. Marker Board bottom edge heights shall be installed as established for each grade level intended and as the details indicate on Figure 49 of this section.

3. Each wall mounted short throw projector arm assembly shall be mounted and installed in an area built out with engineer approved and general contractor provided and installed re-enforcement backing which shall be installed in the wall for support of each projector assembly. General contractor shall provide, supervise and ensure the selected electrical contractor shall provide and install the engineer approved and acceptable 24” x 24” (or engineered dimensions) reinforcement backing centered in the wall at 96 inches A.F.F. above and centered on the installed marker board at all wall mounted short throw projector arm assembly “STPJ” locations.

4. General contractor shall provide, supervise and ensure the selected electrical contractor shall provide and install all wall mounted short throw projector arm assembly “STSB”, D2, general power receptacles and teacher station “TS” outlet boxes and EMT conduit stub outs at all locations.

5. NOTE: Due to USB cable limitations, the distance between the “STSB” outlet box stub out and the “TS” outlet box stub out above ceiling shall be no more than twelve (12) feet distance at all installation locations with no exceptions.
6. At each wall mounted short throw projector arm assembly location general contractor shall provide, supervise and ensure the selected electrical contractor shall provide and install outlet boxes and EMT conduit stub outs as specified for all wall mounted short throw projector arm assembly supporting outlets which shall be a combination of three (3) outlets as follows: “STSB” outlet, D2 data outlet and duplex general power receptacle all installed at ninety six (96) inches A.F.F. within twelve (12) to twenty four (24) inches oriented parallel to the wall mounted projector arm assembly location. Each wall mounted short throw projector arm assembly “STSB” outlet shall consist of one (1) double gang receptacle back box 4” W X 4” H X 2.5” D coupled to a single one (1) and one quarter (1/4) inch EMT conduit vertically installed to above ceiling (reamed and bushed) at all locations.

7. The “STSB” double gang back box shall be installed at ninety six (96) inches A.F.F. recessed and squared in the teaching wall at locations designated by authorized SDOC Representatives during design and shall be complete with general contractor provided and installed “STSB” outlet faceplate which shall be a outlet faceplate assembly which shall be a PASS & SEYMOUR double gang stainless steel faceplate with dual rocker panel holes PASS & SEYMOUR Part Number# SSJ262. The left rocker panel on each stainless steel faceplate shall be installed with a MM Electronics Decora cable pass through MM Electronics Part Number# 50-7405 on this configuration at all locations.

8. For each wall mounted projector arm assembly location general contractor shall provide, supervise and ensure the selected electrical contractor shall provide and install outlet boxes and EMT conduit stub outs as specified for all teacher station “TS” outlet locations which shall be installed at eighteen inches A.F.F. oriented parallel and adjacent to the teacher station D4 data outlet and duplex clean power receptacle location. The General Contractor shall in each classroom and other locations designated by authorized SDOC Representatives on the usable teaching wall area provide and install one (1) Teacher Station “TS” conduit stub out consisting of a single one (1) and one quarter (1/4) inch EMT conduit coupled from the “TS” double gang receptacle back box vertically installed to above ceiling (reamed and bushed) at all locations.

9. The “TS” double gang back box shall be installed recessed and squared in the teaching wall at locations designated by authorized SDOC Representatives during design and shall be complete with general contractor provided and installed “TS” outlet faceplate assembly which shall be a PASS & SEYMOUR double gang stainless steel faceplate with dual rocker panel holes PASS & SEYMOUR Part Number# SSJ262. The left rocker panel on each stainless steel faceplate shall be installed with a MM Electronics Decora cable pass through MM Electronics Part Number# 50-7405 on this configuration at all locations. The faceplate with decora cable pass through is shown in Figure 39 of this section.

I. The selected the general contractor shall provide, supervise and ensure the selected electrical / technology systems contractor(s) provide and install all interactive board location stub outs and outlets, all projector plate assemblies and all interactive projector location stub outs and outlets
inclusive of all designated (“SB” and “TS” or “STSB” and “TS”) plan locations including all EMT conduit, double gang receptacle boxes and faceplate configurations as specified and associated with each specified installation configuration as indicated and identified on all construction technology “T” and electrical sheets. Cabling and connections at all outlet locations shall be general contractor provided, supervised and installed by their selected electrical / technology systems contractor(s). All projector connections shall be by others as detailed and specified in SDOC division 27 technology systems standards and specifications and technology systems “T” sheet construction details. Refer to project specific option configuration figures in this section for in-depth installation details and installation specifics for the designated option.

J. Additional and amplifying Interactive Board and projector plate and Interactive projector installation information:

1. For smart board installation **mounting / anchoring at drywall locations** “ONLY” the SDOC approved fastening device is **“TOGGLER” HIGH PERFORMANCE ANCHORS: SNAPTOGGLE BA Heavy Duty 3/16” Toggle Bolts**. The following Figure 36 is included for product specific details.
Figure 36 Smart board Drywall Installations “TOGGLER” HIGH PERFORMANCE ANCHORS: SNAPTOGGLE BA Heavy Duty 3/16” Toggle Bolts “Typical all drywall locations”

2. For smart board installation mounting / anchoring at concrete wall locations “ONLY” the SDOC approved fastening device is “RED HEAD” Dynabolt Sleeve Anchors size appropriate for the project. The following pages 1 through 3 Figure 37 is included for product specific details.
Figure 37 Smart board Concrete Mount Installations: RED HEAD Dynabolt Sleeve Anchors
“Typical all Concrete Wall Locations”
DIVISION 27 10 00
School District of Osceola County
Technology Standards and Specifications

Figure 37 Smart board Concrete Mount Installations: RED HEAD Dynabolt Sleeve Anchors
“Typical all Concrete Wall Locations”
3. For installations where the smart board is to be installed over an existing passive marker board or other obstruction the **Peerless IWB600-WB wall-mount bracket** or other SDOC approved solution is utilized for installation of the Smart Boards (SB) where attaching over a passive marker board or chalkboard. The following Figure 38 pages 1 through 4 are included for installation specific details.

**Figure 38 Peerless IWB600-WB wall-mount bracket**
“Typical all Locations Where Required”
NOTE: Read instruction sheet before you start installation and assembly.

### Parts List

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<thead>
<tr>
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</tr>
<tr>
<td>B vertical bracket</td>
<td>2</td>
<td>095-4683</td>
</tr>
<tr>
<td>C 1/4&quot; flat washer</td>
<td>6</td>
<td>540-9444</td>
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<tr>
<td>D 1/4-20 X 1&quot; phillips screw</td>
<td>4</td>
<td>510-9110</td>
</tr>
<tr>
<td>E M4 x 6 mm phillips screw</td>
<td>2</td>
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<td>F top depth adjusting bracket</td>
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<td>095-4685</td>
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<td>G .320 ID X 1 OD X .375 spacer</td>
<td>4</td>
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<td>H bottom depth adjusting bracket</td>
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<td>095-4684</td>
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<td>I plastic bushing</td>
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<td>540-0067</td>
</tr>
<tr>
<td>J M5 serrated flanged lock nut</td>
<td>4</td>
<td>530-2042</td>
</tr>
<tr>
<td>K M6 x 12 mm phillips screw</td>
<td>4</td>
<td>520-2039</td>
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<td>L M6 nylock nut</td>
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<td>530-9334</td>
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<td>M M6 x 12 mm phillips screw</td>
<td>4</td>
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<td>N rubber pad</td>
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<tr>
<td>O M5 x 6 mm phillips screw</td>
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<td>520-2167</td>
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</table>

NOTE: Some parts may appear slightly different than illustrated.

### Installation to Wall

#### WARNING

- Installer must verify that the supporting surface will safely support the combined load of the equipment and all attached hardware and components.

1. Be sure wall bracket (A) is level and in desired position. Then use wall bracket (A) as a template to mark center of four mounting holes. Drill four mounting holes. Attach wall bracket (A) to mounting surface using four screws provided by installer and four 1/4 washers (C) if required. Once secure, wall bracket (A) will be flush with the top of the vertical bracket (B). Fasten two M4 x 6 mm phillips screws (E) into wall bracket (A).

**NOTE:** Vertical brackets (B) may be used to determine location of wall bracket (A).
Attaching Top and Bottom Depth Adjusting Brackets
Attach top and bottom depth adjusting brackets (F and H) onto vertical bracket (B) using four M5 x 8 mm phillips screws (O) as shown below.

NOTE: Fully extend and tighten depth adjusting brackets (F and H). Depth can be adjusted after whiteboard is attached to mount.

Repeat using second vertical bracket (B) and top and bottom depth adjusting brackets (F and H).

Installation to SMARTboards...................................................... Skip to Page 4
Installation to Hitachi Starboard................................................. Skip to Page 5
Installation to Marsh Board......................................................... Skip to Page 7
Installation to Interwrite Board.................................................... Skip to Page 10
Installation to ActivBoard............................................................ Skip to Page 11
Figure 38 Peerless IWB600-WB wall-mount bracket
“Typical all Locations Where Required”
1.03 TEACHER STATION “TS”, SMART BOARD “SB”, SHORT THROW PROJECTOR “STSB” AND PROJECTOR PLATE “PJ” COMPONENTS:

Figure 39 - “TS”, “SB” and “STSB” Double Gang Stainless Steel Faceplate with Dual Rocker Holes and Cable Pass-through. “Typical all Locations”

1. The General Contractor shall provide and install all project specified projector plate assemblies which are inclusive of all projector plates and all components including all parts, pieces and supports for QUANTUM UNIVERSAL PROJECTOR DROP-IN CEILING MOUNT PLATE PART NUMBER AVM-PRO-DCP-UNV-404-SV, all duplex general power receptacles, all D2 data outlet cabling, components and faceplates, all A-V CAT.5 Extender module matched sets part number WP-CAT5-VGA-AUD-COMP and all associated A-V CAT.5 Extender module certified Category 5 data cables “blue in color only” (required with A/V Extender Module Sets) as SDOC and manufacturer specified in the figure and detail pages of SDOC Standards and Specifications Section 27_10_00 for Configuration 1 installations.
2. QUANTUM A-V CAT5 EXTENDER MODULE SET WP-CAT5VGA-AUD-COMP, 3.5mm STEREO JACK.

- NOTE: The A-V CAT5 EXTENDER MODULE WP-CAT5VGA-AUD-COMP, 3.5mm STEREO JACK are MATCHED PAIR SETS.

- NOTE: The A-V CAT5 EXTENDER MODULE WP-CAT5VGA-AUD-COMP, 3.5mm STEREO JACK module in each set containing a thumb switch shall always be installed:
  - For **Configuration 1** at both the Projector Plate Assembly “PJ” drop ceiling plate location and the Teacher Station “TS” outlet location at 18 inches A.F.F.
  - For **Configuration 2** at both the Wall Mount Short Throw Projector Smart Board “STSB” outlet location at 96 inches A.F.F. and the Teacher Station “TS” outlet location at 18 inches A.F.F.
3. The General Contractor shall in each classroom and all other project specific locations designated by authorized SDOC Representatives on the useable teaching wall area provide and install within the Contractor Provided Teacher Station “TS” faceplate one (1) of a set of two (2) Contractor provided Quantum A-V CAT.5 Extender modules WP-CAT5VGA-AUD-COMP and the second as configuration dictates at “either” the projector plate assembly “PJ” or the short throw “STSB” wall mounted outlet location.
4. **The Quantum A-V CAT.5 Extender module set includes one module with thumb switch and one without.** The A-V CAT.5 Extender module with thumb switch shall always be installed at the projector plate assembly “PJ” or the short throw “STSB” wall mounted outlet location. At the “TS” faceplate shall be the A-V CAT.5 Extender module without thumb switch and containing one (1) 3.5 mm mini jack connection for audio enhancement system sound equipment and shall be installed with one (1) female USB connection from the Smart Board / Interactive Board or the interactive projector location as shown in Figure 39B.

**Figure 39B “TS”,“SB” and Short Throw “STSB” outlet Stainless Steel Faceplate with DECORA Cable Pass Through and Quantum A-V CAT.5 Extender module part number WP-CAT5-VGA-AUD-COMP. “Typical all Locations”**
5. The General Contractor shall provide and install between the Teacher Station “TS” faceplate and the Projector Plate “PJ” (configuration 1) or the “STSB” (configuration 2) A/V Extender Modules two (2) certified CAT 5 patch cords blue in color “ONLY” from the rear of the each of the set of two (2) Quantum A-V CAT.5 Extender modules as shown in Figure 39C.

**Figure 39C Quantum A-V CAT 5 Extender module part number WP-CAT5-VGA-AUD-COMP (front and rear views). “Typical all Locations”**

(A/V Extender Module Informational Note: CAT.5A and CAT.5B are not category 5A and category 5B patch cord terminations. They are Category 5 patch cord “PORT” A and Category 5 patch cord “PORT” B.)

**Figure 39C Quantum A-V CAT 5 Extender module part number WP-CAT5-VGA-AUD-COMP (front and rear views). “Typical all Locations”**
1.04 CEILING MOUNTED PROJECTOR PLATE BUILD OUT:

A. The General Contractor shall provide and install all projector plate assemblies which are inclusive of, all projector plates and all components including all parts and pieces and supports for QUANTUM UNIVERSAL PROJECTOR DROP-IN CEILING MOUNT PART NUMBER AVM-PRO-DCP-UNV-404-SV, all duplex general power receptacles, all D-2 data outlet cabling, components and faceplates, all QUANTUM A-V CAT 5 EXTENDER MODULES (which are matched sets) PART NUMBER# WP-CAT5-VGA-AUD-COMP and all associated A/V Extender Module Certified Category 5 patch cords (a quantity of two (2) Category 5 patch cords blue in color “ONLY” required to be installed with A/V Extender Module Sets), as SDOC and manufacturer specified in the figure and detail pages of this document.

B. The General Contractor shall provide and install each projector plate assembly at position locations as indicated in detail pages of SDOC Standards and Specifications Section 27.10.00. The SDOC specifications include appropriate space distance and centering for teaching wall, support lanyards and other SDOC and manufacturer specified hardware, components and devices.

C. The General Contractor shall provide and install one (1) single gang duplex general power receptacle with MC Cable and six feet of coiled slack on each projector plate which shall be installed at ceiling height for all locations designated by authorized SDOC Representatives. Refer to 1.04 System Power Requirements for information.

D. The General Contractor shall provide and install:

1. One (1) single gang data faceplate complete with two (2) Category 6 RJ45 data ports installed, terminated, labeled and tested to the local MDF or IDF space as appropriate. Data faceplate and all components shall be a match with installed site specified technology components of COMPLETE CLOSED PANDUIT, ORTRONICS or AMP/TYCO SOLUTION with no exception.

2. One (1) Quantum A-V CAT 5 Extender with rocker cover in knock out as shown in Figure 41 D. Attach certified CAT 6 cable complete with connectors on both ends installed with two (2) feet of cable slack at the data faceplate on the ceiling mount projector plate then home run extending through the Teacher Station (TS) conduit and back box faceplate to the rear of the Quantum A-V CAT 5 Extender installed in the Teacher Station (TS) outlet faceplate location. Cable shall be properly supported throughout the permanent run per SDOC Standards.
1.05 **SYSTEM POWER REQUIREMENTS:**

A. General Power is the standard for ceiling mount projector power receptacle installations.

B. Interactive Board Teacher Station “TS” conduit stub out and back boxes installed at teacher desks and other SDOC designated locations shall be designed and installed with a nearby data outlet. This data outlet shall routinely be installed with a clean power receptacle that will function to provide clean power needed at each teacher desk location for the installed systems.

C. The Interactive Board “SB” conduit stub out and back box installation currently requires no power installation. The “SB” stub out and back box serves as the pathway for intelligent board cabling connections to be installed by others as SDOC contracted.
D. Interactive Short Throw Projector “STSB” conduit stub out and back boxes installed at Short Throw Projector Arm assembly classroom locations and other SDOC designated locations shall be designed and installed with a nearby D2 data outlet. This D2 data outlet shall be installed with a duplex general power receptacle that will function to provide power needed at the Short Throw Projector Arm assembly location for the installed systems.

1.06 INTERACTIVE BOARD AND PROJECTOR PLATE AND INTERACTIVE PROJECTOR AND MARKER BOARD FIGURES AND DETAILS:
Figure 40 Interactive Board/Ceiling Mount Projector Plate/Audio Enhancement Classroom Configuration "Typical"

Notes:

#1 - SDCC MIT Department has established that Center of each Interactive Board shall be installed at center of usable Teaching Wall for all locations. Exact center of each usable teaching wall shall be determined and designed by project architect and engineer. Physical location for all Interactive Boards shall be in compliance with requirements and approval of MIT Department.

#2 - Install selected marker and task boards to be built out from edges of smart board as designed for installation. All board dimensions shall be MIT and Construction Services Department approved. All established dimensions shall be incorporated in design by project architect and engineer in compliance with SDCC direction for teaching wall configuration.

#3 - Board detail as oriented U.O.N. shall be a centered six (6) foot wide area for intelligent board, two (2) six (6) foot wide areas for marker boards and two (2) four (4) foot wide areas for task boards. NOTE: Board widths may vary dependent upon SDCC specifications. Project architect and engineer are responsible to verify all dimensions with SDCC MIT Department to establish design requirements.

#4 - With SDCC input, the architect and engineer shall determine teaching wall orientation based on intelligent board, marker board and task board dimensions selected for site specific installation.

TYPICAL SMART BOARD CONFIGURATION FOR STANDARD CLASSROOM

NOT TO SCALE – SDCC ITS DEPARTMENT CONCEPTUAL DRAWING

Ceiling projector with data outlet and duplex general power receptacle
Figure 40A Interactive Board /Ceiling Mount Projector/Audio Enhancement
Classroom Components Configuration “Typical”

Figure 40A Interactive Board /Ceiling Mount Projector/Audio Enhancement
Classroom Components Configuration “Typical”
Figure 41 Interactive Board/Ceiling Mount Projector/Audio Enhancement
Classroom Conduit and Back Box Rough-in Configuration “Typical”
Figure 42 Interactive Board Classroom Installation Positioning Detail “Typical”
Figure 43 Ceiling Mount Projector Plate Specifications Details “Typical”

The PRO Series Universal Projector Drop-In Ceiling Mount is an all inclusive solution that removes the hassle of traditional mounting options. Quick and easy to install, this product supports projectors weighing up to 30 lbs. Its cast aluminum construction provides a strong, lightweight, heat-dissipating platform that is perfectly suited for mounting almost any A-V projector in a suspended ceiling. Its unique design, array of drop extensions, and cable management allow the mount to adapt to almost any installation.

- Easy to install
- Includes hold-down clips and safety/support cable
- 2’ x 2’ Reinforced steel lay-in ceiling plate has 5 mounting points and 4 orientations for easy adjustment & alignment
- Extension options and flush mount kit available
- 4 outlet punch-outs for power & data
Figure 43 Ceiling Mount Projector Plate Specifications Details “Typical”

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<td>Product Group</td>
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<tr>
<td>Part Number</td>
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<tr>
<td>Features</td>
<td>2' x 2' Reinforced steel lay-in ceiling plate fits in the space of a standard ceiling tile, eliminating the hassle associated with traditional projector mounting. 5 mounting points for easy adjustment &amp; alignment. 4 NEMA standard outlet box openings provided for electric and data connections, as well as covers for unused openings. The head unit is made of high quality, lightweight cast aluminum for heat dissipation and strength. Projector head unit fits virtually any projector, providing arms for three or four mounting points. 180° pitch &amp; yaw, 360° rotation with lock-down for perfect A-V projector alignment. Cables/electricity can be run securely inside cable raceway. Scratch-resistant, eco friendly acrylic finish on all surfaces. Includes clips, safety support cable, mounting hardware, and tool kit. Easy release for projector maintenance.</td>
</tr>
<tr>
<td>Load Capacity</td>
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<tr>
<td>Unit Weight</td>
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<tr>
<td>Finish</td>
<td>Anodic electrodeposition using acrylic paint</td>
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<tr>
<td>Color</td>
<td>Hammer tone silver head unit &amp; white ceiling plate</td>
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<tr>
<td>Accessories</td>
<td>AVM-PRO-EXT-ADJ2432 — Adjustable extension pole 24&quot; to 32&quot; x 1&quot; diameter  AVM-PRO-EXT-5006 — 50mm x 6&quot; aluminum extension tube  AVM-PRO-EXT-5012 — 50mm x 12&quot; aluminum extension tube  AVM-PRO-EXT-5024 — 50mm x 24&quot; aluminum extension tube  Note: extensions &amp; extension add-ons available from 2&quot; to 60&quot;</td>
</tr>
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Made of high quality cast aluminum for heat dissipation, strength, & light weight.

Universal mounting pattern holds most A-V projectors.

Cables/electricity can be securely inside the cable channels.
Figure 44 Ceiling Mount Projector Plate Installation Positioning Details “Typical”
Figure 45 Ceiling Mount Projector Plate Support Details “Typical”

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<td>M6.5 Washer</td>
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Figure 45 Ceiling Mount Projector Plate Support Details “Typical”
Figure 46 Wall Mount interactive Projector System Teaching Wall Configuration “Typical”
Figure 47 Wall Mount interactive Projector System Conduit Rough-In Detail “Typical”

TYPICAL CLASSROOM TEACHING WALL INFRASTRUCTURE ROUGH-IN PLAN

NOTE: “STSB” AND “TS” OUTLETS SHALL NOT BE INSTALLED MORE THAN TWELVE (12) FEET DISTANCE HORIZONTAL BETWEEN THE TWO (2) LOCATIONS

CLASSROOM WALL MOUNTED INTERACTIVE PROJECTOR CONDUIT IN WALL ROUGH-IN PLAN

NOTE: “STSB” AND “TS” OUTLETS SHALL NOT BE INSTALLED MORE THAN TWELVE (12) FEET DISTANCE HORIZONTAL BETWEEN THE TWO (2) LOCATIONS
Figure 48 Wall Mount interactive Projector System Component Placement Diagram “Typical”
Figure 49 Wall Mount interactive Projector System Component Detail Diagram “Typical”

REINFORCEMENT BAC KING IN WALL

"STPJ" PROJECTOR ARM

FOOT (MOUNTS TO WALL ABOVE MARKER BOARD)

ON REINFORCED BACKING

1¼ INCH STUB OUT IN WALL TO ABOVE CEILING

1¼ INCH HORIZONTAL CONDUIT BETWEEN "TS" AND "STSB" OUTLETS SHALL NOT BE INSTALLED IN THIS CONFIGURATION.

PROJECTOR PLATE ASSEMBLY WILL NOT BE INSTALLED IN THIS CONFIGURATION. ALL PLATE COMPONENTS: D2 DATA OUTLET, DUPLEX GENERAL POWER RECEPTACLE AND AN EXTENDER SHALL BE RELOCATED TO THE TEACHING WALL AS INDICATED.

96 INCHES A.F.F.

1¼ INCH STUB OUT IN WALL TO ABOVE CEILING

1¼ INCH HORIZONTAL CONDUIT BETWEEN "TS" AND "STSB" OUTLETS SHALL NOT BE INSTALLED IN THIS CONFIGURATION.

PROJECTOR PLATE ASSEMBLY WILL NOT BE INSTALLED IN THIS CONFIGURATION. ALL PLATE COMPONENTS: D2 DATA OUTLET, DUPLEX GENERAL POWER RECEPTACLE AND AN EXTENDER SHALL BE RELOCATED TO THE TEACHING WALL AS INDICATED.

96 INCHES A.F.F.

CENTER LINE OF BOARD

96 INCHES A.F.F.

NOTE: TRADITIONAL SMARTBOARDS WILL NOT BE INSTALLED FOR CLASSROOMS IN THIS SPECIFIC INSTALLATION CONFIGURATION.

CLASSROOM WALL MOUNTED INTERACTIVE PROJECTOR AND MARKER BOARD PLACEMENT DIAGRAM

BALT “ONLY” MATTE FINISH INTERACTIVE MARKER BOARD PART NUMBER 2G2KG-26 WITH BRIOTRIM PROVIDED BY GENERAL CONTRACTOR INSTALLED BY SDOC MIT DEPARTMENT CONTRACTOR

NOTE: TRADITIONAL SMARTBOARDS WILL NOT BE INSTALLED FOR CLASSROOMS IN THIS SPECIFIC INSTALLATION CONFIGURATION.

