CITY OF POMPANO BEACH

CITY OF POMPANO BEACH GOLF COURSE SHELTER & RESTROOM RENOVATIONS

PERMIT SUBMITTAL

DECEMBER 10, 2014

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SECTION 01010

SUMMARY OF WORK

PART 1 GENERAL

1.01 SUMMARY

A. The Work of this Contract comprises the removal of an existing Concessions building and construction of a new restroom and storage pavilion at the City of Pompano Beach Municipal Golf Course located in Pompano Beach, Broward County, Florida. The project also entails the renovations and remodeling of an existing restroom pavilion on the same site.

B. Related Section:

1. 01040 - Coordination.

C. Type of Contract: Lump Sum Hard Bid.

1.02GENERAL DESCRIPTION

A. The new Concessions building and restroom renovations are to be constructed at locations as described in the Site Survey and the Site Conditions included in these Documents.

B. The project will not be broken into phase packages. A single 100% Package for all disciplines will be permitted.

1.03DELIVERY, STORAGE, AND HANDLING

A. The sequence of delivery and storage of materials shall comply with the limits of the designated on-site area and shall be as agreed upon by the CM, Owner, and A/E.

PART 2 EXECUTION

2.01ADJUSTING AND CLEANING

A. Maintain work areas in a clean and organized manner at all times.

B. During the work, remove excess materials from the site after the completion of each sequence or phase of construction.

C. At the completion of the work, repair and return the designated on-site area to its original condition or its revised use.

END OF SECTION

SECTION 01025

SCHEDULE OF VALUES

PART 1 GENERAL

1.01 SUMMARY

A. Related Section:

1. 01312 - Construction Schedule Critical Path Method (CPM).

1.02 SUBMITTALS

A. Immediately after contract award and before preconstruction meeting, submit a proposed Schedule of Values to the A/E.

1. Determine with A/E additional data, if any, required to be submitted.

a. Provide copies of the subcontracts or other data acceptable to the A/E, substantiating the sums described.

2. Schedule of Values shall be compatible with and related to Section 01312 - Construction Schedule Critical Path Method (CPM).

a. Tasks shall be cost loaded, organized, and coded to allow schedule to be summarized according to the Construction Specifications Institute (CSI) 16 division format.
b. Provide a detailed breakdown of the Contract Amount showing values assigned to each of the various parts of the Work coded and organized by area of work according to Section 01312.

3. Provide separate labor and material values of, but not limited to, the following:

a. Each major and minor construction stage and trade operation of work sequence identified by project specification section number, name of operation, and trade.
b. Subcontractors and suppliers individually broken down.
c. Monthly applications for payments in relation to the CPM.

4. Secure the A/E's approval of the Schedule of Values before submitting first requisition for payment.

PART 2 NOT USED

PART 3 NOT USED

END OF SECTION

SECTION 01040

COORDINATION

PART 1 GENERAL

1.01 BUILDING CODE & OTHER INSPECTIONS

A. The City of Pompano Beach building code inspectors (PB-BCI) will make periodic inspections. PB-BCI will inspect specific construction phases as noted in the Permit and at any other times as often as decided by the inspectors.

B. City of Pompano Beach Project Management team will make periodic inspections at their discretion.

C. A/E will make periodic inspections at their discretion.

1.02 A/E of Record (A/E)

A. References in the General Conditions to A/E refer to the firm of;

Silva Architects, 135 San Lorenzo Avenue Suite 880, Coral Gables, Florida, 33146

1.03 SURVEYOR'S AFFIDAVIT

A. Furnish a Florida registered land surveyor's affidavit verifying the location of buildings and elevations of building floors are according to Construction Documents.

1.04 COORDINATION OF DRAWINGS AND SPECIFICATIONS

A. Where discrepancies occur between the Drawings and specifications, between large scale Drawings and small scale Drawings, or within a document itself, the use of the item or arrangement of better quality, greater quantity, or higher cost shall be decided by the A/E.

B. If any such discrepancies occur in the Drawings or specifications, notify A/E and the Owner for interpretations or decisions before proceeding with the Work. A/E interpretations or decisions shall be final.