CLASSROOM WALL MOUNTED INTERACTIVE PROJECTOR AND MARKER BOARD PLACEMENT DIAGRAM

NO SCALE

BALT “ONLY” MATTE FINISH INTERACTIVE MARKER BOARD PART NUMBER 2G2KG-26 WITH BRIOTRIM WHICH SHALL BE INSTALLED BY SDOC MIT DEPARTMENT CONTRACTOR

NOTE: TRADITIONAL SMARTBOARDS WILL NOT BE INSTALLED FOR CLASSROOMS IN THIS SPECIFIC INSTALLATION CONFIGURATION.

CLASSROOM WALL MOUNTED INTERACTIVE PROJECTOR AND MARKER BOARD PLACEMENT DIAGRAM

NO SCALE
Figure 50 Wall Mount interactive Projector LightRaise 60wi Manufacturer Specifications “Typical”

The LightRaise 60wi projector is the only integrated interactive projector that supports touch and pen-enabled interactivity, enabling two students to simultaneously collaborate. The LightRaise projector includes SMART Notebook software and access to high-quality lesson content, service and support.

LightRaise™ 60wi interactive projector

The LightRaise 60wi interactive projector enables you to add interactivity to almost any surface. This touch and pen-enabled, ultra-short-throw interactive projector enables two students to instantly start collaborating on lesson activities at the same time.

Experience collaborative learning
The LightRaise 60wi projector is the only interactive projector that provides touch and pen-enabled input, enabling two students to simultaneously write, draw and manipulate content in SMART Notebook™ collaborative learning software using a finger or the interactive pen. The LightRaise 60wi enables educators to deliver engaging and collaborative content and gives students the ability to interact with material in richer, more engaging ways.

Bring learning to life with SMART Notebook
The LightRaise projector includes award-winning SMART Notebook software, which sets the standard for creating, delivering and managing interactive lessons that motivate students. Through SMART Notebook, educators also have immediate access to over 60,000 learning resources on the SMART Exchange™ website.

Add interactivity almost anywhere
With the LightRaise projector, you can turn almost any surface, including a dry-erase whiteboard, into an interactive, small-group, collaborative learning space. The ultra-short-throw interactive projector enables you to create screen sizes of up to 100” (254 cm) on the diagonal. Complementary SMART solutions integrate with the LightRaise projector through SMART Notebook software, so you always have the option to extend and enhance your classroom solution in the future.
Figure 50 Wall Mount interactive Projector LightRaise 60wi Manufacturer Specifications “Typical”
THE MOST CURRENT VERSION OF THE SCHOOL DISTRICT OF OSCEOLA COUNTY, FLORIDA (SDOC) DIVISION 27 TECHNOLOGY SYSTEMS STANDARDS AND SPECIFICATIONS MAY BE LOCATED AT THE SDOC WEBSITE UNDER THE MEDIA AND INSTRUCTIONAL TECHNOLOGY SERVICES DEPARTMENT SECTION AT: (HTTP//WWW.OSCEOLA.K12.FL.US/DEPTS./IMC/INDEX.ASP) ANY QUESTION REGARDING CURRENT VALIDITY OR CONTENT OF THESE STANDARDS AND SPECIFICATIONS SHALL BE ADDRESSED IMMEDIATELY WITH THE TECHNOLOGY SERVICES DEPARTMENT TECHNOLOGY CONSTRUCTION PROJECT MANAGERS.

1.01 SUMMARY:

A. During the design phase for each site specific project it is the responsibility of the project specific architect and engineer to contact SDOC MTSD to verify and ensure all specified dimensions and components remain up-to-date, accurate, complete and unchanged regarding all SDOC Audio Enhancement Sound System installations and to update SDOC specified dimensions and components on the conformed technology documents and plans when changes are identified with no exception.

B. As required for upgrades in technology and for replacement of obsolete equipment certain products and components may change which can also affect specified dimensions or other requirements that may potentially not currently be reflected in the current SDOC Standards and Specifications.

C. Following are the current specified conduit, hardware, dimensions and basic components for pathway and support installation for SDOC Audio Enhancement Sound System installations. These stub out pathways and supports are to be utilized for Audio Enhancement Sound System equipment electronics, cabling and devices to be installed by others as SDOC contracted.

1.02 AUDIO ENHANCEMENT CONDUIT INSTALLATION REQUIREMENTS:

A. General Contractor shall provide and install all Audio Enhancement (AE) stub outs, power receptacles and faceplates as specified in the detail pages of SDOC Standards and Specifications Section 271100.

B. These stub outs are to be utilized for Audio Enhancement (AE) equipment cabling and devices to be installed by others as SDOC contracted.
C. General Contractor shall provide and install the Audio Enhancement (AE) stub out to SDOC specification as follows:

1. In each classroom and other locations designated by authorized SDOC Representatives above the wardrobe or other cabinets or locations as SDOC designated install an Audio Enhancement (AE) stub out consisting of one (1) 1 ¼ inch EMT conduit coupled to one (1) 4” W X 4” H X 2.5” D double gang receptacle box and **2-Gang SS Split faceplate with grommet PASS & SEYMOUR Part Number# SS787**. This stub out shall be installed at 96” A.F.F.U.O.N. in the wall at the SDOC specified location in each specified room. EMT conduit shall be stubbed out above finished ceiling reamed with bushing installed.

2. In each classroom location designated by authorized SDOC Representatives within twenty-four inches of each (AE) stub out install one (1) single gang duplex general power receptacle which shall be installed at 96” A.F.F.U.O.N.

3. Audio Enhancement (AE) conduit stub out and back boxes installed at teacher desks and other SDOC designated locations shall be designed and installed within twenty-four inches of one (1) single gang duplex general power receptacle. This general power receptacle shall routinely be installed to provide general power needed for the installed Audio Enhancement (AE) systems.

### 1.03 SOUND ENHANCEMENT CONTRACTOR INSTALLATION:

A. Sound enhancement contractors shall provide, install, terminate, test and label all SDOC approved interior flush mount ceiling mounted speakers for hard ceiling or ceiling grid applications. Each interior flush mount speaker installation shall be installed with a ceiling grid tile bridge bracket and above ceiling a recessed enclosure.

B. Support for each sound enhancement system cable run shall be contractor provided and installed to SDOC satisfaction per Section 270200 of the SDOC Technology Standards and Specifications.

C. Contractor shall provide and install a complete and separate cable pathway for the sound enhancement cable run at all locations. Supports shall be placed every five (5) feet with the cable(s) secured to the supports with Velcro at these locations. For cable runs with multiple cables these cable runs shall be contractor provided and installed with Velcro on the cable bundle every two (2) feet throughout the pathway run.

D. SDOC approved support devices are “J” hooks “ONLY”. Velcro straps installed by themselves and tied to building structures is not SDOC authorized or approved. Cable ties and or pipe straps are not SDOC approved or authorized support devices or means to secure cabling. **Contact SDOC Technology Construction Supervisors to approve devices if in question**. Contractor shall be
responsible for removal of unauthorized supports and to provide and install SDOC approved support systems.

1.04 WALL PENETRATIONS FOR SOUND SYSTEMS:

A. Contractor shall provide and install all required interior and exterior wall penetrations which shall be sleeved with EMT conduit and sealed on the outer portion of the EMT conduit sleeve both at the interior and exterior locations and after installation of the cable the inner portion of the conduit shall also be sealed on both the interior and exterior locations.

B. Contractor shall penetrate all required exterior walls from exterior to interior.

C. Wall penetrations shall be minimum ¾ inch in width and shall be installed at SDOC pre selected inconspicuous locations above covered walkways and or other structures on exterior walls and as high as feasible on all interior and exterior walls taking care to make the surface mounted installation as inconspicuous as possible.

D. The installing contractor shall remove all debris both interior and exterior above ceiling as well as below both during and upon completion of installation.

E. All conduit sleeving shall be adequately supported to SDOC satisfaction, trimmed and bushed on both interior and exterior ends wherever sleeving is installed. The exterior portion of the conduit shall extend to the location of the equipment leaving no exposed cable on the exterior surface of the building. Installation of single gang or double gang weather proof back boxes is suggested as needed to ensure this occurs for exterior installations. Adequately strap and support all installed conduit at all locations to SDOC satisfaction.

F. Contractor shall provide and install all electronic component amplifiers which shall be permanently secured and immobile using SDOC approved hardware and fastening devices whether installed on contractor provided and installed shelving or installed on SDOC provide furnishings and cabinets. Seek SDOC input prior to installation or contractor is subject to removal and replacement to SDOC satisfaction.

1.05 SYSTEM POWER REQUIREMENTS:

A. General Power is the standard for Audio Enhancement (AE) system power receptacle installations.
Figure 40 Interactive Board/Ceiling Mounted Projector Plate/Audio Enhancement Classroom Configuration “Typical”
Figure 40A Interactive Board /Ceiling Mount Projector/Audio Enhancement Classroom Components Configuration “Typical”
Figure 41 Interactive Board/Ceiling Mount Projector/Audio Enhancement Classroom Conduit and Back Box Rough-in Configuration “Typical”
RADIO REPEATER INFRASTRUCTURE REQUIREMENTS


PART 1 – GENERAL REQUIREMENTS

SUMMARY:

A. Radio Repeater Systems shall be installed at new construction projects. The conduit, single gang box and general power receptacle installation shall be provided and installed by the general contractor. The stub out rough in location shall be indicated in each design and included on all new construction conformed documents and plans.

B. The Radio Repeater System shall be of superior audio and transmission quality. All Radio Repeater Systems installations shall address the site specific needs of the school or other site for which they are installed.

1. All components and conditions shall be as specified and detailed in all applicable sections of the SDOC Division 27 Technology Systems Standards and Specifications.

2. All work and installation practices shall be accomplished in accordance with all applicable sections of the School District of Osceola County Division 27 Technology Systems Standards and Specifications and referenced publications.

1.01 WALL PENETRATIONS FOR SURFACE MOUNTED ANTENNAES:

A. Contractor shall provide and install all penetrations which shall be sleeved with EMT conduit and sealed on the outer portion of the EMT conduit sleeve both at the interior and exterior locations and after installation of the cable the inner portion of the conduit shall also be sealed on both the interior and exterior locations.

B. Contractor shall penetrate all required exterior walls from exterior to interior.
C. Wall penetrations shall be ¾ inch in width and shall be installed at SDOC pre selected inconspicuous locations above covered walkways and or other structures on exterior walls as high as feasible taking care to make the surface mounted antennae installation as inconspicuous as possible.

D. The installing contractor shall remove all debris both interior and exterior above ceiling as well as below both during and upon completion of installation.

E. All conduit sleeving shall be adequately supported to SDOC satisfaction, trimmed and bushed on both interior and exterior ends where ever sleeving is installed. The exterior portion of the interior to exterior penetration conduit shall connect to a contractor installed double gang weather proof back box and shall extend to the location of the antennae with ¾ inch EMT conduit bushed on the antenna end leaving no exposed cable on the exterior surface of the building installation to the antenna. Adequately strap and support all installed conduit at all locations to SDOC standards.

1.02 ANTENNAE MOUNTING:

A. The antennae shall be mounted using concrete TAPCON Fasteners or other SDOC approved fastening devices only. Screws with plastic anchors and drywall screws are not SDOC approved fastening devices.

1.03 RADIO REPEATER MOUNTING INSTALLATION:

A. In the SDOC pre-selected space the radio repeater shall be installed on a contractor provided and installed shelf manufactured specifically for installation with this specific device using all hardware supplied from the manufacturer and installed to SDOC and manufacturer specifications. If there is no mounting hardware included with the contractor provided shelf consult SDOC representative for approved contractor provided and installed hardware for installation.

B. Specific installation location in the selected space for radio repeaters is site specific. Consult SDOC Technology Construction Supervisors for exact location.

C. The location in the selected space the shelf shall be installed shall be on the wall as close to and directly adjacent to the entrance door frame as possible at a height of 48 inches A.F.F. This location shall be pre-approved by campus administration and SDOC Technology Construction Supervisors.
1.04 SPACE ACCESS FROM THE CEILING:

A. For radio cable installation and access from above ceiling into the SDOC pre-selected space the contractor shall provide and install one (1) ¾ inch EMT conduit attached to a single gang back box with mud ring in the space wall from a minimum six (6) inches above finished ceiling to the location of the radio repeater at forty-eight (48) inches A.F.F.U.O.N. there shall be no exposed cable on the exterior surface of the wall. Adequately strap and support the installed conduit to SDOC satisfaction at all locations.

B. A conduit sleeve shall be contractor provide and installed from the interior of the SDOC pre-selected space to the exterior of the space in the corridor or other SDOC selected area. The installed sleeve shall be adequately supported to SDOC satisfaction, trimmed and bushed on both ends.

C. Contractor shall provide and install a grounding conductor cable and sleeving for access from building steel above ceiling into the SDOC pre-selected space to a contractor provided and installed surge protection device. The ground conductor shall be minimum stranded copper #6 green jacketed ground cable U.O.N. No trimming of the strands at any location is acceptable.

D. The building steel location shall be in direct vicinity of the room at the closest and straightest run possible. The grounding connection to building steel must be a clean paint free surface, the connector shall be an NEC approved connection device and all connections shall be tightly and securely fastened. Support for the grounding cable run shall be installed every five feet. Install the grounding cable in the support run and secure the cable to the support with cable ties.

E. The contractor provided and installed sleeve shall be a separate 3/4 inch EMT conduit from six (6) inches above the ceiling tiles to the location of the radio repeater surge protection device leaving no exposed cable on the exterior surface of the wall. The conduit sleeve shall be trimmed and bushed on both ends. The ground conductor shall be bonded to the EMT conduit on one end with a contractor provided and installed NEC approved connector with a ground conductor of the same size as is installed in the conduit. Adequately strap and support all installed conduit at all locations to SDOC satisfaction.

1.05 RADIO INFRASTRUCTURE CABLE INSTALLATION:

A. Support for the radio system cable run shall be contractor provided and installed to SDOC satisfaction per Section 27020 of the SDOC Technology Standards and Specifications.

B. Contractor shall provide and install a complete and separate cable pathway for the radio repeater cable runs at all locations. This is inclusive of sleeving and supports. SDOC approved supports shall
be placed every five (5) feet with the cable(s) secured to the supports with Velcro at these locations. For cable runs with multiple cables these cable runs shall be contractor provided and installed with Velcro on the cable bundle every two (2) feet throughout the pathway run in addition to the velcro at each support device.

C. Examples of SDOC approved support devices are “J” hooks or Bridal Rings. Velcro straps installed by themselves and tied to building structures such as grid wire, rebar, threaded rod etc. are not SDOC authorized or approved. Cable ties and or pipe straps are not SDOC approved or authorized support devices or means to secure cabling. Contact SDOC Technology Construction Project Managers for approval of devices if in question. Contractor shall be responsible for removal of any and all supports deemed unauthorized by SDOC Technology Construction Project Managers and shall be replaced with contractor provided and installed SDOC approved support systems.

1.06 RADIO REPEATER POWER REQUIREMENTS:

A. General Power is the standard for radio repeater power receptacle installations.

B. Contractor shall provide and install within twenty-four inches of the radio repeater conduit and back box at forty-eight (48) inches A.F.F.U.O.N. one (1) single gang duplex general power receptacle. This general power receptacle shall routinely be installed to provide general power needed for the installed Radio Repeater System. If none is available the contractor shall be responsible for provision and installation U.O.N.

1.07 CABLE AND COMPONENT LABELING:

A. Contractor shall provide, install and label all installed individual radio cables with SDOC approved typewritten labels on each end of each cable to identify the far end connection. Contact SDOC Technology Construction Supervisors for approved labeling scheme. Handwritten labeling is not authorized or approved. Contractor shall be responsible for removal of unauthorized labeling and to provide and install SDOC approved labeling scheme.

B. The SDOC approved labeling scheme for the antennae cable at both ends shall be Radio Repeater Room #? Contact SDOC Technology Construction Supervisors for approved labeling scheme.

C. At the Radio Repeater a label shall be installed and the labeling shall read Antennae Interior/Exterior (as applicable) Building #? Contact SDOC Technology Construction Supervisors for approved labeling scheme.

D. Label each grounding cable run on each cable end with sturdy secured typewritten labels on both ends of each cable to identify the far end connection. On the Radio Repeater end the labeling shall
read Installed to Building Steel interior above Room “? On the Building Steel end the labeling shall read Radio Repeater Room#?

1.08  SYSTEM PERFORMANCE:

A. Contractor shall demonstrate to the satisfaction of SDOC Representatives the Radio Repeater System is programmed and operational in all respects as required for school operations at all locations requested.

1.09  COMPLETION:

A. The system will be considered complete when all of the following requirements have been met:

1. All devices are installed per the conformed plans and specifications.
2. The system responds to activations at all devices and locations.
3. All selected and identified applicable personnel at the school have received formal training and the document indicating the date of training, trainer and all attendees has been signed and submitted to the SDOC ITSD Representative for project retention.
4. All dead end cables and unused ports are terminated and identified with typewritten labels on all ends.
5. All equipment is determined by SDOC ITSD Representatives to be installed at a minimum to manufacturers' specifications.
6. All cabling installed at each device location and space is terminated and identified with typewritten labels on all ends to SDOC satisfaction.
7. Demolition and removal of all dead end and obsolete or replaced pre-existing system cabling and equipment has been accomplished by the contractor to SDOC satisfaction.
8. A contractor produced, designed and provided as built plan indicating all devices and cabling configuration to SDOC satisfaction has been submitted to the owner for retention.
9. Contractor shall provide a bound document complete with the as-built drawings, installed programming, component cut-sheets of the equipment installed and completed training information to SDOC satisfaction has been submitted to the owner for retention.
10. It shall be the responsibility of the contractor to repair any exposed surface which has been scratched, scarred chipped or damaged in any way as a result of the installation and shall be restored to like-new condition. All paint shall be matching and shall blend with no noticeable difference in shade at any location applied. Upon completion of project all exterior surfaces of equipment shall be cleaned of fingerprints, paint splatters, and other foreign substances. All construction debris such as wire trimmings, mortar, and foreign debris shall be removed from equipment areas and any area directly affected during the installation or service of equipment.

11. It shall be the responsibility of the contractor to verify the condition of all ceiling tiles and floor tiles in the work spaces prior to installation. All broken or damaged ceiling or floor tiles or other damages not previously documented and deemed by authorized SDOC Representatives to be the fault of the contractor at the end of each project shall be repaired and or replaced as applicable by the contractor at no expense to SDOC prior to final payment authorization.

1.10 ACCEPTANCE INSPECTION:

A. Project Engineer and SDOC ITSD Technology Construction Project Manager or Authorized Representative shall conduct both a substantial and final inspection of all technology installations to ensure all installations are in compliance with all SDOC Standards and Specifications as well as those requirements specific to the installation of Radio Repeater Systems. At substantial inspection contractor shall demonstrate the functionality and operation of the installed system in the following manner:

1. Inspection and observation of the installed system with no faults.

2. Inspection and observation of the activation of a randomly selected device(s) at randomly selected locations.

3. Inspection and observation verifying the Radio Repeater System transmits to applicable devices on selected frequencies as appropriate.

4. Inspection and observation of other tests deemed necessary to establish proper system operability.

5. Verification that the above tests are documented in the operation and maintenance manuals as as-built conditions.

6. Verification of formal instruction given to owner designated key personnel at a time selected by owner in separate sessions if requested by owner.
7. Verification of training covering operation, programming, troubleshooting and maintenance.

8. Verification in the form of formal written report, signed by the instructor and submitted to the owner detailing subjects covered, names of persons instructed, dates and amount of instruction each person has been received. This report shall be submitted within one week following the instruction.

9. Upon completion of all issues identified as not complete to SDOC satisfaction at Substantial Inspection a Final inspection shall be conducted as applicable to verify all issues have been completed to SDOC satisfaction. Once the Final Inspection is complete to SDOC Satisfaction Final Payment for the project shall be authorized and a contractor evaluation sheet shall be completed by the SDOC ITSD Technology Construction Project Manager or Authorized Representative to evaluate the security contractor’s performance. This evaluation sheet shall be submitted to the contractor for their information and retained in the project records by SDOC.

1.11 WARRANTY:

A. All Radio Repeater system equipment and cabling shall be guaranteed by the installing contractor to be free of defects in materials and workmanship from the date of final inspection completion for the installed system for a period of time established as contracted by SDOC Purchasing Department.

B. Any system component showing evidence of failure, improper or incorrect operation during the warranty period shall be repaired or replaced by the contractor at no expense to SDOC as specified in contract documentation.

1.12 AS-BUILT DRAWINGS:

A. General: A comprehensive Radio System as-built drawing shall be provided to SDOC for retention containing at a minimum the following information:

1. A block diagram of the installed system indicating all cables, cable types, active and passive components.

2. A block diagram of the building or campus sites indicating the zone/area layout of the system.

3. If the site has as built CAD drawings available the contractor shall update the Radio System as-built to match the installed system as approved by SDOC ITSD Representatives.
DIVISION 27 13 00
School District of Osceola County
Technology Standards and Specifications

PORTABLE CLASSROOM
TECHNOLOGY SYSTEMS INSTALLATIONS

THE MOST CURRENT VERSION OF THE SCHOOL DISTRICT OF OSCEOLA COUNTY, FLORIDA (SDOC) DIVISION 27 TECHNOLOGY SYSTEMS STANDARDS AND SPECIFICATIONS MAY BE LOCATED AT THE SDOC WEBSITE UNDER THE MEDIA AND INSTRUCTIONAL TECHNOLOGY SERVICES DEPARTMENT SECTION AT: (HTTP//WWW.OSCEOLA.K12.FL.US/DEPTS./IMC/INDEX.ASP) ANY QUESTION REGARDING CURRENT VALIDITY OR CONTENT OF THESE STANDARDS AND SPECIFICATIONS SHALL BE ADDRESSED IMMEDIATELY WITH THE TECHNOLOGY SERVICES DEPARTMENT TECHNOLOGY CONSTRUCTION PROJECT MANAGERS.

1.01 TECHNOLOGY SYSTEMS BACKBONE CABLING BUILDING MDF OR IDF CLOSET TO PEDESTAL AND BACKBONE FEEDER CABLING PEDESTAL TO PORTABLE INSTALLATION:

A. New SDOC portable site installations are as a standard built to service up to twenty four (24) portables including spare intercom and fiber strands for exterior local speakers and cameras from one pedestal.

B. Initial backbone technology cabling installed from the building MDF or IDF location is inclusive of a minimum (and possibly more than) one (1) 48 strand tight buffered 50/125 micron OM4 multimode fiber optic cable which shall be installed at the building MDF or IDF location in a free standing two post rack at a standard rack mount fiber optic tray. The thirty (30) West Penn AQC 369 copper intercom cables are terminate to 66 blocks mounted at the MDF or IDF intercom wall field for cross connect at the building back to the campus or other site intercom head end location.

C. These fiber optic and copper indoor / outdoor cables transit from the building MDF or IDF to a portable site pedestal through a newly established conduit system pathway appropriately sized nominally as a minimum one (1) and normally two (2) four inch PVC conduits with innerducts for future expansion from the building in what may be a wall mounted technology service cabinet or a free standing two post technology service cabinet at the portable site location or a combination of both dependent upon the site. All thirty (30) copper intercom and the minimum one (1) forty-eight strand fiber optic backbone cables homerun from the MDF or IDF location to the pedestal and are terminated at both ends for cross connection and use as portables are nduit shall be stubb.

D. All backbone Multimode Fiber Optic Cabling (MMFOC) shall be tight buffered “ONLY” 50/125μ terminated using SC connectors installed in approved OCC “ONLY” RMLIU / fiber optic cable trays at each Building MDF or IDF location and Hubbell “ONLY” WMLIU fiber optic cable cabinets at each free standing pedestal cabinet or wall mount cabinet backboard location IAW SDOC Division 27 Standards and
Specifications (latest reversion). All copper intercom cables shall be terminated to 66 blocks mounted on the interior of each free standing pedestal cabinet or wall mount cabinet backboard location.

E. Exterior indoor / outdoor technology systems backbone feeder cabling installations for each individual portable are then installed from the portable pedestal connections at the portable site location on campus to the IDF Cabinet location in each portable.

F. Each portable backbone feeder cable run includes estimates up to 250 feet of feeder cabling from the portable pedestal at the portable site location on campus to the IDF Cabinet location at the interior of each portable installed in 11/4 inch PVC conduit as the pathway from the pedestal to the portable.

G. Each Portable backbone feeder cable installation shall include:

1. One (1) homerun installed six strand tight buffered multimode 50/125 fiber optic cable complete with a total of four (4) SC fiber optic connectors having two (2) connectors terminated at each end of each fiber optic cable and installed securely in a fiber block mounted in the Portable IDF Cabinet on the portable IDF backboard location where the two SC connectors shall be inserted into two SC fiber optic barrels mounted on the fiber block IAW SDOC Division 27 Standards and Specifications.

2. One (1) homerun installed West Penn AQC369 intercom cable installed securely at a 66 block mounted in the Portable IDF Cabinet on the portable IDF backboard location where all intercom cable pair leads and the drain wire shall be neatly and cleanly punched down at the 66 block IAW SDOC Division 27 Standards and Specifications.

3. All portable installation technology components shall be installed, terminated, labeled, and tested to include all existing data outlet locations within the portable.

4. Each installation shall provide a completely operational system from MDF or IDF location through pedestal cabinets to portable IDF cabinet and ultimately to each data drop location. It is the contractor’s responsibility to insure a completely terminated, tested, labeled and operational cabling system at the completion of each project. The intercom crossing, surge protection and final connections shall be completed and the speaker and call button tested and operational as a function of the intercom contractor.

5. The SDOC Technology Systems Department Technicians shall complete patching, crossing and final connections of the network equipment at the Building MDF or IDF and each individual Portable IDF location when the contractor cabling and hardware installation is satisfactorily completed, tested and inspected by the SDOC Technology Construction Project Manager.
1.02 PORTABLE INTERIOR TECHNOLOGY SYSTEMS BACKBONE FEEDER CABLING INSTALLATION:

A. Intercom Backbone Feeder Installation -

1. From the portable pedestal cabinet at the portable site location homerun install, terminate, test, and label one (1) AQC369 intercom cable to each portable IDF cabinet.

NOTE: Terminate All AQC369 Connections to one side “ONLY” outer pins of each 66 Block. See Figure 50 and 51 below for proper intercom cabling orientation.

B. Fiber Optic Feeder Installation -

1. From the portable pedestal cabinet at the portable site location homerun install, terminate, test, and label one (1) six strand tight-buffered MMFOC to each portable IDF Cabinet. Terminate 2 stands with SC connectors on both ends unless otherwise directed by SDOC Technology Construction Project Manager.

2. At the portable pedestal cabinet connect each strand of the terminated forty eight strand backbone fiber optic cable to each terminated strand of each portable backbone feeder cable consecutively to the forty eight strands. Test all strands after connection to insure connectivity within acceptable SDOC parameters.

3. NOTE: Strain relief shall be utilized and shall be a minimum six (6) inches in length, braided and secured to the frame of the fiber optic tray at the cable jacket location and shall be utilized to secure all MMFOC at each end of all fiber optic cables.

4. NOTE: At all locations where new fiber optic backbone feeder cables are being installed to existing building fiber optic backbone cables it shall be the contractor’s responsibility to test connectivity and insure the fiber optic strands utilized are within acceptable parameters for signal loss for all connecting fiber strands complete from each portable connector to every MDF / IDF rack mounted fiber optic connector and (if lacking) re-label all cables (with FISH number) at all connection points at which the existing fiber backbone connections are being utilized from all MDF/IDF locations to the pedestal and/or wall mounted pull box locations to the connectors in each portable IDF Cabinet. Based on result of tests, contractor shall provide install, terminate, repair and test any failed or suspect fiber optic connections and or fiber optic cable.

5. All backbone exterior technology cabling installed shall have a service loop of five (5) feet either in the pedestal or above ceiling at each Portable IDF Cabinet location as designated by the SDOC
Technology Construction Project Manager ensure all cabling at the designated locations is properly supported IAW SDOC Division 27 Standards and Specifications (latest version).

1.03 PEDESTALS:

A. Exterior wall mount and free standing pedestals -

1. All exterior pedestals shall be durable metal weatherproof hinged with lift-off hinges, tamper-resistant with quarter-turn latches and shall be lockable pedestals gray in color complete with installed gray painted wood backboard and multiport grounding bus bar.

2. All free standing and wall mount technology cabinet pull boxes and portable technology service pedestals shall be of sufficient size and depth (not less than 36” Wide X 36” High X 10” Deep) to accommodate 66 blocks and fiber optic wall mount LIU’s installed to provide and service up to thirty (30) portables from one pedestal inclusive of a five foot service slack around the interior of the pedestal for both the backbone cables from the building IDF location and thirty (30) intercom and six (6) strand fiber optic feeder cables to each of thirty (30) portables. The pedestal shall be mounted where the floor of the pedestal is not more than 36 inches above grade and shall be of sufficient depth with the door closed and latched all equipment will remain mounted and without any inside component making contact. Each pedestal shall be roomy enough that technicians shall be able to maintain existing installations for cross connects and relocations and to pull cable in for additions with ease. All conduits shall be installed on the floor of the pedestal “ONLY” with no exceptions.

3. All free standing and wall mount technology cabinet pull boxes and portable technology service pedestals shall have wood backboards painted gray in color which shall either be gray Ready Spec Backboard installed with manufacturer supplied fasteners and according to manufacturer’s specifications or shall be ¾” A/C grade virgin plywood painted with (2) two coats of gray Fire Retardant Intumescent Latex paint on all sides provided and installed to the complete satisfaction of SDOC Technology Construction Project Managers IAW SDOC Division 27 Standards and Specifications. It shall be the responsibility of the contractor to install the appropriate project specific colors and amounts of Ready Spec or SDOC approved other backboard as defined in SDOC Division 27 Standards and Specifications.

B. Technology pedestal cabinet grounding scenarios:

1. New wall mount technology cabinet enclosure installations - (and if missing and needed for existing portable pedestals) shall have a solid copper ground bus and supports as specified in the SDOC Technology installation Division 27 Standards and Specifications. At each new cabinet location install the copper ground bus in a location specified by SDOC Technology Construction Project Manager.

   a. Homerun (in the shortest route possible) install, label and test one (1) #4 minimum stranded copper green jacketed ground wire from the ground bus to the closest electrical panel feeding the space adjacent to the exterior wall mount cabinet enclosure.
b. Homerun (in the shortest route possible) install, label and test one (1) #6 minimum stranded copper green jacketed ground wire from the ground bus to the closest building steel at the interior adjacent to the exterior wall mount cabinet enclosure.

c. Install all ground connections that transition into the ceiling space each into their own sleeve and for EMT conduit sleeving ground one end of each sleeve with the same size conductor as is in the conduit.

d. All surge suppression devices within the technology cabinet enclosure require grounding connections. These grounding connections shall all be individual homerun #6 minimum stranded copper green jacketed ground wire connections from the applicable device to the copper ground bus.

2. New free standing technology cabinet enclosure installations - (and if missing and needed for existing free standing technology cabinet enclosures) shall have a solid copper ground bus and supports as specified in the SDOC Technology installation Division 27 Standards and Specifications. At each new cabinet location install the copper ground bus in a location specified by SDOC Technology Construction Project Manager.

a. From the interior of the free standing technology pedestal cabinet at the pedestal location install, terminate, test and label one (1) homerun #6 green jacketed stranded copper grounding conductor from the multiport grounding bus bar installed in the pedestal to a driven grounding rod IAW SDOC Division 27 Standards and Specifications.

b. Grounding conductor pathway from grounding rod to interior of technology pedestal shall be a minimum ½ inch PVC conduit or of appropriate size and length from a PVC connector installed on the pedestal to within one (1) inch of the driven grounding rod at grade.

c. The PVC ground conductor conduit shall be strapped with conduit straps where possible or secured to Kendorff with sleeve straps or shall be installed to one (1) foot below grade to sustain its outdoor durability. Securing the PCV conduit with cable ties or Velcro is not acceptable.

C. Contractor shall provide and install, terminate, test and label all items to SDOC satisfaction.
1.04 PORTABLE CLASSROOM INTERIOR TECHNOLOGY INSTALLATION:

A. For the interior at each SDOC specified Portable IDF Cabinet location, unless otherwise specified by the SDOC Technology Construction Project Manager the contractor shall provide and install (1) one wall mounted Hubbell REBox IDF32 Cabinet, light grey in color. Each IDF Cabinet shall be installed with the top of the cabinet flush at ceiling height and with two (2) ½ inch PVC connectors and two (2) 2 inch PVC connectors positioned as shown in Figure 49 below to above ceiling for cable access and entrance to the interior of the cabinet.

B. In the interior of the REBox IDF32 Cabinet contractor shall provide and install a REKBB20 backboard. Insure the alignment of this backboard is flush with the top of the REBox Cabinet at a location specified to accommodate the appropriate sleeves installed for cable access to the interior of the cabinet from the ceiling space.

C. Inside the wall mounted lockable the REBox Cabinet the contractor shall provide and install a fan kit as follows: CHATSWORTH “ONLY” – CPI, 13051-001 FANKIT, 4U-6U, Thin line using available fan knockout in the center floor of each REBox Cabinet.

D. From the exterior Hoffman pedestal to each portable interior wall mounted lockable REBox Cabinet the contractor shall provide and install, terminate, label and test one (1) West Penn AQC 369 intercom cable and one (1) indoor / outdoor rated tight-buffered “ONLY” six strand 50/125 micron multimode fiber optic cable.

E. The contractor shall provide and install all cabling from the pedestal location at the portable site to the exterior of the portable and from the outside of the portable to the interior of the space at the IDF cabinet utilizing provided and installed 1 1/4 inch PVC conduit from the pedestal to a 12 X 12 inch PVC connection box with removable screw on cover mounted at the frame of the portable and a 1 1/4 inch PVC conduit from the PVC connection box running vertically up the outside of the portable and penetrating in horizontally above ceiling with a PVC “LB” to above ceiling on the interior of the portable. All penetrations shall be installed and sealed by the Contractor IAW SDOC Division 27 Standards and Specifications for the installation of conduit and penetrations.

F. From the interior of each REBox Cabinet to the space electrical panel in each space the contractor shall provide, install, terminate, label and test one (1) homerun #6 green jacketed stranded copper grounding conductor and one (1) general power duplex receptacle in the space provided below the backboard at the bottom of the cabinet and to the right side as shown in Figure 49 below.

G. To maximize the useable space within each REBox IDF Cabinet during installation and termination of all hardware and cabling the contractor shall use and install “ONLY” SDOC specified hardware with all components and cabling located as and where SDOC specified within the cabinet as shown in Figure 49 below.
H. The contractor shall provide, install, terminate, label and test the following hardware inclusive of all exterior backbone feeder and interior horizontal infrastructure cabling:

1. REKBB20 backboard
2. One (1) four port fiber block
3. Two (2) dual port SC fiber optic connector barrels
4. One (1) 12 port mini patch panel for three (3) D4 data outlet locations. Contractor shall only provide and install PANDUIT, ORTRONICS or AMP/TYCO equipment and cabling SOLUTIONS “ONLY” for all data installations.
5. One (1) two port data block with two (2) PANDUIT, ORTRONICS or AMP/TYCO RJ45 connectors
6. One (1) twenty-five or fifty pair 66 block with MGB ground rail.
7. One (1) multiport ground block.
8. One (1) CHATSWORTH “ONLY” – CPI, 13051-001 FANKIT, 4U-6U, Thinline
9. One (1) Duplex General Power Receptacle (Black in color)

I. On the interior of each portable at three (3) SDOC designated in wall technology ¾ inch EMT conduit and single gang deep box data outlet locations as indicated by SDOC Technology Construction Project Manager, from the REBox Cabinet location install four Category 6 data cables as (1) D4 data outlet at each of the three data locations designated. All data cabling shall be installed in its own separate cable run and shall be installed as is defined in Section 27 02 00 of the SDCO Division 27 Standards and Specifications which specifies that all cabling shall have a “J” hook support system installed with “J” hooks placed every five feet and Velcro wraps at the “J” Hook and every two feet along the cable run for cable bundles. All cable specifics defined in Section 27 02 00 apply for every Portable Classroom cable installation.

J. For interior space intercom requirements at the REBox Cabinet the incoming backbone feeder cable shall be contractor provided, installed, terminated, labeled and tested punched down on the lower left and outermost 66 block pins in the following order top to bottom: red, black, drain wire, white, and green. The interior intercom cable run shall be one (1) AQC369 cable “only”, punched down on the lower right and outermost 66 block pins in the following order top to bottom: red, black, drain wire, white, and green. Contractor shall install bridging clips on the 66 block center pins between each intercom feeder lead and drain wire and interior cable lead and drain wire. The one (1) single AQC369 interior intercom
cable shall run from the IDF Cabinet to the call switch location where the cable shall be installed to the ¾ inch EMT conduit and single gang deep box where the white / green pairs shall be terminated to the call button location and cable will then continue back up to the intercom speaker where the red / black pairs shall terminate. All intercom cabling shall be installed in its own separate cable run and shall be installed as is defined in Section 27 02 00 of the SDCO Division 27 Standards and Specifications which specifies that all cabling shall have a “J” hook support system installed with “J” hooks placed every five feet and Velcro wraps at the “J” Hook and every two feet along the cable run for cable bundles. All cable specifics defined in Section 27 02 00 apply for every Portable Classroom cable installation.

K. Provide owner with specifics on the selected call button for installation. **NOTE: BOGEN CALL BUTTONS ARE NOT ACCEPTABLE** these call switches cause false faults in SDOC intercom systems and shall not be permitted for use.

L. Install one (1) wall mounted speaker white in color, metal can only. Each speaker can shall be installed with the top flush at ceiling height. The speaker taps shall be set optimally at a .5 watt setting. Yet, if this is not an available setting the tap shall be set at the next greater setting closest to .5 watts.

M. To prevent damage to installed intercom head end equipment all final crossing and connections for the intercom system installation shall only be connected and tested at the intercom head end location by qualified technicians from the School District of Osceola County or by technicians from the company who originally installed the intercom head end equipment and system.

N. In DROP CEILING portables provide and install one (1) projector plate (PJ) IAW manufacturers installation specifications centered on the smart board on the teaching wall and five full ceiling tiles back IAW SDOC DIVISION 27 Standards and Specifications Section 27_10_00 and manufacturers recommendations utilizing all components provided including all parts and pieces for one (1) QUANTUM UNIVERSAL PROJECTOR DROP-IN CEILING MOUNT PART NUMBER AVM-PRO-DCP-UNV-404-SV. Provide and install on projector plate (PJ) one (1) duplex general power receptacle with six feet of “MC” cable slack supported and secured, one (1) D2 data outlet with six (6) feet of service slack supported and secured, one (1) of two AVCAT5 EXTENDER MODULES P/N# WP-CAT5-VGA-AUD-COMP complete and connected with two (2) FIFTY FOOT CAT5 DATA PATCH CORDS (blue in color) all data patch cord slack shall be supported and secured at the projector plate as SDOC and manufacturer specified.

O. In HARD CEILING portables at above 80 inches A.F.F. to the bottom of the assembly provide and install IAW manufacturers installation specifications utilizing all components provided one (1) projector arm assembly (PJA) centered on the smart board on the teaching wall IAW SDOC DIVISION 27 Standards and Specifications Section 27_10_00 and manufacturers recommendations all components including all parts and pieces for one (1) EPSON P/N# ELPMB24. This installation shall be inclusive of one (1) duplex general power receptacle, one (1) D2 data outlet and data cables as SDOC and manufacturer specified.

P. In DROP CEILING portables provide and install one (1) vertical SMART BOARD Station (SB) conduit stub out consisting of one (1) one and one quarter inch EMT conduit coupled to the (SB) 4” W X 4” H X
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2.5” D double gang receptacle back box complete with provided and installed 2-Gang SS Split faceplate with ¾ inch access hole with rubber grommet PASS AND SEYMOUR P/N# SS787 which shall be installed at 18” A.F.F.U.O.N. recessed and squared in the teaching wall at location designated near the edge of the smart board installation. The 1 ¼ inch EMT conduit shall be stubbed out above finished ceiling reamed with bushing installed.

Q. In HARD CEILING portables at above 80 inches A.F.F. provide and install one (1) vertical SMART BOARD Projector Arm Assembly Station (PJA) conduit stub out consisting of one (1) one and one quarter inch EMT conduit coupled to the (PJA) 4” W X 4” H X 2.5” D double gang receptacle back box complete with provided and installed 2-Gang SS faceplate with combination rectangle rocker switch hole and ¾ inch access hole with rubber grommet PASS AND SEYMOUR P/N# TBD which shall be installed at minimum 80” A.F.F.U.O.N. to the bottom of the outlet recessed and squared in the teaching wall at location designated near the . The 1 ¼ inch EMT conduit shall be stubbed out above finished ceiling reamed with bushing installed. Installation shall also include the installation at above 80 inches A.F.F. of one (1) D2 data outlet and one (1) duplex power receptacle parallel to the (PJA) Station within twelve (12) inches distance. Provide and install in the (PJA) Station faceplate one (1) of two AVCAT5 EXTENDER MODULES P/N# WP-CAT5-VGA-AUD-COMP complete and connected to two (2) FIFTY FOOT CAT5 DATA PATCH CORDS (blue in color) from the projector plate location to the Teacher Station (TS) location as SDOC and manufacturer specified.

R. In ALL portables at 18 inches A.F.F. provide and install one (1) vertical SMART BOARD Teacher Station (TS) conduit stub out consisting of one (1) one and one quarter inch EMT conduit coupled to the (TS) 4” W X 4” H X 2.5” D double gang receptacle back box complete with provided and installed 2-Gang SS faceplate with combination rectangle rocker switch hole and ¾ inch access hole with rubber grommet PASS AND SEYMOUR P/N# TBD which shall be installed at minimum 18 inches A.F.F.U.O.N. to the center of the outlet recessed and squared in the teaching wall at location designated near the teacher station D4 data outlet and duplex power receptacle. The 1 ¼ inch EMT conduit shall be stubbed out above finished ceiling reamed with bushing installed. Provide and install in the (TS) Station faceplate the second of two AVCAT5 EXTENDER MODULES P/N# WP-CAT5-VGA-AUD-COMP complete and connected to the two (2) FIFTY FOOT CAT5 DATA PATCH CORDS (blue in color) from the projector plate location to the Teacher Station (TS) location as SDOC and manufacturer specified.

S. In ALL portables unless otherwise noted provide and install IAW SDOC DIVISION 27 Standards and Specifications Section 27_13_00 and manufacturers recommendations one (1) PEERLESS SMART BOARD Mount part number IWB600-SBSMARTBOARDSB680MOUNT to be installed over existing marker board locations to install and support the installation of the SMARTBOARD P/N# SB680 U.O.N.

T. In ALL portables at above 80 inches A.F.F. provide and install one (1) AUDIO ENHANCEMENT Station (A/E) conduit stub out consisting of one (1) one and one quarter inch EMT conduit coupled to the (A/E) 4” W X 4” H X 2.5” D double gang receptacle back box complete with provided and installed 2-Gang SS Split faceplate with ¾ inch access hole with rubber grommet PASS AND SEYMOUR P/N# SS787 which shall be installed at above 80 inches A.F.F.U.O.N. recessed and squared one the portable wall at location designated near the IDF Cabinet installation. The 1 ¼ inch EMT conduit shall
be stubbed out above finished ceiling reamed with bushing installed. This installation shall be inclusive of one (1) duplex general power receptacle installed parallel to the AUDIO ENHANCEMENT Station (A/E) within twelve (12) inches distance.

U. Contractor provided and installed cable support and Velcro is required throughout the installation for all cabling both interior and exterior at each portable location in accordance with SDOC Division 27 Standards and Specifications (latest version). If there is no “red iron” or rebar or other SDOC approved structure available to attach cable supports, the supports shall be installed along the walls using the portable drywall framing to attach approved supports as the standard. **At no time shall any ceiling grid support hangers, threaded rod, or ventilation ducting straps be acceptable or utilized as a means to attach cables or supports.** Contractor may also install a separate set of grid hangars fastened at both ends where installed and painted with a swatch of blue paint to indicate they are technology support hangars. No other methods are authorized or approved.

V. Sleeving is required wherever wall or ceiling penetrations are required. Seal all penetrations around the exterior and the opening of each sleeve with approved UL listed sealants (provide certification of qualification to install sealant to SDOC authorized representative). Properly support each sleeve with Kendorff and brackets or other approved devices where applicable.

W. All locations where ceiling penetrations are made through ceiling tiles for all systems projects the penetration shall be cut, notched and neatly fit to seat around the sleeve or other penetration installed. In no instance will breaking or chipping of the tiles be an acceptable practice for providing access on systems installations from a space into a ceiling cavity.

X. In instances where speakers or other devices are contractor installed in a ceiling tile the speaker or other device shall be installed with an appropriate manufacturer recommended support device appropriately fastened to the adjacent ceiling grid and shall be inclusive of ceiling grid support and speaker can with washer.

Y. Where deemed necessary for safety issues by SDOC Representatives it shall be the responsibility of the contractor to install additional ceiling grid hangar wire for added support at any location where new speakers or devices are installed.

Z. In the event a ceiling tile is damaged during any portable technology systems project installation it is the responsibility of the contractor to obtain and replace the affected ceiling tile. Within reason damaged tiles may be requested from the SDOC Maintenance Department. Notify the Technology Construction Project Manager of the issue and they will attempt to make arrangements to obtain a replacement tile for the systems contractor to install. Yet, if there are no tiles available or, if the tile is a special tile not readily supported by the SDOC Maintenance Department tile replacement shall remain the sole responsibility of the contractor to replace any tile damaged during their installation with a matching tile regardless of whether a replacement is provided for their installation or not. It is recommended that upon arrival at the site the contractor survey the condition of all tiles and report any damage to the SDOC Technology Construction Project Manager. Failure to identify any pre-existing conditions will result in the contractor being the responsible party regarding replacement for any issues in question.
AA. All SDOC contractors general and both technology systems and electrical shall be responsible to
insure the environment of the work site at both the interior and exterior locations is maintained in a clean,
orderly and safe manner on a daily basis. No unsightly conditions shall exist more than on a same day
basis. All ceiling tiles shall be closed on a daily basis. The contractor shall remove all materials and
debris both interior and exterior from the site upon completion of the installation on a daily basis.

BB. Absolutely no unsafe condition such as open trenches, manholes or other issues deemed hazards by
the SDOC Technology Construction Project Manager or site administration shall be left unattended at
any time during work in progress (inclusive of lunch or break time) and shall not remain open longer
than the period of the day in question that these hazards are being opened for work. Where possible all
affected hazards shall be closed and or filled in at close of business on the same day the work occurred.
In the special circumstance where closing said trench or other hazard were not possible on the same day,
it is the responsibility of the contractor to make the SDOC Technology Construction Project Manager
aware of this issue with enough advance notice to permit proper notification for site administration. In all
instances where this is necessary, it is the responsibility of the contractor to appropriately stake off, rope
off and flag all effected hazardous areas with the appropriate caution or danger tape to the satisfaction of
the SDOC Technology Construction Project Manager.

CC. The School District of Osceola County, Florida shall not be held liable for any lost, stolen or damaged
tools or devices belonging to the contractor. The contractor shall be responsible for the security and
replacement of all contractor owned tools and devices utilized for projects where contracted by the
school district with no exceptions. Furthermore loss, theft or damage of a contractor owned tool or
device utilized in completion of any district project shall not be a viable or acceptable reason for project
schedule delays and or stop work by the contractor. The School District of Osceola County, Florida shall
not be held liable for any technology related materials with regard to contractor provided (and or district
provided) technology equipment, parts, hardware, cabling or other project related items that become lost,
missing or stolen during the process of the any technology project installation and that are required for on
time completion of the contractor scope of work. The contractor shall be responsible for the security and
prompt replacement of all materials and parts required to complete the project for which they are
contracted within the parameters agreed to with the school district at time of project scheduling in any
circumstance.

DD. The use of restroom facilities especially with regard to portable classroom installations by contractors
within any installation site (such as portables, classrooms, student stations, etc.) at any campus location is
strictly prohibited. Use of these facilities can result in dismissal as an approved contractor in the School
District of Osceola County. If there are facilities within the confines of the permanent buildings available
for use by contractors, the availability of these facilities is strictly the option of the school administration
and must be pre-arranged with site administrators. Restroom Facilities for contractors are not the
responsibility of the School District of Osceola County to provide for contractors. The recommendation
EE. All aspects of this installation shall be properly installed, supported, tested and labeled with typewritten labels. Consult the SDOC Technology Construction Project Manager for labeling schemes and specifics prior to labeling installation or the contractor shall be subject to removal and replacement of all labeling if not in accordance with SDOC labeling guidelines. All infrastructure cable labeling shall include port numbers for data, intercom and CCTV cabling at each termination point, Building IDF identification numbers for all feeder and backbone cabling, and FISH numbers on all feeder cabling with respect to portable installations (this is to include final destination location of specific cabling). No handwritten labeling will be accepted for final project completion. (See owner’s representative for specific details relevant to each site-specific location) in accordance with the School District of Osceola County: Division 27 Standards and Specifications (Latest revision).

FF. This standard and specification outlines the portable technology installation requirements. In acceptance of this project the contractor agrees and shall provide all labor, equipment, and materials necessary to provide a complete, tested and one hundred per-cent fully functional system regardless of any omission by the owner and to the satisfaction of the School District of Osceola County.

GG. In the acceptance of this project, the contractor agrees upon commencement of work to provide a deadline date for one hundred per-cent completion and that the complete one hundred per-cent installation shall within reason be delivered at the time specified.

HH. The contractor agrees to commit to the one hundred per-cent installation deadline set and to provide whatever manpower or material is necessary to insure all installation requirements and the deadline as set and agreed to is met as specified.

II. The intent of this standard and specification is to insure the delivery of a one hundred per-cent complete and functional, top quality installation ready for use. Omission of any essential detail from this scope does not relieve the contractor of the obligation to furnish a one hundred per-cent complete, fully operational and top quality system installed in accordance with School District of Osceola County: Division 27 Standards and Specifications (Latest revision). All contractors shall consult with the SDOC Technology Construction Project Manager for matters regarding clarification on any area of Division 27 Technology Standards and Specifications and regarding the actual physical placement of any technology related item being installed that may be in question.
Figure 46 – Hybrid Portable Configuration “Typical”
Figure 47– Standard Portable Configuration “Typical”

![Diagram of Standard Portable Installation with Projector Plate, Smart Board, and Audio Enhancement Installation]
Figure 48 – Hybrid Portable Hard Ceiling Configuration “Typical”
Figure 49 – Standard Portable Hard Ceiling Configuration “Typical”
Figure 50 – Standard Portable Pedestal Configuration “Typical”

Hoffman 36" x 36" NEMA 1 Enclosure

Pedestal Configuration

Figure 50 – Standard Portable Pedestal Configuration “Typical”
Figure 51 – Standard Portable IDF Cabinet Configuration “Typical”
Football Stadium Press Box Technology Installations

1.01 Football Stadium Press Box Sound System Installation:

A. The technology systems contractor shall provide, install, terminate, label, test and surge protect (utilizing SDOC approved Surge Protection Devices) one (1) new SDOC specified Stadium Press Box Sound System Amplifier Cabinet at an SDOC specified location within the press box.

B. Securely fasten the amplifier cabinet to the floor or wall of the Press Box to SDOC satisfaction IAW Division 27 Technology Standards and Specifications.

C. The contractor shall from the local electrical panel in the Press Box provide, install, terminate, label and test one duplex general power receptacle at 18 inches A.F.F. at the Press Box Sound System Amplifier Cabinet interior location.

D. The contractor for all sound system cabling pathways shall provide and install all SDOC approved conduit, boxes, mounting and support hardware from all new SDOC specified stadium speaker locations to the Press Box Sound System Amplifier Cabinet. All conduits shall be of SDOC approved sizes and quantities installed IAW SDOC Division 27 Technology Standards and Specifications. Contractor shall provide and install two (2) 2-inch PVC conduits as the underground backbone pathway and "12 X 12" PVC boxes con-currently mounted on the bottom exterior of the press box location for all turns as pull points. At the point of penetration and sleeving into the press box from the floor of the press box the conduits shall stubout directly into the interior of the Press Box Sound System Amplifier Cabinet.

E. The contractor shall insure that all conduit penetrations at the press box floor are weatherproof and only of minimal size to accommodate the conduit being installed.

F. The contractor shall for all installed sound system cabling pathways provide and install all SDOC approved new weatherproof outdoor rated stadium speakers with durable weather resistant mounting and support hardware including safety lanyards at all new SDOC specified stadium speaker locations IAW SDOC Division 27 Technology Standards and Specifications.

G. The contractor shall provide and install a ¾ inch EMT conduit pathway to an exterior location to be determined by SDOC Technology Construction Project Managers on the front exterior face of the Press Box. The single penetration both interior and exterior shall be sealed 360 degrees with SDOC.
approved sealants and made water tight to SDOC satisfaction. The exterior portion of the EMT conduit shall be attached to a single gang deep weatherproof bell box with cover. From the bell box on the exterior a second EMT conduit shall be attached and run to a second location where it shall be attached to a second single gang deep weatherproof bell box with cover. All exterior screws installed shall be sealed watertight. All exterior EMT conduit and Bell boxes shall be painted to exacting specifications to match the existing paint on the exterior face of the Press Box with no exception. The conduit run both interior and exterior shall be provided, installed strapped, and supported IAW SDOC Division 27 Standards and Specifications for all data installa tions for each data stub out.

H. The contractor shall provide, homerun install, terminate, label and test from all new SDOC specified stadium speaker locations to the Stadium Press Box Amplifier Cabinet all new SDOC specified outdoor rated WESTPENN AQ227 UNSHIELDED AQUASEAL Speaker Cables. All cables shall be neatly dressed and secured at the amplifier cabinet and at each cable to each speaker location in the field where the cable shall be installed with a service slack and drip loop and secured properly to prevent unnecessary movement in windy situations.

I. Adequate grounding shall be provided in the form of homerun #6 green jacketed stranded copper ground cable as the main grounding conductor. One (1) multiport ground block with headless setscrews shall be mounted bolted metal to metal on the frame of the new Sound System Amplifier Cabinet where it shall be connected to one (1) homerun installation of number six green jacketed copper stranded grounding cable from the ground block to the local electrical panel in the Press Box homerun installed through a grounded sleeve with bushing above ceiling from the new Sound System Amplifier Cabinet and then supported with “J” hooks and Velcro wraps to the Press Box Electrical Panel for final connection.

J. The contractor shall provide, install, terminate, label, test and surge protection IAW SDOC Division 27 Technology Standards and Specifications at all SDOC specified speaker cabling and connections in adherence to manufacturer’s installation recommendations from the SDOC specified speaker assemblies at the field to the interior of the SDOC specified Press Box Sound System Amplifier Cabinet.

K. The contractor shall provide and install SDOC approved sturdy industrial strength non-conductive basket cable tray under the press box counter the full length of the counter for cable support and storage using SDOC approved hardware and support devices.

L. The contractor shall provide, install, support, terminate, label and test four (4) interior microphone cables, jacks and faceplates from beneath counter to the interior of the Press Box Sound System Amplifier Cabinet for connection. Place under counter one (1) interior microphone cable, jack and faceplate on each side wall and two (2) evenly spaced under counter on the long wall of the press box window wall.
Figure 51A - Football Stadium Press Box Sound System
Figure 51B - Football Stadium Sound System Components and Configuration Detail “Typical”
Figure 51C - Football Stadium Underground Conduit and Speaker Detail “Typical”
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Figure 51D - Football Stadium Sound System Cable and Component Riser Detail “Typical”

Figure 51D - Football Stadium Sound System Underground Conduit and Speaker Detail “Typical”
Figure 51E - Football Stadium Scoreboard Speaker / Horn Detail “Typical”

SCORE BOARD

SPEAKER HORN PLACEMENT
“TYPICAL”

FRONT VIEW

EACH SPEAKER SHALL BE INSTALLED USING ALL SPEAKER HORN MOUNT BOLT HOLES FASTENED WITH PROPER STAINLESS STEEL BOLTS, NUTS AND WASHERS. EACH SPEAKER SHALL BE MOUNTED METAL TO METAL REMOVING ALL PAINT AT SURFACE ON ANGLE IRON WHERE HORN IS INSTALLED ON THE SCORE BOARD SUPPORT STRUCTURE. EACH SPEAKER SHALL BE INSTALLED WITH A GRADED STEEL CABLE SAFETY LANYARD AT MANUFACTURER'S RECOMMENDED SIZE OR IF NOT INDICATED SHALL BE MINIMUM 1/4 INCH THICK GRADED STEEL CABLE SAFETY LANYARD ATTACHED TO EACH HORN AND THE SCORE BOARD SUPPORT STRUCTURE TO MEET TECHNOLOGY CONSTRUCTION PROJECT MANAGER'S COMPLETE SATISFACTION.

ONE (1) INCH EMT CONDUIT STRAPPED FROM PVC “J” BOX LOCATION TO THREE (3) WATERPROOF DOUBLE GANG DEEP EMT “J” BOX LOCATIONS (ONE AT EACH SPEAKER) INSTALLED WITH WATERPROOF COUPLERS TO TRANSITION THE CABLE TO EACH SPEAKER.

ONE (1) INCH EMT CONDUIT STRAPPED FROM PVC “J” BOX LOCATION TO THREE (3) WATERPROOF DOUBLE GANG DEEP EMT “J” BOX LOCATIONS (ONE AT EACH SPEAKER) INSTALLED WITH WATERPROOF COUPLERS TO TRANSITION THE CABLE TO EACH SPEAKER.

REAR VIEW

TWO (2) X 2 INCH PVC CONDUITS UNDERGROUND FROM 12” X 12” PVC “J” BOX ON VERTICAL SUPPORT POST AT PRESET BOX LOCATION TRANSITIONING THROUGH TRAFFIC RATED PULL BOXES TO 12” X 12” PVC “J” BOX MOUNTED AT 48 INCHES ABOVE FINISHED GRADE ON VERTICAL SUPPORT POST AT REAR OF SCORE BOARD.

TRAFFIC RATED PULL BOX INSTALLED FLUSH AT GROUND LEVEL INSTALLED WITH MINIMUM SIX (6) INCH GRAVEL BASE.

THREE (3) WESTPENN AG227 UNSHIELDED ALLIGRADE SPEAKER CABLES SHALL BE HomeRUN INSTALL FROM THE INTERIOR PRESSBOX SOUND SYSTEM AMPLIFIER LOCATION TRANSITIONING THROUGH CONDUIT PATHWAYS AND TRAFFIC RATED PULL BOXES TO THE 12” X 12” PVC “J” BOX MOUNTED AT 48 INCHES ABOVE FINISHED GRADE ON VERTICAL SUPPORT POST AT REAR OF SCORE BOARD. THESE CABLES SHALL CONTINUE IN THE ONE (1) INCH EMT PATHWAY PROVIDED TO BE TERMINATED ONE (1) CABLE AT EACH HORN. ALL CABLES SHALL BE LABELED ON BOTH ENDS, PROPERLY COILED AND SECURED WITH ADEQUATE SLEEVING AND DRIP LOOP PROVIDED AT EACH OF THE THREE HORN LOCATIONS WHEN TERMINATED AT EACH SPEAKER TO MEET SATISFACTION.

Figure 51E - Football Stadium Scoreboard Speaker / Horn Detail “Typical”
1.02 Football Stadium Press Box IDF Cabinet Technology Systems Installation:

A. The contractor shall provide, install, terminate, label, test and surge protect (utilizing SDOC approved Surge Protection Devices) one (1) new SDOC specified technology systems network IDF Cabinet installation at the Football Stadium Press Box as detailed in Figure 52 Football Stadium Press Box IDF Cabinet “Typical”.

B. The contractor shall provide, install, terminate, label and test the following items:

1. One (1) new HUBBELL REBox IDF 32 wall mount cabinet (light gray in color) at ceiling height above the installed Press Box sound system cabinet.

2. Inclusive of one (1) interior cabinet REKBB20 backboard. (light gray or white in color)

3. Two (2) four port fiber optic blocks for installation complete with four (4) SC Multimode Fiber Optic Barrels in each of the two dual port fiber blocks. One set shall be installed in the connecting Building IDF or MDF on the voice and data backboard and one set shall be installed on the backboard of the HUBBELL REBox IDF 32 wall mount cabinet located in the Press Box as detailed in Figure 52 Football Stadium Press Box IDF Cabinet “Typical”.

4. One (1) multiport ground block with headless setscrews mounted bolted metal to metal on the floor of the HUBBELL REBox IDF 32 wall mount cabinet as detailed in Figure 52 Football Stadium Press Box IDF Cabinet “Typical” connected to one (1) homerun installation of number six green jacketed copper stranded grounding cable from the ground block to the local electrical panel in the Press Box.

5. Two (2) twenty five pair 66 blocks and brackets with MGB Ground rails. One (1) 66 block and bracket with MGB Ground rail shall be installed in the connecting Building IDF or MDF on the voice and data backboard and one shall be installed on the backboard of the HUBBELL REBox IDF 32 wall mount cabinet in the Press Box as detailed in Figure 52 Football Stadium Press Box IDF Cabinet “Typical”.

6. Adequate grounding shall be provided in the form of homerun #6 green jacketed stranded copper ground cable from the MGB Ground rail or other components requiring grounding to the telecommunications grounding bus bar in the IDF or MDF location and homerun #6 green jacketed stranded copper ground cable from the MGB Ground rail or other components requiring grounding to the multiport ground block as detailed in Figure 52 Football Stadium Press Box IDF Cabinet “Typical”. The main grounding conductor shall be homerun #6 green jacketed stranded copper ground cable installed in a grounded sleeve from the new REBOX IDF 32 wall mount cabinet stubbed out and bushed above ceiling continuing to the Press Box Electrical Panel for final connection as detailed in Figure 52 Football Stadium Press Box IDF Cabinet “Typical”.


7. One (1) twelve port Category 6 mini patch panel 568A Version “ONLY” and bracket that shall be installed on the backboard of the HUBBELL REBox IDF 32 wall mount cabinet as detailed in Figure 52 Football Stadium Press Box IDF Cabinet “Typical”.

8. The contractor shall provide, install, terminate, label and test to SDOC satisfaction on both ends two (2) D2 data outlets consisting of two (2) cable runs of Category Six cable from the HUBBELL REBox IDF 32 wall mount cabinet twelve port Category 6 mini patch panel and bracket to two (2) evenly spaced data outlet locations under counter on the long wall of the press box window wall as detailed in Figure 52 Football Stadium Press Box IDF Cabinet “Typical”.

   a. Contractor shall only provide and install PANDUIT, ORTRONICS or AMP/TYCO equipment and cabling SOLUTIONS “ONLY” for all data installations.

   b. The contractor shall provide data pathways that shall be ¾ inch EMT stub outs attached to single gang deep duplex receptacle boxes.

   c. Each of the cable runs of Category Six cable from the HUBBELL REBox IDF 32 wall mount cabinet shall be installed in a sleeve from the new REBOX wall mount cabinet stubbed out and bushed above ceiling.

   d. All cabling shall be provided, installed and supported IAW all applicable sections of the SDOC Division 27 Standards and Specifications for all data installations for every data stub out.

9. One (1) CHATSWORTH Cabinet Fan for internal cabinet mounting Part number CPI 13051-001 FANKIT 4U-6U mounted on the floor of the HUBBELL REBox IDF 32 wall mount cabinet at the location of the fan knockout screen as detailed in Figure 52 Football Stadium Press Box IDF Cabinet “Typical”.

10. One (1) homerun installation from nearest Building IDF or the MDF location of two (2) WEST PENN AQC369 intercom cables as feeder cables to the interior of the HUBBELL REBox IDF 32 wall mount cabinet in the Press Box as detailed in Figure 52 Football Stadium Press Box IDF Cabinet “Typical”. All pairs and the drain wire for each cable shall be terminated at the bottom left outer most pins of the installed twenty five pair 66 blocks as detailed in Figure 52 Football Stadium Press Box IDF Cabinet “Typical”.

11. One (1) homerun installation from nearest Building IDF or the MDF location of one (1) 50/125um six strand tight buffered multimode fiber optic cable either BERK-TEK or OCC fiber optic cable “ONLY” for this installation. Terminate four of six strands on each end of this cable and installed in the four port fiber blocks installed in the Building IDF or MDF on the voice and data backboard and as detailed in Figure 52 Football Stadium Press Box IDF Cabinet “Typical”.

   C. The contractor shall provide, install, support, terminate, label and test the new REBOX wall mount cabinet, cabling and all components using SDOC approved hardware, and support devices. Sleeving
conduits shall be installed into the overhead of press box at the HUBBELL REBox IDF 32 wall mount cabinet located above the Press Box Sound System amplifier cabinet.

D. The contractor shall provide, install, terminate, label and test one (1) duplex general power receptacle on the bottom left or right hand corner of the floor of the new REBox wall mount cabinet as detailed in Figure 52 Football Stadium Press Box IDF Cabinet “Typical” from the local electrical panel in the Press Box for use with CHATSWORTH cabinet fan and SDOC provided and installed network electronic switches.

E. The contractor shall provide and install SDOC approved backbone pathway conduit, boxes and mounting and support hardware from SDOC specified nearest Building IDF or the MDF location to the new REBox IDF 32 wall mount cabinet for all technology system cabling pathways in SDOC approved sizes and quantities installed IAW SDOC Division 27 Technology Standards and Specifications. Provide and install two (2) inch PVC conduit as the pathway and 8" X 8" or 6" X 6" PVC boxes concurrently mounted on the bottom exterior of the press box location for all bends and as pull points and at the point of penetration and sleeving into the press box from the floor of the press box directly into the top through sleeves in the new REBox IDF 32 wall mount cabinet or from below through two inch sleeving provided between these two cabinets installed from the sound system amplifier cabinet subsequently up and into the HUBBELL REBox IDF 32 wall mount cabinet from below.

F. The contractor shall provide and install all weatherproof connections and penetrations at the press box floor conduit through a hole in the penetrated floor at the bottom exterior of the press box location into the interior of the press box homerun connected to the new HUBBELL REBox IDF 32 wall mount cabinet matching the conduit size with the penetrated hole and installing the other end of this conduit to the 8" X 8" or 6" X 6" PVC box under the press box in close proximity.

G. SDOC Technology Construction Project Managers shall conduct substantial and final inspections on installation. It is strongly recommended and the absolute responsibility of the contractor to request interim, substantial and final inspections as well as to consult when unsure of installation practices and locations.

H. The contractor shall provide all associated warranty documentation upon completion of final inspection of system installation.
Figure 52 - Football Stadium Press Box IDF Cabinet “Typical”
1.03 Football Stadium Press Box Wireless Access Point Installation:

A. The contractor shall provide, install, terminate, label and test to SDOC satisfaction inclusive of all hardware and cable supports IAW SDOC Technology Standards and Specifications from the twelve port Category 6 mini patch panel installed in the HUBBELL REBox IDF 32 wall mount cabinet in the Press Box one (1) Category Six D2 cable run as a wireless access point “WAP” network connection above ceiling at an SDOC specified location to be determined.

B. From the twelve port mini patch panel to the field end location above ceiling provide, install, terminate, label and test the following:

1. Two cable runs up to 50 feet in length each of Category Six cable for two (2) fifty foot cable runs. Install five (5) feet of service slack secured neatly above ceiling on “J” hooks near the cable sleeve into the REBox IDF 32 wall mount cabinet. Install five (5) feet of service slack secured neatly above ceiling on a “J” hook at the wireless access point network connection at the SDOC specified location to be determined.

2. Install One (1) two port RJ45 module block complete with two (2) Category Six RJ45 modules inserted in the block.

C. Each two port block and Category Six RJ45 module assembly shall be neatly and properly secured with Velcro supported and at the service slack cable coil location shall be suspended as part of the service slack coil not to hang away from the coil and not to be laid on the ceiling tile with no exception.
ADDRESSABLE FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Requirements of the Division 28 Sections for Basic Electrical Requirements, Basic Electrical Materials and Methods, and Sections 28701 and 28709 apply to this Section:

C. The complete installation is to conform to the applicable sections of NFPA 72 and the National Electrical Code with particular attention to Article 760.

D. The entire installed system and all integrated system operations shall be within guidelines of the Uniform Fire Alarm Code for the State of Florida and the SBCCI.

E. NFPA 90A


G. ADA

H. ASME / ANSI A17.1 and A17.3

I. State Requirements for Educational Facilities (SREF).

J. Most stringent requirements apply where conflict exists between documents listed above.

K. Underwriters Laboratories, Inc. (UL)
1.2 SUMMARY

A. This Section includes fire alarm systems, including manual stations, detectors, notification appliances, signal equipment, controls, and devices.

B. Work covered by this specification section includes the furnishing of labor, equipment, materials, and complete operational performance required for installation of the Fire Alarm System as shown on the drawings, as specified, and as directed by the Architect/Engineer.

C. The work covered by this section of the specification is to be coordinated with the related work as specified elsewhere under the project specifications.

D. The Fire Alarm System shall consist of all necessary hardware equipment and software programming to perform the following functions:

1. Fire Alarm and Detection Operations.


E. Related Sections: The following Sections contain requirements that relate to this Section:

   1. Division 15 21 Section "Fire Protection" for water-flow, pressure, or tamper switches connected to fire alarm system.

   2. Division 15 23 Section "DDC" for duct smoke detectors.

   3. Division 28 27 Section "Security Systems" for transmission of signals to central station monitoring location.

1.3 SYSTEM DESCRIPTION

A. General: Complete, no coded, addressable, microprocessor-based fire detection and alarm system with manual and automatic alarm initiation, addressable analog initiating devices, and automatic alert for certain analog smoke sensor zones as indicated.

B. System shall be a campus network, with a fire alarm control unit/network node at each building.
C. The fire alarm system shall allow for loading and editing special instructions and operating sequences as required. The system shall be capable of on-site programming to accommodate system expansion and facilitate changes in operation. All software operations shall be stored in a non-volatile programmable memory within the fire alarm control unit. Loss of primary and secondary power shall not erase the instructions stored in memory.

D. The system shall have the capability of loading software operations from a single node to all other nodes on the network.

E. Resident software shall allow for full configuration of initiating circuits so that additional hardware shall not be necessary to accommodate future changes. For example, monitoring of normally open contact devices to monitoring of normally closed contact devices, or from sensing of normally open contact devices to sensing a combination circuit and being able to differentiate between the two.

F. Resident software shall allow for configuration of notification appliance and control circuits so that additional hardware shall not be necessary to accommodate changes. For example, changing a non-coded notification appliance circuit to a coded circuit, or from a slow march time (20 BPM) to fast march time (120 BPM) coding.

G. The system shall have the capability of recalling alarms and trouble conditions in chronological order for the purpose of recreating an event history.

H. Signal Transmission: A combination of hard-wired, using separate individual circuits for each zone of alarm initiation and alarm device operation as required, and multiplexing signal transmission for addressable alarm initiation and alarm device operation, dedicated to fire alarm service only.

I. Data Communication Transmission: The peer-to-peer network communication channel shall operate using digital token-ring communication techniques. Communications shall be dedicated to fire alarm service only.

J. Network communication details shall be per the following:

1. Each building node shall communicate to the next in a token ring configuration, over a dedicated fiber optic cable pair.

2. Provide, as part of this scope, the necessary fiber termination equipment to create the physical ring configuration at the Main Distribution Frame (M.D.F.). The campus fiber backbone is a radial configuration, originating at the M.D.F.
3. In the event that the path to the next node on the ring has experienced a communications failure, the node with possession of the token shall transmit it back in the direction from which it came to attempt to reach the next node by going around the ring in the opposite direction. At the same time the status of the noncommunicating node shall be added into the token content.

4. If a group of nodes becomes isolated from the rest of the network ring, that group shall form a subnetwork with all common interaction of monitoring and control remaining intact. The network shall be notified with the exact details of the lost communications.

5. In the event that a single node becomes unable to handle the network token, the network interface card shall continue communications to the rest of the network. The off-line node is reported as such to the network and is periodically interrogated to determine if it is ready to be brought back on-line with the rest of the network.

6. The communication method shall be NFPA 72 style 7.

K. Audible Alarm Notification: By horns, for buildings, unless otherwise indicated, By voice alarm messages and tone signals on loudspeakers for buildings indicated.

L. System connections for alarm-initiation and alarm-notification circuits shall be: Style B and Y wiring.

M. Functional Description: The following are required system functions and operating features:

1. Priority of Signals: Accomplish automatic response functions by the first zone initiated. Alarm functions resulting from initiation by the first zone are not altered by subsequent alarms. The highest priority is an alarm signal. Priority two, Supervisory Service and Trouble signals have second-, third-, and fourth-level priority. Signals of a higher-level priority take precedence over signals of lower priority even though the lower-priority condition occurred first. Annunciate all alarm signals regardless of priority or order received.

2. Non-interfering: Zone, power, wire, and supervise the system so a signal on one zone does not prevent the receipt of signals from any other zone. All zones are manually resettable from the FACU after the initiating device or devices are restored to normal.
3. Signal Initiation: The manual or automatic operation of an alarm-initiating or supervisory-operating device shall cause the FACU to transmit an appropriate signal including:

   a. General alarm.
   b. Fire-suppression alarm.
   d. Smoke detector alarm.
   e. Heat detector alarm.
   f. Fan shutdown.
   g. Smoke control initiation.
   h. Door release.
   i. Elevator recall.
   j. Elevator shutdown.
   k. Fire pump running.
   l. System trouble.
   m. Fire pump power supervisory.
   n. Valve tamper supervisory.

4. Transmission to Remote Central Station:

   Automatically route alarm, supervisory, and trouble signals to a remote central station service transmitter, using listed and approved equipment. Provide interface with communicator furnished as part of the security system. Verify required transmission of fire alarm signals, coordinate with security system contractor.

5. Loss of primary power at the FACU shall sound a trouble signal at the FACU and shall indicate at the FACU when the system is operating on an alternate power supply.

6. Annunciation: Manual and automatic operation of alarm and supervisory initiating devices shall be annunciated both on the FACU and on the annunciator, indicating the location and type of device.

7. FACU Alphanumeric Display: Shall display plain-language description of alarms, trouble signals, supervisory signals, monitoring actions, system and component status, and system commands.

8. General Alarm: A system general alarm shall include:

   a. Indicating the general alarm condition at the FACU and the annunciator.

   b. Identifying the device or its zone that is the source of the alarm at the FACU and the annunciator.
c. Displaying the alarm on an 40 character orgreater LCD display and a color touch screen display. The system alarm LED shall flash on the control unit until the alarm has been acknowledged. Once acknowledged, this same LED shall latch on. A subsequent alarm received from another zone shall flash the system alarm LED on the control unit and remote annunciator. The display shall show the new alarm information.

d. A pulsing alarm tone shall occur within the control unit and the graphic annunciator until the event has been acknowledged.

e. Operating audible and visible alarm notification signals throughout the building.

f. Sounding a continuous fire alarm audible signal until silenced by the alarm silence switch at the control unit or at the graphic annunciator.

g. Activate voice evacuation signal in auditorium.

h. All visible alarm notification appliances shall flash continuously until the Alarm Reset Switch is operated.

i. Any subsequent zone alarm shall reactivate the alarm notification appliances.

j. Closing fire and smoke doors normally held open by magnetic door holders. All doors normally held open by 24 VDC door control devices shall release.

k. Unlocking designated doors.

l. Stopping supply and return fans serving zone where alarm is initiated.

m. Activating the air handling systems per life safety code, NFPA 90A and NFPA 101.

n. Activating a supervised signal to notify the local fire department.

o. Initiating automatic elevator recall per ASME/ANSI A17.1 and A17.3.
8. Transmit the alarm to the central receiving station via a digital communicator alarm transmitting device at the main telephone background location. Provide conduit and wire from the fire alarm cabinet to the digital communicator whether or not shown on the drawings. Provide the digital communicator device accepted by the central receiving station that the owner selects.

9. The alarm activation of any elevator lobby smoke detector shall, in addition to the operations listed above, cause the elevator cabs to be recalled according to the following sequence:

   a. If the alarmed device is on any floor other than the main level of egress, the elevator cabs shall be recalled to the main level of egress.

   b. If the alarmed device is on the main egress level, the elevator cabs shall be recalled to the predetermined alternate recall level as determined by the local authority having jurisdiction.

10. Water-flow alarm switch operation:

    a. Initiates a general alarm.

11. Smoke detection initiates a general alarm.

12. Smoke Sensor Sensitivity Adjustment:

    a. Authorized operation of controls at the FACU shall cause the selection of specific addressable smoke sensors for adjustment, display of their current status and sensitivity settings, and control of changes in those settings.

13. Remote Controllability: Individually monitor sensors at the FACU for calibration, sensitivity, and alarm condition, and individually adjust for sensitivity from the FACU. The alarm decision for each sensor shall be determined by the control unit. The control unit shall determine the condition of each sensor by comparing the sensor value to the stored values.

14. The sensitivity of each sensor will be as high as it can possibly be for its location without being so sensitive that it will be nuisance alarm-prone.

15. Smoke Sensor Sensitivity: Between .2- and 3.7-percent-per-foot smoke obscuration when tested according to UL 268.
16. The control unit shall maintain a moving average of the sensors smoke chamber value to automatically compensate (move the threshold) for dust, dirt, and component degradation conditions that could affect detection operations. The control unit shall automatically maintain a constant smoke obscuration sensitivity for each sensor (via the floating threshold) by compensating for environmental factors.

17. The control unit shall automatically indicate when an individual sensor needs cleaning. When a sensors average value reaches a predetermined value, a ADIRTY SENSOR@ trouble condition shall be audibly and visually indicated at the control unit for the individual sensor. Additionally, the LED on the sensor base shall glow steady giving a visible indication at the sensor location. If a ADIRTY SENSOR@is left unattended and its average value increases to a second predetermined value, an AEXCESSIVELY DIRTY SENSOR@ trouble condition shall be indicated at the control unit for the individual sensor. To prevent false alarms, these ADIRTY@ conditions shall in no way decrease the amount of smoke obscuration necessary for system activation.

18. The control unit shall continuously perform an automatic self-test routine on each sensor which will functionally check sensor electronics and ensure the accuracy of the values being transmitted to the control unit. Any sensor that fails this test shall indicate a ASELF TEST ABNORMAL@ trouble condition.

19. Sprinkler valve tamper switch operation shall cause or initiate the following:

   a. The activation of any standpipe or sprinkler valve supervisory (tamper) switch shall activate the system supervisory service audible signal and illuminate the LED at the control unit and the graphic annunciator. Differentiation between valve tamper activation and opens and/or grounds on the initiation circuit wiring shall be provided. The differentiation shall be clearly identified in plain-language on the FACU Alphanumeric display.

   b. Pressing the Supervisory Service Acknowledge Key shall silence the supervisory audible signal while maintaining the Supervisory Service LED "on" indicating the off-normal condition.

   c. A record of the event in the FACU historical log.

   d. Transmission of supervisory signal to remote central station and color graphics unit.
e. Restoring the valve to the normal position shall cause the Supervisory Service LED to extinguish, indicating restoration to normal.

20. Fire pump power failure, including a dead phase or phase-reversal condition shall cause or initiate the following:

a. Activate the system supervisory service audible signal and illuminate the LED at the control unit, and the remote annunciator. Differentiation between fire pump power failure activation and opens and/or grounds on the initiation circuit wiring shall be clearly identified in plain-language on the FACU Alphanumeric display.

b. Pressing the Supervisory Service Acknowledge Key will silence the supervisory audible signal while maintaining the Supervisory Service LED "on" indicating the off-normal condition.

c. A record of the event in the FACU historical log.

d. Transmission of supervisory signal to remote central station.

e. Restoring the fire pump power shall cause the Supervisory Service LED to extinguish, indicating restoration to normal.

N. Recording of Events: Provide a system printer to record all alarm, supervisory, and trouble events. Printouts are by zone, device, and function. When the FACU receives a signal, the alarm, supervisory, and trouble conditions are printed. The printout includes the type of signal (alarm, supervisory, or trouble) the zone identification, date, and the time of the occurrence. The printout differentiates alarm signals from all other printed indications. When the system is reset, this event is also printed, including the same information concerning device, location, date, and time. A command initiates the printout of a list of existing alarm, supervisory, and trouble conditions in the system. Trouble conditions shall indicate and differentiate in plain-language open circuit trouble, short circuit trouble, disable trouble, and manual override trouble for each circuit.

1. Permissible Signal Time Elapse: The maximum permissible elapsed time between the actuation of any fire alarm or fire-detection system alarm-initiating device and its indication at the FACU shall be per NFPA72.

2. Circuit Supervision: Circuit faults shall be indicated by means of both a zone and a trouble signal at the FACU. Provide a distinctive indicating audible tone and alphanumeric annunciation.
3. Independent System Monitoring: Supervise each independent smoke detection system, fire suppression system, duct detector, and elevator smoke detection system for both normal operation and trouble.

4. The system shall support 100% of addressable devices in alarm or operated at the same time, under both primary(AC) and secondary (battery) power conditions. Systems which cannot support 100% of their points in alarm simultaneously cannot assure appropriate system response and are not acceptable.

5. Priority Two UL 1076 Security Zones: Shall be indicated by means of an indicating audible tone and alphanumeric annunciation. Zones shall be supervised during bypass mode to indicate tampering or fault conditions.

O. Automatic Voice Evacuation Relocation Sequence (Auditorium Only):

1. The audio alarm signal shall consist of an alarm tone for a maximum of five seconds followed by an automatic digital voice message. At the end of the voice message, the alarm tone shall resume. The audio alarm signals shall sound alternately until the signal silence switch has been operated.

2. All audio operations speaker circuit selection and alarm tone / voice messages and timing variations shall be activated by the system software so that any required future changes can be facilitated by authorized personnel without any component rewiring or hardware additions.

P. Manual Voice Paging

1. The system shall be configured to allow voice paging. Upon activation of any speaker manual control switch, the alarm tone shall be sounded over all speakers in that group.

2. If any speaker manual control switches are activated, the control panel operator shall be able to make announcements via the push-to-talk paging microphone over the preselected speakers. When the microphone button is released, the alarm tone shall resume.

3. Facility for total building paging shall be accomplished by the means of an "All Circuits" switch.
Q. Alarm Silencing

1. If the "Alarm Silence" button is pressed, audio only alarm signals shall cease operation.

2. Signals shall not be silenced during the 60 second alarm silence inhibit mode.

R. System Reset

1. The "System Reset" button shall be used to return the system to its normal state after an alarm condition has been remedied. Display messages shall provide operator assurance of the sequential steps("IN PROGRESS","RESET COMPLETED") as they occur, should all alarm conditions be cleared.

2. Should an alarm condition continue, the system will remain in an alarmed state. System control relays shall not reset. The control unit alarm LED shall remain on. The alarmed points will not require acknowledgment if they were previously acknowledged.

3. Upon reset of the fire alarm control unit, air handling units shall sequentially start up to minimize power demand.

S. A manual evacuation drill switch shall not be provided.

T. Activation of an auxiliary bypass switch located at the MDF or FACP, shall override the selected automatic functions, including air handling unit/fan shutdown and gas supply cut-off, and all notification circuits campus wide.

U. The system shall have a single key that will allow the operator to display all alarms, troubles, and supervisory service conditions including the time of each occurrence.

V. The actuation of the "walk test" program at the control unit shall activate the "walk test" mode of the system which shall cause the following to occur:

1. The city circuit connection shall be bypassed.

2. Control relay functions shall be bypassed.

3. The control unit shall show a trouble condition.

4. The alarm activation of any initiation device shall cause the audible notification at the FACP.
5. Any momentary opening of an initiating or notification appliance circuit wiring shall cause the audible signals to voice announce sound for 4 seconds indicating the trouble condition.

6. The system shall have the capacity of 8 programmable pass code protected one person testing groups, such that only a portion of the system need be disabled during testing.

W. Auxiliary manual controls shall be supervised so that an "off normal" position of any switch shall cause an "off normal" system trouble. The Aoff normal@ status shall be clearly identified in plain-language on the FACU alphanumeric display.

X. Each independently supervised circuit shall include a discrete readout to indicate disarrangement conditions per circuit.

Y. The System Modules shall be electrically supervised for module placement. Should a module become disconnected the system trouble indicator shall illuminate and the audible trouble signal shall sound.

Z. The system shall have provisions for disabling and enabling all circuits individually for maintenance or testing purposes.

AA. Power Requirements

1. The control unit, color graphics unit and printer shall receive 120 VAC power via separate dedicated circuits.

2. The system shall be provided with sufficient battery capacity to operate the entire system upon loss of normal 120 VAC power in a normal supervisory mode for a period of 24 hours with 5 minutes of alarm operation at the end of this period. The system shall automatically transfer to battery standby upon power failure. All battery charging and recharging operations shall be automatic. Batteries and chargers shall be mounted within each control panel.

3. All circuits requiring system operating power shall be 24 VDC and shall be individually fused at the control unit.

4. The incoming power to the system shall be supervised so that any power failure must be audibly and visibly indicated at the control unit and the remote annunciator. A green "power on" LED shall be displayed continuously while incoming power is present.
5. The system batteries shall be supervised so that battery condition or disconnection of the battery shall be audibly and visibly indicated at the control unit and the remote annunciator. Batteries shall be located within the FACP or FACU or a remote cabinet next to the FACP or FACU.

AB. Network Nodes (Fire Alarm Control Units)

1. Fire Alarm Control Units shall be microprocessor based, housed in an all metal cabinet suitable for surface or wall mounting. Each control unit shall be an NFPA 72, stand-alone, complete fire alarm control unit with communications into the network and custom network programming capabilities. One control unit shall be located in each building on campus.

2. All points monitored and controlled by the Fire Alarm Control Unit shall be capable of being made available to the network. Such points shall include: initiating circuit devices such as addressable sensors, including sensor type and sensor values; addressable manual fire alarm pull stations; supervisory operation, such as for sprinkler flow and tamper monitoring; control circuits, such as for notification appliances, fan control, elevator control, and other similar operations.

3. Each point made in the network may be programmed to be operated by any other Fire Alarm Control Unit connected to the network. When point information is programmed into a node other than the "owner", a "replica" of that point is programmed into the other node. When a replica is so programmed, the node with the replica can operate on those points as though they were directly connected to that node.

4. Network communications shall be capable of supporting "point lists" that can be handled as though they were a single point.

   a. When any point in the list enters into an off-normal condition, the list is annunciated as in that condition.

   b. The network message shall include the point list name, the point list status, and the number of devices in that status.

   c. The network message shall not be burdened with detail information on each point in the point list. If such information is needed by the network, the points required shall be declared public and programmed accordingly.

   d. Individual point information shall be available either by inquiry at the owner node, or by accessing the point if it is public and programmed as external at the inquiring node.
e. Individual point information shall be available through an external CRT / Keyboard inquiry at the owner node, or by issuing a `Aset host@` command to access the points on any other node as if it were the owner node.

AC. Automatic Voice Evacuation Relocation Sequence (Auditorium):

1. The audio alarm signal shall consist of an alarm tone for a maximum of five seconds followed by an automatic alarm digital voice message. At the end of the voice message, the alarm tone shall resume. The audio alarm signals shall sound alternately until the signal silence switch has been operated.

2. All audio operations speaker circuit selection and alarm tone / voice messages and timing variations shall be activated by the system software so that any required future changes can be facilitated by authorized personnel without any component requiring or hardware additions.

AD. Manual Voice Paging (Auditorium):

1. The system shall be configured to allow voice paging. Upon activation of any speaker manual control switch, the alarm tone shall be sounded over all speakers in that group.

2. If any speaker manual control switches are activated, the control panel operator shall be able to make announcements via the push-to-talk paging microphone over the preselected speakers. When the microphone button is released, the alarm tone shall resume.

3. Facility for total building paging shall be accomplished by the means of an `AAll Circuits@` switch.

1.4 SUBMITTALS

A. General: Submit the following according to Basic Electrical Requirements Section of this Specification.

B. Product data for system components. Include dimensioned plans and elevations showing minimum clearances and installed features and devices. Include list of materials and NRTL-listing data.

C. Wiring diagrams from manufacturer differentiating between factory- and field-installed wiring. Include diagrams for equipment and for system with all terminals and interconnections identified. Indicate components for both field and factory wiring.
D. Shop drawings showing details of remote annunciator.

E. System operation description covering this specific Project including method of operation and supervision of each type of circuit and sequence of operations for all manually and automatically initiated system inputs and outputs. Manufacturer’s standard descriptions for generic systems are not acceptable.

F. Operating instructions for mounting at the FACU.

G. Listing of function and operation of all network components, node addresses, and all device addresses of completed system.

H. Operation and maintenance data for inclusion in Operating and Maintenance Manual delivered to Owner. Include data for each type product, including all features and operating sequences, both automatic and manual. Include recommendations for spare parts to be stocked at the site. Provide the names, addresses, and telephone numbers of service organizations that carry stock of repair parts for the system to be furnished.

I. Product certification signed by the manufacturer of the fire alarm system components certifying that their products comply with indicated requirements.

J. Submission to Authority Having Jurisdiction: In addition to routine submission of the above material, make an identical submission to the authority having jurisdiction. Include copies of annotated Contract Drawings as required to depict component locations to facilitate review. Upon receipt of comments from the Authority, submit them for review. Make resubmissions if required to make clarifications or revisions to obtain approval.

K. Submission to Owner: Provide identical submission, as described above, to Osceola county School District

L. Record of field tests of system, including detector sensitivity tests.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A factory-authorized Technician, with minimum 5 years experience, is to perform the Work of this Section. Technician shall be licensed and certified on the installed system, and NICET level II certification. All other installers to have alarm status per State of Florida Business and Professional Regulation.

B. Compliance With Local Requirements: Comply with the applicable building code, local ordinances, and regulations, and the requirements of the authority having jurisdiction.
C. Comply with NFPA 70, "National Electrical Code."

D. NFPA Compliance: Provide fire alarm and detection systems conforming to the requirements of the following publications:

1. NFPA 72, "National Fire Alarm Code"

E. NRTL Listing: Provide systems and equipment that are listed and labeled.

1. Terms "Listed" and "Labeled": As defined in the "National Electrical Code," Article 100.

2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

F. Each and all items of the Fire Alarm System shall be listed as a product of a SINGLE fire alarm system manufacturer under the appropriate category by Underwriters Laboratories, Inc. (UL), and shall bear the "U.L." label. All control equipment shall be listed under UL category UOJZ as a single control unit. Partial listings shall NOT be acceptable.

G. All control equipment must have transient protection to comply with UL864 requirements. Fire alarm system shall utilize EDCO TVSS devices only. All requirements of Specification Section 28709 apply to Fire Alarm System. Provide ground rod within eight (8) feet of all TVSS devices.

H. Where Fire Alarm circuits leave the building, additional transient protection must be provided for each circuit. Devices must be UL listed under standard #497B (Isolated Loop Circuit Protectors).

I. Architectural and Transportation Barrier Compliance Board: Title III of the Americans with Disabilities Act.


1.6 MAINTENANCE SERVICE

A. Maintenance Service Contract: Provide maintenance of fire alarm systems and equipment for a period of 12 months commencing with Substantial Completion, using factory-authorized service representatives.
B. Basic Services: Systematic, routine maintenance visits on an annual basis at times coordinated with the Owner. In addition, respond to service calls within 3 hours of notification of system trouble. Adjust and replace defective parts and components with original manufacturer's replacement parts, components, and supplies.

C. Additional Services: Perform services within the above 12-month period not classified as routine maintenance or as warranty work when authorized in writing. Compensation for additional services must be agreed upon in writing prior to performing services.

D. Renewal of Maintenance Service Contract: No later than 60 days prior to the expiration of the maintenance services contract, deliver to the Owner a proposal to provide contract maintenance and repair services for an additional one-year term. Owner will be under no obligation to accept maintenance service contract renewal proposal.

1.7 SPARE PARTS

A. General: Furnish spare parts, matching products installed (as described below), packaging with protective covering for storage, and identifying with labels clearly describing contents. Provide wiring schematic with spare parts.

B. Glass Rods for Manual Stations: Furnish quantity equal to 15 percent of the number of manual stations installed; minimum of 6 rods.

C. Lamps for Remote Indicating Lamp Panels: Furnish quantity equal to 10 percent of the number of units installed, but not less than one.

D. Lamps for Strobe Units: Furnish quantity equal to 10 percent of the number of units installed, but not less than one.

E. Smoke Detectors, Fire Detectors, and Flame Detectors: Furnish quantity equal to 10 percent of the number of units of each type installed but not less than one of each type.

F. Detector Bases: Furnish quantity equal to 10 percent of the number of units of each type installed but not less than one of each type.

G. Printer Ribbons: Furnish 6 spare ribbons.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: The equipment and service described in this specification are those supplied and supported by Silent Knight and represent the basis of design for the equipment.

B. Subject to compliance with requirements, provide acceptable equivalent products by one of the following:

1. Notifier
2. Edwards Systems Technology (EST)
3. Simplex

C. Being listed as an acceptable Manufacturer in no way relieves the Contractors obligation to provide all equipment and features in accordance with these specifications.

D. If equipment of another manufacturer is submitted for approval, the contractor shall state how much is to be deducted from the base bid for the substitution, and also shall state what, if any, specific points of system operation differ from the specified points of the system operation. This differentiation report must reference every paragraph of this specification.

E. The Manufacturer shall be a nationally recognized company specializing in smoke detection and fire alarm systems. This organization shall employ factory trained and NICET certified technicians. The Manufacturer and service organization shall have a minimum of 10 years experience in the fire protective signaling systems industry.

2.2 MANUAL PULL STATIONS

A. Description: Double-action type, fabricated of high impact red LEXAN or metal, and finished in red with molded, raised-letter operating instructions of contrasting color. The manual station shall be fitted with screw terminals for field wire attachment. Station will mechanically latch upon operation and remain so until manually reset by opening with a key common with the control units. Stations requiring the breaking of a glass panel are not acceptable. Stations requiring the breaking of a concealed rod may be provided.
B. Station Reset: The front of the station is to be hinged to a book plate assembly and must be opened with a key to reset the station. The key shall be common with the control units. Stations which use Allen wrenches or special tools to reset, will not be accepted.

1. Addressable pull stations will contain a communication transmitter and receiver having a unique identification and capability for status reporting to the FACU. There shall be no limit to the number of stations, detectors, or zone adapter modules, which may be activated or "in alarm" simultaneously.

2.3 AUTOMATIC DETECTORS

A. General: Comply with UL 268, "Smoke Detectors for Fire Protective Signaling Systems." Include the following features:

1. Factory Nameplate: Serial number and type identification.

2. Operating Voltage: 24-V d.c., nominal.

3. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.

4. Plug-In Arrangement: Detector and associated encapsulated electronic components are mounted in a module that connects to a fixed base with a twist-locking plug connection. The plug connection requires no springs for secure mounting and contact maintenance. Terminals in the fixed base accept building wiring. Detector construction shall have a mounting base with a twist-lock detecting head that is lockable. The locking feature must be field removable when not required. Removal of the detector head shall interrupt the supervisory circuit of the fire alarm detection loop and cause a trouble signal at the control Unit. Detector design shall provide compatibility with other fire alarm detection loop devices (heat detectors, pull stations, etc.)

5. Each sensor base shall contain a LED that will flash each time it is scanned by the Control Unit. When the Control Unit determines that a sensor is in an alarm or a trouble condition, the Control Unit shall command the LED on that sensor's base to turn on steady indicating that abnormal condition exists. Sensors which do not provide a visible indication of an abnormal condition at the sensor location shall not be acceptable.

6. Each sensor base shall contain a magnetically actuated test switch to provide for easy alarm testing at the sensor location, or other approved testing method.
7. Each sensor shall be scanned by the Control Unit for its type identification to prevent inadvertent substitution of another sensor type. The Control Unit shall operate with the installed device but shall initiate a "Wrong Device" trouble condition until the proper type is installed or the programmed sensor type is changed.

8. The sensor's electronics shall be immune from false alarms caused by EMI and RFI.

9. Visual Indicator: Connected to indicate detector has operated.

10. Addressability: Sensors include a communication transmitter and receiver in the mounting base having a unique identification and capability for status reporting to the FACU.

B. True Alarm Photoelectric Smoke Detectors: Include the following features and characteristics:

1. An infrared detector light with matching silicon cell receiver and actuated by the presence of visible products of combustion.

C. Duct Smoke Detector: Photoelectric type, with sampling tube of design and dimensions as recommended by the manufacturer for the specific duct size and installation conditions where applied. Detector includes relay as required for fan shutdown.

1. The addressable TrueAlarm duct smoke sensors shall operate on the light scattering, photo-diode principle, and shall communicate actual smoke chamber values to the system control. The sensors shall not have a self contained smoke sensitivity setting and shall automatically communicate actual smoke chamber values to the system control unit. The sensor's electronics shall be shielded to protect against nuisance alarms from EMI and RFI.

2. The Duct Housing shall provide an auxiliary alarm relay with two "Form C" contacts rated at 2A@ 28VDC or 120 VAC resistive. This auxiliary relay operates when the sensor reaches its alarm threshold, or when the control unit via software control, manually or automatically operates the relay in response to inputs from other devices. Provide manual bypass switch for duct detectors at the FACP.

3. For maintenance purposes, it shall be possible to clean the duct housing sampling tubes by accessing them through the duct housing front cover.

4. Each duct detector shall have a Remote Test Station with an alarm LED and test switch.
E. True Alarm Addressable Thermal Sensor: Rate-compensated/fixed-temperature type with plug-in base and alarm indication lamp. Detectors have a communication transmitter and receiver with unique identification and capability for status-reporting to the FACU.

2.4 ALARM-NOTIFICATION APPLIANCES

A. General: Equip alarm-notification appliances for mounting as indicated. Provide terminal blocks for system connections.

B. Fire Alarm Horns: Electric-vibrating polarized type, operating on 24-V d.c., with provision for housing the operating mechanism behind a grille. Horns produce a sound pressure level of 87 Db, measured 10 feet from the source, with a resultant level of 60 Db in all areas of facility.

1. The system manufacturer shall review the placement of visual and audible signals throughout the facility and shall provide additional devices where deemed necessary, for the equipment furnished, to meet all codes and in particular, the ADA Requirements and NFPA 72. In addition, the Contractor shall bid 20 additional devices over and above those shown on the plans (and those deemed necessary by the manufacturer) to be installed at time of substantial completion, where the Architect/Engineer requests for complete coverage. Per NFPA and SREF, audible devices shall provide a level of 60 dB in all areas of the facility.

C. Visual Notification Appliances: 100 candela-Second Xenon flash output, 24 VDC operation, wall mounted, compatible with ADA requirements with "FIRE" printed vertically. Provide synchronization of visual flash in areas with multiple appliances, per ADA and NFPA requirements.

1. Combination notification appliances consist of factory-combined, audible and visual notification units in a single mounting assembly.

2. The system manufacturer shall review the placement of visual and audible signals throughout the facility and shall provide additional devices where deemed necessary, for the equipment furnished, to meet all codes and in particular, the ADA Requirements and NFPA 72. In addition, the Contractor shall bid 20 additional devices over and above those shown on the plans (and those deemed necessary by the manufacturer) to be installed at time of substantial completion, where the Architect/Engineer requests for complete coverage.
D. Voice/Tone Speakers: Comply with UL 1480, "Speakers for Fire Protective Signaling."

1. Speakers: Compression-driver type with flared projectors having a frequency response of 400 to 4000 Hz; equipped with a multiple tap, varnish-impregnated, sealed, matching transformer. Match transformer tap range and speaker power rating to the acoustical environment of the speaker location.

2. High-Range Speaker Units: Rated 2-15 watts.

3. Low-Range Speaker Units: Rated .25-2 watts.

4. Speaker Mounting: Recessed.

5. Combination speaker/strobe appliances shall be provided for all wall mounted devices. Ceiling units shall be fully recessed and speaker only. Ceiling speaker shall be white round perforated. Wall units shall be red square perforated.

2.5 ADDRESSABLE CIRCUIT INTERFACE MODULES

A. Addressable Circuit Interface Modules: Arrange to monitor one or more system components that are not otherwise equipped for multiplexing communication. Modules transmit identification and status to the FACU using a communication transmitter and receiver with unique identification and capability for status reporting to the FACU. Modules shall be used for monitoring of water flow, valve tamper, Halon Control Units, non-addressable detectors, and for control of evacuation indicating appliances and AHU systems.

B. Addressable Circuit Interface Modules will be capable of mounting in a standard electric outlet box. Modules will include cover plates to allow surface or flush mounting. Modules will receive their operating power from the signaling line or a separate two wire pair running from an appropriate power supply as required.

C. There shall be three types of modules:

1. Type 1: Monitor Circuit Interface Module, or equivalent.

For conventional 2-wire smoke detector and/or contact device monitoring with Class B or Class A wiring supervision: This type of module will provide power to and monitor the status of a zone consisting of conventional 2-wire smoke detectors and/or N/O contact devices as specified elsewhere and identified in a schedule on the plans. The supervision of the zone wiring will be Class B. This module will communicate the zone's status (normal, alarm, trouble) to the FACU.
For conventional 4-wire smoke detector with Class B wiring supervision: This type of module will provide power to and monitor the contact status of a zone consisting of conventional 4-wire smoke detectors as specified elsewhere and identified in a schedule on the plans. The module will provide detector reset capability and a 2 amp fuse to provide over-current power protection for the 4-wire detector. This module will communicate the zone's status (normal, alarm, trouble) to the FACU.

2. Type 2: Control Circuit Interface Module, or equivalent.

Module for signals, speakers and other device control with Style D and Style Z wiring supervision.

For Non-Supervised Control: This type of module will provide double pole double throw relay switching for voltages up to 120VAC. It shall contain easily replaceable 2 amp fuses, one on each common leg of the relay.

3. Type 3: Monitor Circuit Interface Module, or equivalent.

This type of module is an individually addressable module that has both its power and its communications supplied by the two wire multiplexing signaling line circuit. It provides location specific addressability to an initiating device by monitoring normally open dry contacts. This module is required for monitoring water flow and tamper switches.

D. The Circuit Interface Module shall be supervised and uniquely identified by the control unit. Module identification shall be transmitted to the control unit for processing according to the program instructions. Should the module become non-operational, tampered with, or removed, a discrete trouble signal, unique to the module, shall be transmitted to, and annunciated at, the control Unit.

E. The Circuit Interface Module shall be capable of being programmed for its "address" location on the multiplexing signaling line circuit. The Circuit Interface Module shall be compatible with addressable manual stations and addressable detectors on the same multiplexing signaling line circuit.

F. Provide for interface to future portables at three (3) locations. Each location shall include Type 1, Type 2, and Type 3 module for minimum (4) initiation circuits and 6 amperes signal power. Locate modules as shown on plans or as directed in field.
2.6 MAGNETIC DOOR HOLDERS

A. Description: Units are equipped for wall mounting and are complete with matching door plate. Electromagnet operates from a 24-V d.c. source, and develops a 25 lbs. holding force.

B. Material and Finish: Match door hardware.

2.7 FIRE ALARM CONTROL UNIT (FACU)

A. General: Comply with UL 864, "Control Units for Fire-Protective Signaling Systems."

B. Cabinet: Lockable steel enclosure. Arrange unit so all operations required for testing or for normal care and maintenance of the system are performed from the front of the enclosure. If more than a single unit is required to form a complete control unit, provide exactly matching modular unit enclosures. Accommodate all components and allow ample gutter space for interconnection of units as well as field wiring. Identify each enclosure by an engraved, red-laminated, phenolic resin nameplate.

C. Systems: Alarm and supervisory systems are separate and independent in the FACU. The alarm-initiating zone boards in the FACU consist of plug-in modules. Construction requiring removal of field wiring for module replacement is not acceptable.

D. Control Modules: Types and capacities required to perform all functions of the fire alarm systems plus 20% for future expansion. Local, visible, and audible signals notify of alarm, supervisory, and trouble conditions.

E. Zones: Provide for all alarm and supervisory zones indicated.

F. Resetting: Provide the necessary controls to prevent the resetting of any alarm, supervisory, or trouble signal while the alarm or trouble condition still exists.

G. Alphanumeric Display and System Controls: Arrange to provide the basic interface between human operator at FACU and addressable system components, including annunciation and supervision. A display with alarm, supervisory, and component status messages. Arrange keypad for use in entering and executing control commands.
H. Voice Alarm: An emergency communication system, integral with the FACU, includes central voice alarm system components complete with microphones, pre-amplifiers, amplifiers, and tone generators. Features include:

1. Amplifiers comply with UL 1711, "Amplifiers for Fire Protective Signaling Systems."

2. One alarm channel permit transmission of announcements to zones or floors automatically or by use of the central control microphone. All announcements are made over dedicated, supervised communication lines.

3. Status annunciator indicates the status of the various voice alarm speaker zones.

I. Instructions: Printed or typewritten instruction card mounted behind a LEXAN plastic or glass cover in a painted steel or aluminum frame. Install the frame in a location observable from the FACU. Include interpretation and appropriate response for displays and signals, and briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

J. Network Display Unit (Network Nodes) shall contain the following features:

1. 40 character display by 2 line back-lighted LCD readout of point status.

2. Capacity to annunciate network point and/or point lists.

3. Multiple NDUs shall be capable of being installed as needed to vector point information by type, location, or other qualifier.

4. Historical event logs shall maintain separate Alarm and Trouble events.

5. Printer ports shall be provided:
   a. Interface to serial printer to record network information as programmed at the NDU.
   b. Interface to CRT / Keyboard to display network information as programmed at the NDU.
   c. Interface to wireless notification message paging.
   d. Interface for interrogating the status of any other node on the network.
   e. Third party systems interface.
2.8 FIRE ALARM CONTROL UNIT (FACU - DEFINED AS NETWORK NODES)

A. Control Unit construction shall be modular with solid state, microprocessor based electronics. It shall display only those primary controls and displays essential to operation during a fire alarm condition. Keyboards or keypads shall not be required to operate the system during fire alarm conditions. A local audible device shall sound during Alarm, Trouble or Supervisory conditions. This audible device shall also sound during each keypress to provide an audible feedback to ensure that the key has been pressed properly.

B. The following primary controls shall be visible through a front access Unit:

1. 40 or greater character liquid crystal display.
2. Individual red fire alarm LED.
3. Individual red priority 2 alarm LED.
4. Individual yellow supervisory service LED.
5. Individual yellow trouble LED.
6. Green "power on" LED.
7. Yellow signals silenced LED.
8. Fire alarm acknowledge key.
9. Priority 2 alarm acknowledge key.
10. Supervisory service acknowledge key.
11. Trouble acknowledge key.
12. Alarm silence key.
13. System reset key.

C. The following programmable secondary control switches and LED’s shall be available behind an access door:

1. City disconnect/switch
2. Elevator bypass
3. Door holder release bypass
4. Manual over-ride of AHU/fan shutdown, Gas shutdown and signal circuits to bypass automatic control by fire alarm system.

D. The control Unit shall provide the following:

1. Setting of time and date.
2. LED testing.
3. Alarm, trouble, and abnormal condition listing.
4. Enabling and disabling of each monitor point separately.
5. Activation and deactivation of each control point separately.
6. Changing operator access levels.
7. One Person test enable.
8. Running diagnostic functions.
9. Displaying software revision level.
10. Displaying historical logs.
11. Displaying card status.
12. Point listing.

E. For maintenance purposes the following lists shall be available from the point lists menu:

1. All points list by address.
2. Monitor point list.
3. Signal/speaker list.
4. Auxiliary control list.
5. Feedback point list.
6. Pseudo point list.
7. LED/switch status list.

F. Scrolling through menu options or lists shall be accomplished in a self-directing manner in which prompting messages shall direct the user. These controls shall be located behind an access door.

G. Primary Keys, LED's and LCD Display

1. The Control Unit shall have a 40 or greater character liquid crystal display which shall be backlit for enhanced readability. So as to conserve battery standby power, it shall not be lit during an AC power failure unless an alarm condition occurs or there is keypad activity.

H. Under normal conditions the front Unit shall display a "System is Normal" message and the current time and date.

I. Should an abnormal condition be detected the appropriate LED (Alarm, Supervisory or Trouble) shall flash. The Unit audible signal shall pulse for alarm conditions and sound steady for trouble and supervisory conditions.

J. The LCD shall display the following information relative to the abnormal condition of a point in the system:

1. 40 character custom location label
2. Type of device (i.e. smoke, pull station, water flow)
3. Point status (i.e. alarm, trouble)

K. Two methods of acknowledgment for each abnormal condition shall be provided. One may be chosen depending on the NFPA requirements.
L. These acknowledge functions may be pass code protected. If the user has insufficient privilege to acknowledge such conditions, a message shall indicate insufficient privilege but allow the user to view the points without acknowledging them. Should the user have sufficient privilege to acknowledge, a message will be displayed informing the user that the condition has been acknowledged.

M. After all points have been acknowledged, the LEDs shall glow steady and the tone alert will be silenced. The total number of alarms, supervisory and trouble conditions shall be displayed along with a prompt to review each list chronologically. The end of the list shall be indicated by an end of list message "END of LIST".

N. Alarm Silencing:
   1. Should the "Alarm Silence" button be pressed all alarm audible only signals shall cease operation and a signals silenced LED will illuminate.
   2. Signals shall not be silenced during alarm silence inhibit mode.

O. System Reset:
   1. The SYSTEM RESET button shall be used to return the system to its normal state after an alarm condition has been remedied. The LCD display shall step the user through the reset process with simple English Language messages. Messages, "SYSTEM RESET IN PROGRESS", will first be displayed followed by the message, "SYSTEM RESET COMPLETED", and finally, "SYSTEM IS NORMAL", should all alarm conditions be cleared.
   2. Should an alarm condition continue to exist the message, "SYSTEM RESET IN PROGRESS", will be followed by the message, "SYSTEM RESET ABORTED", and the system will remain in an abnormal state. System control relays shall not reset. The tone alert and the Alarm LED will be on. The display will indicate the total number of alarms and troubles present in the system along with a prompt to use the ACK keys to review the points. These points will not require acknowledgement if they were previously acknowledged.
   3. Should the Alarm Silence Inhibit function be active, the (SYSTEM RESET) key press will be ignored. The message, "SYSTEM RESET INHIBITED", will be displayed for a short time to indicate the action was not taken. As feedback to the operator, the message "SYSTEM RESET NO LONGER INHIBITED" will be displayed when the inhibit function times out.
P. Function Keys: Additional function keys shall be provided to access status data for the following points:

1. Initiating device circuits
2. Indicating appliance circuits
3. Auxiliary relays
4. Feedback points
5. All other input/output points

The following status data shall be available:

1. Primary state of point
2. Zone, PID and card type information
3. Class "A" status
4. Current priority of outputs
5. Disable/Enable status
6. Verification tallies of initiating devices
7. Automatic/Manual control status of output points
8. Acknowledge status
9. Relay status

Q. The system shall be capable of logging and storing events in an alarm log and events in a trouble log. Each recorded event shall include the time and date of that event's occurrence.

The following Historical Alarm log events shall be stored:

1. Alarms
2. Alarm acknowledgment
3. Alarm Silence
4. System reset
5. Alarm historical log cleared

The following Historical Trouble log events shall be stored:

1. Trouble conditions
2. Supervisory alarms
3. Trouble acknowledgment
4. Supervisory acknowledgment
5. Alarm verification tallies
6. One Person test results
7. Trouble historical log cleared
R. Silent One Person Testing with History Logging

The system shall be capable of being tested by one person. While in testing mode the alarm activation of an initiating device circuit shall be silently logged as an alarm condition in the historical data file. The unit shall automatically reset itself after logging of the alarm.

The momentary disconnection of an initiating or indicating device circuit shall be silently logged as a trouble condition in the historical data file. The Unit shall automatically reset itself after logging of the trouble condition.

Should the one person test feature be on for an inappropriate amount of time it shall revert to the normal mode automatically. The control unit shall be capable of supporting up to 8 separate programmable one person testing groups whereby one group of points may be in a testing mode and the other (non-testing) groups may be active and operate as programmed per normal system operation. After testing is considered completed, testing data may be retrieved from the system in chronological order to ensure device/circuit activation.

Should an alarm condition occur form an active point, not in one person test mode, it shall perform operations described in Section 1.

S. LED Supervision: All control module LEDs shall be supervised for burnout or disarrangement. Should a problem occur the LCD shall display the module and LED location numbers to facilitate location of the LED.

T. System Trouble Reminder: Should a trouble condition be present within the system and the audible trouble signal silenced, the trouble signal shall resound at preprogrammed time intervals to act as a reminder that the fire alarm system is not 100% operational. Both the time interval and the trouble reminder signal shall be programmable to suit the owner's application.

U. Access Levels

1. There shall be four (4) access levels with level 4 being the highest level. Level 1 actions shall not require a pass code. Changes to passcodes shall only be made by authorized personnel.

2. In order to maintain security when entering a pass code the digits entered will not be displayed but a cursor will move along filling the position with an x to indicate that the digit has been accepted. All key presses will be acknowledged by a local audible sound.

3. When a correct pass code is entered, the message "Access Granted" shall be displayed. The new access level shall be in effect until the operator manually logs out or the keypad has been inactive for ten (10) minutes.
4. Should an invalid code be input, the operator shall be notified with the message, "ERROR...INCORRECT PASS CODE", and shall be allowed up to three chances to enter a valid code. After three unsuccessful tries, the message, "ACCESS DENIED", shall be displayed. The level shall not be altered, and the operator shall no longer be in the menu option.

5. Access to a level will only allow the operator to perform all actions within that level plus all actions of lower levels, not higher levels.

6. The following keys/switches shall have access levels associated with them:

   a. Alarm silence
   b. System reset
   c. Set time/date
   d. Manual control
   e. On/off/auto control
   f. Disable/enable
   g. Clear historical alarm log
   h. Clear historical trouble log
   i. One person testing
   j. Change alarm verification

U. Acknowledge keys shall also require privileged access to acknowledge points. If the operator presses an (ACK) key with insufficient access, an error message will be displayed. The points will scroll with (ACK) key presses to view the points on the list, but the points will not get acknowledged in the database.

V. Fire Alarm Control Unit shall be capable of operating remote CRT's and/or printers; output shall be ASCII from an EIA RS-232-C connection with an adjustable baud rate.

   Each RS-232-C port shall be capable of supporting and supervising a remote Printer, supporting as many as four (4) remote CRT displays or printers. Data amplifiers shall be used to increase CRT or printer line distance. Each RS-232-C port shall only communicate with one keyboard. Each port shall be field configurable for supervised operation (to be used when the remote CRT or printer is permanently installed as part of the system) or for unsupervised operation (for use with portable remote devices that are temporarily connected for testing reports or diagnostic analysis).
2.9 REMOTE ANNUNCIATOR (FAAP)

A. Annunciator Unit: Provide an alphanumeric, 80 character liquid crystal display (LCD) that matches information displayed on FACU, for point status, type of alarm, number of alarms in system and custom label. Manual control switches shall provide for system reset, alarm silence.

B. Enclosure: Finish to match Fire Alarm Control Units. The locking cover/display assembly is. Key and lock shall be common to all secured fire alarm system enclosures.

2.10 SYSTEM PRINTER

A. General: Printer is dot-matrix type, listed and labeled as an integral part of the fire alarm system.

2.11 FIBER TERMINATION EQUIPMENT

A. Provide all interface equipment necessary to allow direct communication over fiber optic cable backbone.

B. Provide fiber termination cabinet as required to create ring configuration. Refer to network communication details in "System Description" paragraph of this section.

2.12 FIBER OPTIC CABLING

A. General: Multi-mode fiber optic cabling shall be provided between system rooms as designated on the contract drawings. Refer to the Telecommunication (TE) drawings for more detail on fiber optic cable.

2.13 FIBER OPTIC CONNECTORS

A. General: Provide field installable, multimode and/or ST to ST type connectors. Connectors shall be Glass-in-Ceramic, UV curable, with a maximum loss of .2 dB.

B. Design selection: Siecor Cam-Lite or equal by Leviton Thread Lock, or Hubbell.

2.14 EMERGENCY POWER SUPPLY

A. General: Components include battery, charger, and an automatic transfer switch.
B. Battery: Sealed lead-acid or nickel cadmium type. Provide sufficient capacity to operate the complete alarm system in normal or supervisory (non-alarm) mode for a period of 24 hours. Following this period of operation on battery power, the battery shall have sufficient capacity to operate all components of the system, including all alarm indicating devices in alarm or supervisory mode for a period of 5 minutes.

1. Magnetic door holders are not served by emergency battery power. Magnetic door holders are released after 15 seconds when normal power fails.

2.15 WIRE


2.28 TAGS

A. Tags For Identifying Tested Components: Comply with NFPA 72.

2.17 GAS SHUTOFF VALVE

A. Provide and install 24 VDC gas solenoid shutoff valves at all points where gas enters a building; science classrooms, kitchens, etc. Solenoids shall be manual reset type. The fire alarm shall control the valve to be normally energized (open); de-energized, (closed) on general alarm and remain closed until F/A reset. Provide manual over-ride switch to bypass automatic control by fire alarm system.

2.18 SIGNAGE

A. Provide plastic laminate signs outside spaces and adjacent to doors where pull stations are located inside; sign shall read "Fire Alarm Pull Station Inside". Sign shall have red background with white letters. Affix sign to structure with brass or stainless fasteners. Coordinate sign construction and installation with architect; reference signage in specifications.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Install system according to NFPA Standards referenced in Parts 1 and 2 of this Section.
B. Fire Alarm Power Supply Disconnect: Shall be painted red and labeled "FIRE ALARM." Provide with a lockable handle or cover.

3.2 EQUIPMENT INSTALLATION

A. Furnish and install a complete Fire Alarm System as described herein and as shown on the plans; to be wired, connected, and left in first class operating condition. Include sufficient control unit(s), annunciator(s), manual stations, automatic fire detectors, smoke detectors, audible and visible notification appliances, wiring, terminations, electrical boxes, and all other necessary material for a complete operating system.

B. Manual Pull Stations: Mount semi-flush in recessed back boxes with center of operating handles 46 inches above finished floor or as indicated.

C. Water-Flow Detectors and Valve Supervisory Switches: Connect for each sprinkler valve station required to be supervised. Flow and tamper switches provided by sprinkler contractor.

D. Smoke Detectors: Install ceiling-mounted detectors not less than 12 inches from a side wall to the near edge. Install detectors located on the wall at least 12 inches but not more than 12 inches below the ceiling. For exposed solid joist construction, mount detectors on the bottoms of the joists. On smooth ceilings, install detectors not over 30 feet apart in any direction. Install detectors no closer than 5 feet from air registers. Install duct-mounted detectors per manufacturer's recommendations and NFPA, coordinate with Division 15 mechanical contractor.

E. Audible Notification Appliances: Install not less than 80 inches above the finished floor nor less than 6 inches below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille or as indicated. Combine audible and visual notification appliances at the same location into a single unit. Refer to Part 2, "Products", of this section for manufacturer's requirements to provide sufficient quantity of appliances to meet code.

F. Visual Notification Appliances: Install not less than 80 inches above the finished floor and at least 6 inches below the ceiling. Provide synchronization of flash in all areas with multiple appliances. Refer to Part 2, "Products", of this specification section for manufacturer's requirements to provide appliance quantities to meet code.

G. Device Location-Indicating Lights: Locate in the public space immediately adjacent to the device they monitor.

H. Fire Alarm Control Unit (FACU): Surface mount with tops of cabinets not more than 6 feet above the finished floor.
I. Remote Annunciator: Arrange as indicated, with the top of the Unit no more than 6 feet above the finished floor.

3.3 WIRING INSTALLATION

A. Wiring Method: Install wiring in metal raceway according to Division 28 Section "Raceways." Conceal raceway except in unfinished spaces and as indicated. All fire alarm system wiring shall be in conduit.

B. Wiring Within Enclosures: Install conductors parallel with or at right angles to the sides and back of the enclosure. Bundle, lace, and train the conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the wiring diagrams of the system. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

C. Cable Taps: Use numbered terminal strips in junction, pull or outlet boxes, cabinets, or equipment enclosures where any circuit tap is made. Utilize wire nuts, no stacons.

D. System Wiring: Wire and cable shall be a type listed for its intended use by an approval agency acceptable to the Authority Having Jurisdiction (AHJ) and shall be installed in accordance with the appropriate articles from the current approved edition of the National Electric Code (NEC)(NFPA 70). It is the Contractor’s responsibility to obtain from the Fire Alarm System Manufacturer written instruction regarding the appropriate wire/cable to be used for this installation. No deviation from the written instruction shall be made by the Contractor without the prior written approval of the Fire Alarm System Manufacturer.

E. Color Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color code for alarm initiating device circuits wiring and a different color code for supervisory circuits. Color-code notification appliance circuits differently from alarm-initiating circuits. Paint fire alarm system junction boxes and covers red. Color: signal circuit - brown and Osceola, initiating circuit - red & black, air handler bypass - white and blue.

F. Wiring to Central Station Transmitter: 1-inch conduit between the FACU and the central station transmitter connection, furnished as part of security system. Install number of conductors and electrical supervision for connecting wiring as required to suit central-station monitoring function. Final connections to terminals in central station transmitter are made under this contract.
3.4 GROUNDING

A. Ground equipment and conductor and cable shields as specified by the equipment manufacturer. For audio circuits, minimize to the greatest extent possible ground loops, common mode returns, noise pickup, cross talk, and other impairments. Provide 5-ohm ground at main equipment location. Measure, record, and report ground resistance. Provide bond to main service ground rods.

B. Provide ground rod within (8) feet of all TVSS devices in the system.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Services: Provide services of a factory-authorized service representative to supervise the field assembly and connection of components and the pretesting, testing, and adjustment of the system. A factory-authorized technician shall install and be available at all times to coordinate system installation with other trades.

B. Pretesting: Upon completing installation of the system, align, adjust, and balance the system and perform complete pretesting. Determine, through pretesting, the conformance of the system to the requirements of the Drawings and Specifications. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new and retest until satisfactory performance and conditions are achieved. Prepare forms for systematic recording of acceptance test results.

C. Report of Pretesting: After pretesting is complete, provide a letter certifying the installation is complete and fully operable, including the names and titles of the witnesses to the preliminary tests.

D. Final Test Notice: Provide a 10-day minimum notice in writing when the system is ready for final acceptance testing.

E. Minimum System Tests: Test the system according to the procedures outlined in NFPA72. Minimum required tests are as follows:

1. Verify the absence of unwanted voltages between circuit conductors and ground.

2. Megger test all conductors other than those intentionally and permanently grounded with electronic components disconnected. Test for resistance to ground. Report readings less than 1-megohm for evaluation.

3. Test all conductors for short circuits utilizing an insulation-testing device.
4. With each circuit pair, short circuit at the far end of the circuit and measure the circuit resistance with an ohmmeter. Record the circuit resistance of each circuit on the record drawings.

5. Verify the control unit is in the normal condition as detailed in the manufacturer's operating and maintenance manual.

6. Test initiating, notification, and signaling circuits for proper signal transmission under open circuit conditions. All connections should be opened for the initiating and notification devices. Observe proper signal transmission according to class of wiring used.

7. Test each initiating device and notification appliance for alarm operation and proper response at the control unit. Test smoke detectors with actual products of combustion.

8. Measure and record the actual current draw of each Notification Appliance Circuit.

9. Test the system for all specified functions according to the manufacturer's operating and maintenance manual. Systematically initiate specified functional performance items at each station including making all possible alarm and monitoring initiations and using all communications options. For each item, observe related performance at all devices required to be affected by the item under all system sequences. Observe indicating lights, displays, signal tones, and annunciator indications. Observe all voice audio for routing, clarity, quality, freedom from noise and distortion, and proper volume level.

10. Test both primary power and secondary power. Verify, by test, the secondary power system is capable of operating the system for the period and in the manner specified.

11. Detector sensitivity tests.

F. Retesting: Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets the Specifications and complies with applicable standards.

G. Report of Tests and Inspections: Provide a written record of inspections, tests, and detailed test results in the form of a test log. Submit log upon the satisfactory completion of tests.

H. Tag all equipment, stations, and other components at which tests have been satisfactorily completed.
I. Final Test, Certificate of Completion, and Certificate of Occupancy: Test the system as required by the Authority Having Jurisdiction in order to obtain a certificate of occupancy. Demonstrate that the system meets the Specifications and complies with applicable standards. This final test shall be witnessed by a representative of the Authority Having Jurisdiction and a factory-authorized service representative. Place certification sticker on each panel after all tests have been passed.

3.6 CLEANING AND ADJUSTING

A. Cleaning: Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish. Clean unit internally using methods and materials recommended by manufacturer.

B. Occupancy Adjustments: When requested within one year of date of Substantial Completion, provide on-site assistance in adjusting sound levels and adjusting controls and sensitivities to suit actual occupied conditions. Provide up to three visits to the site for this purpose.

3.7 TRAINING

A. Provide trip to factory authorized site to demonstrate the system and train and certify Owner's maintenance personnel as specified below.

1. Provide for certification of Owner's maintenance personnel in the procedures and schedules involved in operating, troubleshooting, servicing, upgrading and preventive maintaining of the system.

2. Provide transportation, lodging and cost of training for two (2) Osceola County School Board Technicians.

3. Schedule training with the Owner at least seven weeks in advance.

4. Provide three (3) copies of all program and data software upon completion of training. Issue a release form to the Owner for the use of the software.

5. Training shall be performed by a factory authorized trainer whose primary function is to train and certify technicians for the manufacturer. Training by any other personnel will not be acceptable. Training length to be 40 hours.

6. Provide at the end of the project, four hours of on-site training specifically for this project to review sequence of operation, drawings, programming and panel operations.
Provide training for terminating, splicing and testing of fiber optic cable.

END OF SECTION 28000
DIVISION 31 - SITE WORK

31000 - General

Clean fill dirt shall not leave the facility unless approved by Design Project Manager. Surplus soil will be referred to the Office of Facilities Planning and Construction for removal and storage.

31010 - Subsurface Exploration

Architect/Engineer Responsibilities

The Architect/Engineer shall provide plans showing required test boring locations and shall indicate, by letter to the Design Project Manager, any other information required for the testing laboratory. Owner will furnish boring and subsurface investigation.

Preparation of Plans for Borings

In the preparation of plans for boring locations, the Architect/Engineer shall study plans of existing underground utilities and shall locate borings to avoid these utilities. The Design Project Manager will make available maps showing underground installations.

Information to be included in Contract Documents

Boring locations and sections through borings showing all soil conditions shall be shown. Specifications shall contain statements to the effect that information shown is for the Contractor’s use, and that the Owner shall in no way be held responsible to the accuracy of the information.

31100 - Clearing

Structure Removal

Include this in DEMOLITION

Clearing the Site

Debris resulting from stripping and demolition operations shall be removed from district property at frequent intervals so as to prevent this material from accumulating on the site.
**Grubbing**

Removal of trees and shrubs shall include the removal of stumps and roots to the extent that all roots within five feet of an underground structure or utility line or under footings or paved areas are removed. Grubbing in open areas shall include removal of stumps and all roots within three feet of finish grade elevations. Caution should be taken with existing trees and discussed with Design Project Manager.

**31120 - Structure Removal**

In open areas, foundations of structures shall be removed in accordance to engineering specifications. Where new structures will replace existing structures, indicate extent of foundation removal on the drawings. No existing slabs will remain under fill for new structures. Hazardous material removal shall be coordination with district project managers and conducted prior to structural removal as required by federal, state and local requirements.

Disposal of existing buildings and structures, trees, dismantled equipment, etc., is the responsibility of the Contractor.

**31211 - Rough Grading**

Slopes shall not be greater than (1) vertical to (6) horizontal in grassed areas. Steeper slopes will be considered in unique circumstances and will be reviewed and approved by Office of Facilities Planning and Construction.

**31218 - Landscape Grading**

**31222 - Excavating**

The term “excavation” includes drilling or subsurface exploratory work as well as trenching and general excavation.

**31223 - Backfilling**

Backfilling is required at building perimeter and site structures up to sub grade elevation, fill under interior and exterior slabs-on-grade or pavement, and fill under landscaped areas shall be in accordance with structural/civil engineer specifications.

**31225 - Trenching**

When excavating and backfilling from the mechanical and electrical trades is covered in those portions of the specifications, make certain that the compaction of back-fill is properly specified and meets applicable ANSI/ASTM standards and the requirements of Florida Status and the Trench Safety Act.
Section 01251 is under the responsibility of the Purchasing Department.

END DIVISION 31
DIVISION 32 – EXTERIOR IMPROVEMENTS

32100- Asphaltic Concrete Paving

Materials and installation shall comply with requirements of the Florida Department of Transportation and as determined by the civil engineer. Minimum installation shall consist of 1 1/2” plant mixed type S-1 asphaltic concrete surface course over 8” compact base over 12” stabilized soil, unless civil engineers determine otherwise.

32101- Concrete Paving

Shall be Class A concrete with a minimum compressive strength of 3000 psi in 28 days. All products, materials, and execution shall comply with applicable ANSI and ASTM Standards.

Expansion Joints

Pre-molded type 1/2” thick, full depth of concrete, maximum 30’-0” o.k. and at junctions with vertical surfaces. Expansion joints shall be specified and shown on the drawings.

Control Joints

Shall be saw-cut to squared relief, e.g., 6’-0” side sidewalk, 6’-0” space between. Minimum saw-cut shall be 1/2 to 2/3 of slab thickness to include both inside and outside corners.

Finish

Floated, toweled, and medium boomed.

Utility Cuts

When utilities are required to cross existing paved areas, saw-cutting finished surfaces should be used only as a last resort. The district recommends boring as the standard procedure for crossing streets/roads. Concrete walks shall be cut and replaced from joint to joint, doweled to the remaining slab.
Walks

Concrete sidewalks are required and shall be, at a minimum, (6) feet wide, (4) inches thick with (6 x 6 #10) or Fibermesh reinforcement. All sidewalks subjected to heavy vehicular traffic or crossing shall be a minimum of (6) inches thick.

Walks (used as vehicular drives) shall be a minimum of 6” thick with turned down edges increased to a minimum of 2 additional inches thick and 10’-0” wide, steel reinforced. Secondary sidewalk width should be a minimum of 6 feet, and should match surrounding walk patterns. Care must be taken to prevent slick finishes, and to avoid the possibility of marking or vandalism while the concrete is curing. Expansion joints must be properly designed and indicated on contract drawings. Medium broom finish on all required to protect concrete from defacement by fencing or providing appropriate personnel to maintain and secure the area until the concrete has properly cured.
PART 1 - GENERAL

1.1 DEFINITION

A. A fence is defined as a physical or visual barrier between areas. It can be constructed of various materials to perform the function it is designed to do. A physical and visual fence is described in this standard in fences A thru K and can be regimental or architectural. This type of fencing is used to separate areas that have different functions and for security.

B. A fence or barrier can be made with landscape materials such as ground cover, bushes, trees and earthen berms. This type of fencing will be used in low security areas and for an aesthetic accent to the facility.

C. It is the intent of Osceola County Public Schools to have an “open street” concept at each campus. We also realize that some situations may call for additional security in the form of fencing.

1.2 APPLICATION

A. This Standard designates the areas that receive fencing, gates and accessories; the heights of the fencing and the materials used at each location.

B. Fencing and Site requirements for fencing shall comply with Florida Building Code, (latest addition), Chapter 423 (9) (a).

1.3 FENCES A-J

A. Galvanized steel chain-link fence

B. PVC-coated, steel chain-link fabric ASTM F 668 (for kindergarten play area).

C. Galvanized steel framework
   1. Gates: ASTM F 654-91
   2. Posts: ASTM F 1083-93

D. Polymer –coated steel framework

E. Installation: ASTM F 567

F. Fence Fittings: ASTM 626-96a

1.4 FENCE K

A. Panels are 9 gage galvanized steel wire

B. Finish is powder vinyl coated in accordance with ASTM F 668-95
1.5 SUBMITTALS, GENERAL INSTRUCTIONS, PRODUCT DATA, SHOP DRAWINGS, SAMPLES, CERTIFICATES

A. Supply product data, details, dimensions and finishes for the following:
   1. Fence and gateposts, rails and fittings
   2. Chain-link fabric, reinforcement and attachments
   3. Gates and hardware
   4. Privacy slats
   5. Tension wire
   6. Concrete footings
   7. Fabric

B. Shop Drawings: Show locations of fence, gates, posts, rails, tension wires, attachments, heights and finish.

1.6 QUALITY ASSURANCE

A. Installer Qualifications
   1. An experienced installer who has successfully completed chain-link fences and gate projects.

B. Contractor Qualifications
   1. The Contractor shall be licensed in Osceola County, Florida to install the work described in this section.

C. Preconstruction Surveys/Conferences
   1. Contractor shall verify information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures and verify field dimensions before work begins.

D. Preparation/Field Verification
   1. Contractor shall secure information on locations of underground conduits and utility locations before work begins.
   2. Do not interrupt utilities serving facilities occupied by the Owner. Repair of interrupted underground conduits and utilities shall be the responsibility of the Contractor.

E. Samples
   1. Supply samples for approval for each item listed in paragraph 1.4 Submittals.

1.7 SAFETY PROCEDURES

A. Construction, dealing with School Safety, of fencing shall be done as follows:
   1. During hours when school is not occupied by students or in areas that are marked and barricaded as construction areas.
   2. Do not interrupt campus operation with fence construction.

B. Construction shall comply with OSHA Standards on safety during construction.

1.8 BUILDING PERMIT

A. A permit for the installation of the fence is necessary and the responsibility of the contractor.
PART 2 - PRODUCT/ SYSTEM

2.1 COMPONENTS: MATERIALS, SIZES, FINISHES
A. Fabric, posts, gates & accessories.

2.2 MANUFACTURERS: Chain Link Types A-J
A. Allied Tube and Conduit Corporation
B. Anchor Fence, Inc.
C. Armorlink Corporation
D. Merchant Metals

2.3 MANUFACTURER: Architectural Fence Type K
A. Omega Fence Systems

2.4 TYPE A Chain-Link Fence
A. The location of this fence is around the perimeter of a school facility.
1. Fence height: 6’-0” above grade.
2. Mesh and wire size: 2-inch mesh, .148-inch diameter, hot dipped galvanized after weaving with the top and bottom selvage knuckled. Provide mesh fabricated in one-piece width (height).
3. Tie wire: Top and bottom tension wire No. 9 gage galvanized steel wire for attachment to line posts.
4. Stretcher bars: 3/16” x 3/4” hot dipped galvanized steel. One stretcher bar for each gate and end post & two bars for each corner and pull post.
5. Top rail: No. 9 gage galvanized steel tie wire.
7. Gate or gates: Site specific.
   a. Hardware
      1) Hinges: Hot dipped galvanized offset to allow access each direction.
      2) Latches: Hot dipped galvanized readily lockable with padlock.
8. Footing: Concrete

2.5 TYPE B Chain-Link Fence
A. This fence encloses the Kindergarten play area.
1. Fence height: 4’-0” above grade.
2. Mesh and wire size: 2-inch mesh, .148 diameters, steel wire with top and bottom selvage knuckled. Provide mesh fabricated in one-piece width (height).
3. Color Coating: 10 mil. PVC plastic resin finish.
4. Top rail: Round, 1-5/8” outside dimension, galvanized steel
5. Posts: Round, with outside dimension & minimum wall thickness according to C.L.F.M.I. 1997, with top caps.
6. Gate: 5’-0” wide, double swing. Gate shall swing out.
   a. Hardware:
      1) Hinges: Hot dipped galvanized to allow access in each direction.
      2) Latches: Hot dipped galvanized readily lockable with padlock.

7. Footing: Concrete

2.7 TYPE C Chain-Link Fence
A. This fence is used for equipment enclosures and bicycle rack enclosures.
   1. Fence height: 6’-0” above grade.
   2. Mesh and wire size: 2-inch mesh, .148 diameter, hot dipped galvanized after weaving with top and bottom selvage knuckled. Provide mesh fabricated in one-piece width (height).
   4. Stretcher bars: 3/16” x ¾” hot dipped galvanized steel. One stretcher bar for each gate and end post & two bars for each corner and pull post.
   5. Posts: Round, with outside dimension & minimum wall thickness according to C.L.F.M.I. 1997, with top caps.
   6. Gate: Bicycle rack: One gate 5’-0” double leaf, one gate 3’-0”. All gates shall swing out. Gates shall be at opposite ends of enclosure.

   7. Gate: Equipment enclosure: Gate shall be sized for equipment repair and removal. Minimum size 4’-0” single leaf. For gates 5’-0” and larger use double leaf. All gates shall swing out 180 degrees.
      a. Hardware:
         1) Hinges: Hot dipped galvanized to allow outward swing.
         2) Latches: Hot dipped galvanized readily lockable with padlock.

8. Footing: Concrete

2.7 TYPE D Chain-Link Fence
A. The location of this fence is around the perimeter of water retention areas, drainage ditches and canals that are deeper than 1’-0” and retain water for longer than 24 hours. Water retention areas with slopes of 5:1 and less and that do not retain water for longer than 24 hours do not require fencing.
   1. Fence height: 6’-0” above grade.
      a. Fencing shall allow a 20’-0” maintenance berm around the perimeter of water retention area.
   2. Mesh and wire size: 2-Inch mesh, .148 diameter, hot dipped galvanized after weaving with top and bottom selvage knuckled. Provide mesh fabricated in one-piece width (height).
3. **Tie wire**: Top tie wire No. 9 gage galvanized steel wire for attachment to line posts.

4. **Stretcher bars**: 3/16”x3/4” hot dipped galvanized steel. One stretcher bar for each gate and end post & two bars for each corner and pull post.

5. **Posts**: Round, with outside dimension & minimum wall thickness according to C.L.F.M.I. 1997, with top caps.

6. **Gate**: Pair of 6’-0” out swing gates that open 180 degrees.
   
   a. **Hardware**:
      
      1) **Hinges**: Hot dipped galvanized to allow outward swing.
      
      2) **Latches**: Hot dipped galvanized readily lockable with padlock.

7. **Footing**: Concrete

### 2.8 TYPE E Chain-Link Fence

A. The location of this fence is around the perimeter of tennis courts and basketball courts. Plan is in DGM 32881.

1. Fence height: 10’-0” above court surface.

2. **Mesh and wire size**: 2-inch mesh, .148 diameters, hot dipped galvanized after weaving with top and bottom selvage knuckled. Provide mesh fabricated in one-piece width (height).

3. **Top rail**: Round, 1-5/8” outside dimension, galvanized steel.

4. **Stretcher bars**: 3/16”x3/4” hot dipped galvanized steel. One stretcher bar for each gate and end post & two bars for each corner and pull post.

5. **Posts**: Round, with outside dimension & minimum wall thickness according to C.L.F.M.I. 1997, with top caps.

6. **Gates**: Provide two gates at opposite corners of each court. The size of each gate shall be 4’-0” wide x 7’-0” high. Gates shall swing outward 180 degrees.

   a. **Hardware**:
      
      1) **Hinges**: Hot dipped galvanized to allow outward swing.
      
      2) **Latches**: Hot dipped galvanized readily lockable with padlock.

7. **Wind Block**: Provide reinforced woven fabric to act as a wind block on all fencing. The wind block is 6’-0” and centered in the 10’-0” high fence.

   a. **Note**: No wind block is required for basketball court.

8. **Footing**: Concrete

### 2.9 TYPE F Chain-link Structure

A. The location of this structure (backstop) is on Elementary School and Middle School softball fields. Plan is in DGM 32881.

1. Backstop height: 16’ above grade (16’ vertical section w/ 4’ over-hang).

   a. **Note**: Additional height and overhang may be necessary for protection of public safety of adjoining sites from foul ball trajectories.
2. Mesh and wire size: Lower 8’-0” height shall be 2-inch mesh, No. 6 gage wire. 
Top 8’-0” height shall be 2-inch mesh, No. 9 gage wire. Both gages shall be hot 
dipped galvanized after weaving with top & bottom selvage knuckled.
5. Footing: Concrete

2.10 TYPE G Chain-Link Structure

A. The location of this structure (backstop) is on High School softball fields. Plan view 
is in DGM 32881.
1. Backstop height: 24’ above grade.
2. Fence from backstop to dugout is 18’ above grade.
3. Outfield fence from dugout to dugout is 6’ above grade.
   a. Note: Additional height and overhang may be necessary for protection of 
   public safety of adjoining sites from foul ball trajectories.
4. Mesh and wire size: Lower 12’-0” height shall be 2-inch mesh, No. 6 gage wire. 
Top 12’-0” height shall be 2-inch mesh, No. 9 gage wire. Both gages shall be hot 
dipped galvanized after weaving with top & bottom selvage knuckled. Provide 
   mesh fabricated in one-piece width (height) for each 10’ section.
5. Top, bottom & center (three thus) rails: Round, 1-5/8” outside dimension, 
galvanized steel.
6. Posts: Round, 4” outside dimension, galvanized steel.
7. footing: Concrete

2.11 TYPE H Chain-Link Structure

A. The location of this structure (backstop) is on High School baseball fields. Plan view 
is in DGM 32881.
1. Backstop height: 28’-0” above grade.
2. Fence from backstop to dugout is 18’ above grade.
3. Outfield fence from dugout to backstop is 6’ above grade.
   a. Note: Additional height and overhang may be necessary for protection of 
   public safety of adjoining sites from foul ball trajectories.
4. Mesh and wire size: Lower 12’-0” height shall be 2-inch mesh, No. 6 gage wire. 
Top 16’-0” height shall be 2-inch mesh, No. 9 gage wire. Both gages shall be hot 
dipped galvanized after weaving with top and bottom selvage knuckled. Provide 
   mesh fabricated in one-piece width (height) for each 12’ section.
5. Top, bottom & center (three thus) rails.
Edition.
7. Footing: Concrete

2.12 TYPE J Chain-Link Structure

A. The location of this structure is behind the Discus circle.
1. Backstop height: 12"-0".
2. Configuration: Forming a “U” shape around the discus circle in five equal sections of approximately 12’-0” each. See Section 32881, Playground Equipment and Structures for dimensioned plan. Plan view is in DGM 32881.
3. Top, bottom & center rails.
5. Footing: Concrete

2.13 TYPE K Architectural Fence
   A. The fence shall be used at campus entrances and in areas of aesthetic visual concentration.
      1. Fence height: 5’-0” and 6’-0” above grade.
      2. Posts shall be 2” x 2” hot dipped galvanized.
      3. Gate posts shall be 4” x 4” hot dipped galvanized.
      4. Coating: All surfaces shall be coated with polyester.
      5. Footing: Concrete

PART 3 - QUALITY ASSURANCE DURING EXECUTION

3.1 PROPER SEQUENCE AND SCHEDULING
   A. Do not begin installation before final grading is completed.

3.2 INSTALLATION PROCEDURES/ADJUSTMENT PROCEDURES
   A. Installation of chain-link fencing shall comply with ASTM 567.
   B. Installation instructions and procedures of Architectural fencing shall be by fencing Manufacturer. Spikes in the fabric shall be down.

3.3 SAFETY REQUIREMENTS FOR INSTALLATION
   A. Fencing shall be installed in accordance with OSHA Standards.

3.4 PROTECTION DURING CONSTRUCTION
   A. Care and protection of the construction site shall be made by the contractor to assure that there is no access by students, teachers or visitors at the facility.

END OF 32300
32400 - Bike Racks

Bike racks shall be of a design in accordance to Section 423 of the 2004 Florida Building Code. The School Districts preference is The Ribbon Rack by Brandir.

32500 - Sodding

Refer to ASPA (American Sod Producers Association) - Guideline Specifications to Sodding.

32600 - Trees, Plants, and Ground Cover-As per SREF

Warranty

Provide a warranty on work of this section for a minimum of one year including one continuous growing season. Commence warranty on date identified in the Certificate of Substantial Completion
DIVISION 33 - UTILITIES

1 FIRE HYDRANTS

A. PERFORMANCE REQUIREMENTS

1. The travel distance shall not exceed 300 feet from any building to the hydrant or acceptable water source. This distance requirement is measured from the hydrant to the furthest extreme as a fire hose is laid, not as the crow flies.

2. Flow rate shall be calculated in accordance with the authority having jurisdiction based on building design and construction characteristics. Hydrants shall be added to the above distance requirements in order to meet the calculated flow rate provided the water utility supplying the campus has sufficient capacity.

3. Should the water utility not have sufficient capacity to satisfy the calculated flow rate for an additional hydrant or hydrants, hydrants will not be installed. Once notification from the water utility that the flow rate has been improved to sufficient levels, new hydrants will be added to achieve to required capacity.

B. MATERIALS, PRODUCTS, EQUIPMENT, MANUFACTURED UNITS

1. Recommended Products: Products and associated manufacturers listed below are known to have been approved for use within certain Osceola county fire districts. It shall be the responsibility of the design professional to verify with the specific fire district in question to insure the approved type and acceptable manufacturers are specified for use within that particular fire district.

   c. Clow Valve Mod. Medallion.
   d. American Flow Control (Darling) Mod. No. B-84-B.
   e. Kennedy Valve Mod. K 81 D.
   g. M &H Valve Mod. No. 929 Reliant.

C. FINISHES

1. New and existing hydrants, barrel only.

   a. 1st Coat: S-W Pro-Cryl Acrylic Metal Primer, B66 (5.0-10.0 mils wet, 2-4 mils dry)
   b. 2nd Coat: S-W DTM Acrylic Gloss Coating, OSHA Osceola.
   c. 3rd Coat: S-W DTM Acrylic Gloss Coating, OSHA Osceola, (6.5 - 10.0 mils wet, 2.5 - 4.0 mils dry per coat).
   d. Before painting the hydrant barrels all rust and contaminants are to be removed from both new and existing hydrants.
e. The above colors apply to the hydrant barrel only, the bonnet colors are to be in accordance with NFPA requirements based on the following hydrant gpm flow capabilities, (1) 1500 or greater, Light blue, (2) 1000-1499, Green, (3) 500-999, Osceola, (4) less than 500, Red.

D. ADMINISTRATIVE CLOSEOUT PROCEDURES
1. Warranty Requirements
   a. Manufacture shall provide extended ten (10) year warranty on the fire hydrant.

2 STORM SEWER SYSTEM

PART 1 - GENERAL

1.2 RELATED DOCUMENTS
   A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SCOPE
   A. This section includes storm sewers and structures appurtenant thereto. Excavating, trenching, backfilling and density tests are specified elsewhere. Storm sewer system work includes, but is not limited to, the following:

   1. Storm sewer conduits
   2. Storm sewer structures required by drawings

   B. Refer to applicable DIVISION 2 sections for excavation and backfilling work related to storm sewer systems.

   C. Refer to applicable DIVISION 3 sections for concrete work related to storm sewer systems.

1.3 QUALITY ASSURANCE
   A. Installer: A firm specializing and experienced in storm sewer work for not less than two years.
   B. Code Compliance: Comply with applicable portions of local plumbing codes, the requirements of South Florida Water Management District and the Florida Department of Environmental Protection.
1.4 SUBMITTALS:

A. Product Data: Submit manufacturers technical data and installation instructions for each major component for the storm sewer system materials and products.

B. Record Drawings: At project closeout, submit record drawings of installed storm sewerage piping and products. All drawings must be labeled as “Record Drawings” and be signed and sealed by a Professional Land Surveyor licensed in the State of Florida. Drawings shall include at a minimum: horizontal locations, tied to project coordinate system, of all structures (area drains, catch basins, manholes, headwalls, etc.) and piping, rim elevations of all structures with invert elevations of all pipes entering structures, diameter and material of all piping, and the slope of each pipe segment. Verify all elements of drainage control structures, including rim elevations, elevation of slots, weirs and orifices, and invert elevation of all pipes entering structures. Refer to "EARTHWORK" Section 33200 for record drawing requirements regarding grading, swales, lakes and drainage retention areas.

C. An electronic copy of the Record Drawing shall be provided to the Architect in AutoCadd 2010 format prior to final acceptance of the work.

D. Maintenance Data: Submit maintenance data and parts lists for storm sewer system materials and products. Include this data, shop drawings, product data and record drawings in a maintenance manual to be presented to the Owner at project close-out.

PART 2 - PRODUCTS

2.1 GENERAL

A. Except as otherwise provided, all storm sewer materials shall comply with the applicable sections of the Florida Governmental Utilities Authority Standards which are hereby incorporated into these specifications by reference.

2.2 CONDUIT MATERIALS

A. Provide materials specified below:

1. Polyvinyl Chloride (PVC), ASTM D-3034, SDR 35 pipe and fittings. Joints and fittings shall have elastomeric gasket joints manufactured in accordance with ASTM D-3212 and ASTM D-477.

2. High Density Polyethylene Pipe (HDPE), 3-inch to 10-inch, in accordance with AASHTO M252 and ASTM D-3350, and shall have a smooth interior lining. Joints shall provide a water tight seal using elastomeric gaskets manufactured in accordance with ASTM D-3212 and ASTM F-477.
3. High Density Polyethylene Pipe (HDPE), larger than 10-inch, in accordance with AASHTO M294, Type S, and ASTM D-3350. Joints shall provide a water tight seal using elastomeric gaskets manufactured in accordance with ASTM D-3212 and ASTM F-477.

4. Round Reinforced Concrete Pipe (RCP) in accordance with ASTM C-76. Joints shall be bell and spigot type. The spigot end shall be grooved to accommodate a rubber O-ring gasket to provide a water tight seal conforming to the requirements of ASTM C-443.

2.3 STORM SEWER STRUCTURES

A. Provide materials and perform all work in accordance with Section 425 of the referenced FDOT Standard Specifications.

B. Manhole Joint Seals: Preformed plastic gaskets shall meet all requirements of Federal Spec. SS-S-03310.

C. Manhole Frames and Covers: Traffic-bearing cast iron of size and shape detailed on the drawings. Covers shall have the word "STORM" in 2" raised letters. Castings shall be tough, close-grained gray iron, sound, smooth, clean, free from blisters, blowholes, shrinkage, cold shuts, and all defects. Plane or grind bearing surfaces to ensure flat, true surfaces. Covers shall be true and seat within ring at all points.

D. Catch Basin Frames and Grates: Use cast iron grates and cast-in angle iron seats on all catch basin structures. Grates in paved areas shall be traffic bearing.

E. Base Rock: Clean 3/4" gravel or crushed rock uniformly graded from coarse to fine conforming to requirements of FDOT specifications, 1996.

F. Concrete: All concrete work shall conform to the requirements of SECTION 03300.

G. Cleanouts: Provide as indicated, pipe extension to grade with brass ferrule and brass countersunk cleanout plug.

1. Provide a 12-inch by 12-inch concrete collar, 6 inches thick around all exterior cleanouts.

2.4 MITERED END SECTIONS

A. Provide materials according to FDOT Standard Index No. 273, with 2.5 inch pipe grates on 6-inch centers.
PART 3 - EXECUTION

3.1 GENERAL

A. General: All construction operations shall adhere to the requirements of the referenced FDOT Standard Specifications.

B. Conform to manufacturer's recommendations on the installation of RCP, PVC, and HDPE storm sewers.

C. Pipe Distribution: Distribute material on the job no faster than it can be used to good advantage. Unload pipe which cannot be physically lifted by workers from the trucks, by a forklift, or other approved means. Do not drop pipe of any size from the bed of the truck to the ground.

D. Pipe Preparation and Handling: Inspect all pipe and fittings prior to lowering into trench to ensure no cracked, broken, or otherwise defective materials are being used. Clean ends of pipe thoroughly. Remove foreign matter and dirt from inside of pipe and keep clean during and after installation.

E. Use proper implements, tools, and facilities for the safe and proper protection of the work. Lower pipe into the trench in such a manner as to avoid any physical damage to the pipe. Remove all damaged pipe from the job site. Do not drop or dump pipe into trenches under any circumstances.

3.2 LINE AND GRADE

A. General: All sewer lines between structures shall be absolutely straight and true. No curvature shall be tolerated. Do not deviate from line or grade more than 1/2" for line and 1/4" for grade, provided that such variation does not result in a level or reverse sloping invert.

1. Establish line and grade for pipe by the use of lasers or by transferring the cut from offset stakes to batter boards set in the trench at maximum intervals of 25 feet. Maintain a minimum of three sets of batter boards with string line ahead of the pipe laying at all times.

B. Laying and Jointing Pipe: Pipe laying shall proceed upgrade with spigot ends pointing in direction of flow. After a section of pipe has been lowered into the prepared trench, clean the end of the pipe to be joined and the inside of the joint immediately before joining the pipe. Make assembly of the joint in accordance with the recommendations of the manufacturer of the type of joint used. Provide all special tools and appliances required for the jointing assembly.
1. After the joint has been made, check pipe for alignment and grade. The trench bottom shall form a continuous and uniform bearing and support for the pipe at every point between joints. Apply sufficient pressure in making the joint to assure that the joint is "home" as defined in the standard installation instructions provided by the pipe manufacturer. To assure proper pipe alignment and joint makeup, place sufficient pipe zone material to secure the pipe from movement before the next joint is installed.

2. When pipe is laid within a movable trench shield, take necessary precautions to prevent pipe joints from pulling apart when moving the shield ahead.

3. Take the necessary precautions required to prevent excavated or other foreign material from getting into the pipe during the laying operation. At all times, when laying operations are not in progress, at the close of the day's work, or whenever the workers are absent from the job, close and block the open end of the last laid section of pipe to prevent entry of foreign material or creep of the joints.

4. Plug or close off pipes which are stubbed off for structure construction or for construction by others, with temporary plugs.

5. Take all precautions necessary to prevent the "uplift" or floating of the line prior to the completion of the backfilling operation.

6. Where non-reinforced pipe is connected to manholes or concrete structures, take connection so that the standard pipe joint is located not more than 3 feet from the outside edge of the structure.

7. When cutting and/or machining the pipe is necessary, use only tools and methods recommended by the pipe manufacturer.

3.3 UNDERGROUND STRUCTURES

A. Rock Base: Prior to setting pre-cast concrete base section, remove water from the excavation. Place a minimum of 6" of rock base and thoroughly compact with a mechanical vibrating or power tamper.

B. Structure Joint Seals: Carefully inspect pre-cast structure sections to be joined. Sections with chips or cracks in the tongue shall not be used. Joint seals shall be installed in strict conformance with the manufacturer's recommendations. Only pipe primer furnished by the joint seal manufacturer will be approved.

C. Pre-cast Concrete Structures: Place pre-cast concrete sections as shown on the drawings. Set top elevation of catch basins as indicated on the drawings. Where manholes occur in pavements, set tops of frames and covers flush with finish surface. Elsewhere, set manhole tops 3 inches above finish surface, unless otherwise indicated.

1. Install frames and covers on top of manholes to positively prevent all infiltration of surface or groundwater into manholes.

2. Frames shall be set in a bed of mortar with the mortar carried over the flange of the ring as shown in the Manhole Details on the drawings.

3. Provide rubber joint gasket complying with ASTM C-443.
4. Apply bituminous mastic coating at joints of sections.

D. Manhole Invert: Construct manhole inverts in conformance with details shown on the drawings and to ensure an unobstructed flow through manhole. Remove sharp edges or rough sections which tend to obstruct flow. Trowel all mortar surfaces smooth.

3.4 BACKFILLING

A. General: Conduct backfill operations of open-cut trenches closely following laying, jointing and bedding of pipe, and after initial inspection and testing are completed. Place backfill and compact in accordance with provisions of SECTION 33200 - EARTHWORK.

3.5 CLEANING AND TESTING

A. Prior to final acceptance, the storm sewer system shall be thoroughly cleaned and visually inspected in the presence of the Engineer or his designated representative.

B. Following visual inspection, leakage testing may be required at the discretion of the Engineer and/or local authorities.

C. Acceptable methods of testing shall be water exfiltration in accordance with the local authority requirements.

1. The permissible leakage rate shall be a maximum of 50 gallons per inch of pipe diameter per mile of pipe in a 24 hour period for PVC and HDPE pipe. The permissible leakage rate for RCP shall be a maximum of 200 gallons per inch of pipe diameter per mile of pipe in a 24 hour period.

D. The Contractor shall furnish all necessary tools, supplies, labor and equipment for testing.

E. Visual inspection and testing shall be performed on the same day. Notify the Engineer one week in advance.

F. Contractor shall provide a sealed, certified survey of the as-built layout of the storm system including structure locations, inverts, pipe sizes, locations and inverts and detailed information on the storm water management pond areas.
3 SANITARY SEWAGE SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SCOPE:

A. This section includes sanitary sewers and structures appurtenant thereto. Excavating, trenching, backfilling, and density tests are specified elsewhere. Sewage collection system work includes, but is not limited to, the following:

   Sanitary sewer conduits
   Manholes, frames, and covers

B. For sanitary sewer related construction on the project site, refer to the Florida Governmental Utilities Authority standards, if more stringent than herein specified.

C. Refer to Division 2 Sections for excavation and backfilling work related to sewer collection systems.

D. Refer to Division 3 Sections for concrete work related to sewer collection systems.

1.3 QUALITY ASSURANCE:

A. Installer: A firm specializing and experienced in sewer work for not less than two years.

B. Code Compliance: Comply with applicable portions of a local plumbing codes, the Florida Governmental Utilities Authority standards and the Florida Department of Environmental Protection.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturers technical data and installation instructions for each major component for the sewage collection system materials and products.

B. Record Drawings: At project close-out, submit drawings labeled as “Record Drawings” indicating all installed sewage collection system piping, manholes and products, signed and sealed by a Registered Land Surveyor (State of Florida) containing the following:
1. Location of each manhole. Location of each sewer service at connection. Invert elevations of building services at tie-in. Rim elevations, bottom elevations and invert elevation of all pipes entering manholes. Slope of each segment (mains & services). Length and location of all plugged stub outs. Type of materials used. All horizontal locations required on record drawings shall be located according to the project coordinate.

C. Maintenance Data: Submit maintenance data and parts lists for sewage collection system materials and products. Include this data, shop drawings, product data and record drawings in a maintenance manual to be presented to the Owner at project close-out.

PART 2 - PRODUCTS

2.1 CONDUIT MATERIALS:

A. General: Furnish ells, tees, reducing tees, wyes, couplings, increasors superior physical and chemical properties as acceptable to the Architect/Engineer.


C. PVC Pipe Joints: Joints for PVC sewer pipe shall be rubber gasketed type complying in all respects to the physical requirements of ASTM D-3212 and ASTM F-477. Lubricant for jointing as approved by the pipe manufacturer shall be used for connecting PVC pipes.

2.2 CONCRETE MANHOLES:

A. Precast manhole sections shall be minimum 5" thick and 48" in diameter, conforming to ASTM C-478. Cones shall have same wall thickness and reinforcement as manhole section. Top and bottom of all sections shall be parallel. Joints shall be tongue-and-groove or Keylock type. Joints shall be formed using an approved joint sealer.

1. Prior to the delivery of any size of precast section on the job site, yard tests will be conducted at the point of manufacture. The precast sections to be tested will be selected at random from the stockpiled material which is to be supplied for the job. All test specimens will be mat tested, and shall meet the permeability test requirements of ASTM C-14.
B. Coating System: All sanitary sewer manholes shall be provided with an interior and exterior coal tar epoxy coating. After the concrete has cured for 28 days, minimum, the precast units shall be coated by the manufacturer. The units shall be touched up in the field by the Contractor, if damaged. Interior and exterior surfaces of the manholes shall be coated in accordance with System A, B, or C below.

1. SYSTEM A (TNEMEC)

   Surface Preparation: SP-C2.

   Finish: 2 coats of Tnemec 413 Tneme-Tar at 8.3-mil dry thickness, 11.4 wet (140 SFPG) per coat. Thin first coat 10 percent. Apply second coat within 96 hours.

   Total Thickness (dry): 16.6-mil.

2. SYSTEM B (PORTER)

   Surface Preparation: SP-C2.

   Primer: 1 coat of Porter Tarset Concrete Primer at 4.0-mil dry thickness (260 SFPG).

   Finish: 2 coats of Porter 7013 Tarset C-200 Coal Tar Epoxy Black at 6.0-mil dry thickness (200 SFPG) per coat.

   Total Thickness (dry): 16-mil.

3. SYSTEM C (KOPPERS)

   Surface Preparation: SP-C2.

   Finish: 2 coats of Koppers Bitumastic 300M Water Epoxy at 8.0-mil dry thickness (200 SFPG) per coat.

   Total Thickness (dry): 16-mil.

C. Sewer Main Connection to Manholes: Manholes shall be provided with manufacturer installed rubber boots with stainless steel clamps for connection of gravity lines.

E. Manhole Frames and Covers: Traffic-bearing cast iron of size and shape detailed on the drawings. Covers shall have the word "sewer" in 2" raised letters. Castings shall be tough, close-grained gray iron, sound, smooth, clean, free from blisters, blowholes, shrinkage, cold shuts, and all defects. Plane or grind bearing surfaces to ensure flat, true surfaces. Covers shall be true and seat within ring at all points.

F. Base Rock: Clean 3/4" gravel or crushed rock uniformly graded from coarse to fine conforming to requirements of FDOT specifications, 1996.

G. Concrete: All concrete work shall conform to the requirements of SECTION 03300 - CONCRETE WORK.

H. Cleanouts: Provide as indicated, pipe extension to grade with brass ferrule and brass countersunk cleanout plug.

1. Provide a 12-inch by 12-inch concrete collar, 6 inches thick around all exterior cleanouts

2.3 LOCATION AND IDENTIFICATION:

A. General: All PVC pipe 4 inches and larger shall have a #10 GA copper trace wire located directly above the line and terminate on a metal device accessible from the surface without excavation. In addition, metallic marker tape marked “SANITARY SEWER BELOW” shall be located no less than 1 foot directly above the gravity or force main. Owner’s representative shall field verify the tape and locator wire installations prior to backfilling the trench.

PART 3 - EXECUTION

3.1 INSTALLATION OF CONDUIT:

A. General: All PVC sewer shall be installed in accordance with Uni-Bell, UNI-B-5.

B. Pipe Distribution: Distribute material on the job no faster than it can be used to good advantage. Unload pipe that cannot be physically lifted by workers from the trucks, by a forklift, or other approved means. Do not drop pipe of any size from the bed of the truck to the ground.

C. Pipe Preparation and Handling: Inspect all pipe and fittings prior to lowering into the trench to ensure no cracked, broken, or otherwise defective materials are being used. Clean ends of pipe thoroughly. Remove foreign matter and dirt from inside of pipe and keep clean during and after laying.
D. Use proper implements, tools, and facilities for the safe and proper protection of the work. Lower pipe into the trench in such a manner as to avoid any physical damage to the pipe. Remove all damaged pipe from the job site. Do not drop or dump pipe into trenches under any circumstances.

3.2 LINE AND GRADE:

A. Gravity Sewer Pipe: All sewer lines between manholes shall be absolutely straight and true. No curvature shall be tolerated. Do not deviate from line or grade, as established by the Engineer, more than 1/2" for line and 1/4" for grade, provided that such variation does not result in a level or reverse sloping invert.

1. Establish line and grade for pipe by the use of lasers or by transferring the cut from offset stakes to batter boards set in the trench at maximum intervals of 25 feet. Maintain a minimum of three sets of batter boards with string line ahead of the pipe laying at all times.

B. Laying and Jointing Pipe: Pipe laying shall proceed upgrade with spigot ends pointing in direction of flow. After a section of pipe has been lowered into the prepared trench, clean the end of the pipe to be joined, the inside of the joint, and the rubber ring immediately before joining the pipe. Make assembly of the joint in accordance with the recommendations of the manufacturer of the type of joint used. Provide all special tools and appliances required for the jointing assembly.

1. After the joint has been made, check pipe for alignment and grade. The trench bottom shall form a continuous and uniform bearing and support for the pipe at every point between joints. Apply sufficient pressure in making the joint to assure that the joint is "home" as defined in the standard installation instructions provided by the pipe manufacturer. To assure proper pipe alignment and joint makeup, place sufficient pipe zone material to secure the pipe from movement before the next joint.

2. When pipe is laid within a movable trench shield, take necessary precautions to prevent pipe joints from pulling apart when moving the shield ahead.

3. Take the necessary precautions required to prevent excavated or other foreign material from getting into the pipe during the laying operation. At all times, when laying operations are not in progress, at the close of the day's work, or whenever the workers are absent from the job, close and block the open end of the last laid section of pipe to prevent entry of foreign material or creep of the gasketed joints.

4. Plug or close off pipes that are stubbed off for manhole construction or for construction by others, with temporary plugs.

5. Take all precautions necessary to prevent the "uplift" or floating of the line prior to the completion of the backfilling operation.

6. Where non-reinforced pipe is connected to manholes or concrete structures, make connection so that the standard pipe joint is located not more than 3 feet from the outside edge of the structure.
7. When cutting and/or machining the pipe is necessary, use only tools and methods recommended by the pipe manufacturer.

3.3 UNDERGROUND STRUCTURES:

A. Rock Base: Prior to setting precast concrete base section, remove water from the excavation. Place a minimum of 6" of rock base and thoroughly compact with a mechanical vibrating or power tamper.

B. Manhole Joint Seals: Carefully inspect precast manhole sections to be joined. Sections with chips or cracks in the tongue shall not be used. Joint seals shall be installed in strict conformance with the manufacturer's recommendations.

C. Precast Concrete Manholes: Place precast concrete sections as shown on the drawings. Where manholes occur in pavements, set tops of frames and covers flush with finish surface. Elsewhere, set tops 3 inches above finish surface, unless otherwise indicated.

1. Install frames and covers on top of manholes to positively prevent all infiltration of surface or groundwater into manholes.
2. Frames shall be set in a bed of mortar with the mortar carried over the flange of the ring as shown in the Manhole Details on the drawings.
3. Provide rubber joint gasket complying with ASTM C-443.
4. Apply bituminous mastic coating at joints of sections.

D. Manhole Invert: Construct manhole inverts in conformance with details shown on the drawings and to ensure an unobstructed flow through manhole. Remove sharp edges or rough sections which tend to obstruct flow. Where a full section of pipe is laid through a manhole, break out the top section and cover exposed edge of pipe completely with mortar. Trowel all mortar surfaces smooth.

3.4 BACKFILLING:

A. General: Conduct backfill operations of open-cut trenches closely following laying, jointing and bedding of pipe, and after initial inspection and testing are completed.

1. Place backfill and compact in accordance with provisions of Section 33200 - EARTHWORK.
2. During backfill operations over pipelines, install the continuous trace wire directly above the pipe at a depth of 6-inches below finish grade.
3.5 CLEANING AND TESTING OF GRAVITY SEWERS:

A. Prior to final acceptance, the sewer collection system shall be thoroughly cleaned and visually inspected in the presence of the Engineer and local authorities. Visual inspection shall include closed circuit television inspection.

1. Closed circuit television inspection shall be in conformance with Section V, "Recommended Specifications for Sewer Collection System Rehabilitation" published by the National Association of Sewer Service Companies.

B. Following visual inspection, leakage testing shall be performed on all sewer lines with a maximum allowable exfiltration of 200 gallons per day / per inch of diameter of pipe / per mile of pipeline, with a minimum of 2 feet of internal pressure head. The testing procedures shall be in accordance with ASTM F-1417 for PVC piping.

C. Acceptable methods of testing shall be low-pressure air exfiltration or water exfiltration in accordance with the local authority requirements. The Contractor shall furnish all necessary tools, supplies, labor and equipment for testing.

1. Low pressure air exfiltration tests shall be performed in accordance with Uni-Bell, UNI-B-6.
2. Water exfiltration tests shall be in accordance with Uni-Bell, UNI-B-5.

D. Visual inspection and testing shall be performed on the same day. Notify Engineer one week in advance.

E. Deflection Testing: Testing is required no sooner than 30 days after the final backfilling activities are completed on all sections of PVC piping. No section of pipe shall deflect more than 5% using a rigid ball or mandrel for the testing with a diameter not less than 95% of the base inside diameter of the pipe. Testing shall not be performed using mechanical pulling.

F. Contractor shall provide a sealed, certified survey of the as-built conditions including locations, pipe sizing and invert data for the entire sanitary system.

3.6 PLACING SYSTEM INTO SERVICE:

A. General: The sewage collection system shall not be placed into service until all required testing has been completed, approved by the Engineer, and a “Clearance for Use” certification (if required) has been issued by the Florida Department of Environmental Protection.
4 LANDSCAPE IRRIGATION

All landscaped areas shall be irrigated. The irrigation system shall be designed so as to eliminate water spray on pedestrian walkways and buildings. For sprinkler heads, design around and specify Rain Bird products or approved equal.

1 Irrigation

All landscaped areas shall be adequately irrigated based on the following criteria:

An automatic sprinkler irrigation system shall be provided for all landscaped areas. All sprinkler lines shall be self-draining.

The irrigation system shall be designed and operated to prevent or minimize runoff of irrigation water onto roadways, driveways, walks, etc.

1 Mandatory Equipment Requirements

The below specified equipment is the only mandatory irrigation requirements.

Controllers

A. Required controllers are manufactured by Hunter Industries. No other controllers are acceptable. Acceptable controllers listed below.
B. Pro C up to 15 stations (remote ready).
C. ICC-800-PL (remote ready)
D. ICC-800-M (remote ready).
E. Include Hunter ICR-KIT for each project

Include Acceptable Sensors

A. Wind-CLIK
B. Mini-CLIK

Remote Valves and Heads

A. RainBird type PSEB and PSEB-R Valves.
B. RainBird type 1806 and 1812 heads.
This document shall be signed by the Architect / Engineer of record and provided with the construction document submittal to the School Board of Osceola County Florida project manager.

Project Name:

I do hereby certify that I am the Architect / Engineer of record for the above indicated project and I have reviewed the School Board of Osceola County Florida design guidelines and have incorporated the requirements of those guidelines into the construction documents unless indicated otherwise below. Any exceptions shall be explained in a separate signed document by the Architect or Engineer.

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