C. Drawings are diagrammatic and show general arrangement of systems and work included in the Contract.

1. Coordinate Drawings and verify dimensions before laying out work and be responsible for conflicts.
2. Comply with Drawings in laying out Work and coordinate drawings of various trades involved in the project to verify spaces receiving work.
3. Notify A/E if space conditions appear inadequate before proceeding.

a. If directed by A/E, make reasonable modifications in layout as needed to prevent conflict with work of various trades or for proper execution of Work without extra charge.

1.05 JOB MEASUREMENTS

A. When measurements are affected by new or existing conditions, verify job measurements and consult A/E for final decision.

1.06 SECURITY

A. If Contractor or the Owner determine protection of property is necessary, provide a means of security accepted by the Owner.

1.07 VENTILATION AND AIR-CONDITIONING OF BUILDINGS

A. Provide necessary temporary ventilation fans, power, temporary heat, or place air-conditioning systems in operation to provide proper humidity and temperature conditions for installation or application of flooring, paint, coatings, acoustical ceilings, and any other items requiring climate control at appropriate locations or any other means in compliance with SMACNA IAQ Guidelines for Occupied Buildings Under Construction.

B. Contractor must comply with all requirements of SMACNA IAQ Guidelines for Occupied Buildings Under Construction while building is under construction. Contractor shall submit Construction IAQ Management Plan for approval by A/E before construction begins.

1.08 TEMPORARY LIGHT AND POWER

A. After installation of temporary power connections provide the following:

1. Temporary Lighting: As the building is enclosed, provide temporary lighting as required or according to A/E's direction consisting of one 100-watt lamp for each 250 square feet of area, but not less than 1 lamp per area.

B. Temporary Power Outlets: Provide as required for execution of the Work.

1.09 CONSTRUCTION PROJECT SIGNS

A. Before project sign acceptance by the A/E as to size, design, type, location, and local regulations, Contractor and subcontractors may erect temporary signs for purposes of identification and controlling traffic.

1. Furnish, erect, and maintain signs as required by applicable safety regulations or as necessary to safeguard life and property.

B. Upon starting construction, provide a 4'-0" x 8'-0" project sign containing the following items:

1. Project Name and project number
2. Award date of Construction contract
3. Members of City of Pompano Beach Commission at time of construction contract award.

4. A/E of Record
5. Contractor
6. City of Pompano Beach seals and logos.
7. Layout, color, construction, and location of sign require acceptance by A/E and Owner.

PART 2 NOT USED

PART 3 EXECUTION

3.01 CLEANING

A. In addition to removal of rubbish and leaving buildings "Broom Clean":

1. Replace broken glass.
2. Remove paint spots and smears, stains, marks, and dirt to provide clean surfaces.
3. Clean glass, hardware, fixtures, casework, and equipment.
4. Vacuum carpeting.
5. Wash concrete surfaces, tile floors, tile walls and any other impervious floor and wall surfaces.

3.02 CONSTRUCTION DOCUMENTS

A. The Drawings included with this document are to be part of the construction documents.

END OF SECTION

SECTION 01043

MECHANICAL AND ELECTRICAL COORDINATION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: General procedures for mechanical and electrical work and equipment of other divisions. Provide ventilation, mechanical, plumbing, fire protection, and electrical systems to form complete operating systems.

1. Furnish labor, supervision, energy, materials, tools, transportation, equipment, permits (if required), insurance, taxes, temporary protection, and correction necessary to provide the work shown and specified.
2. Provide apparatus, appliances, materials, and work not shown on drawings but mentioned in specifications, or vice versa. Include incidental accessories necessary for proper installation and operation, even if not specified or shown, without additional expense to the Owner.
3. Apparatus referred to in singular numbers, shall include as many such items required to complete the work.
4. Provide piping, wiring, sheet metal connections, and miscellaneous accessories and materials necessary for a complete installation. Complete connections of supplied special traps, control valves, and other equipment furnished by the Owner, if any, and by other trades.
5. Provide all work, submittals, and personnel support as required by drawings and Specifications in order to comply with USGBC requirements for LEED certification.

B. Work Not Included: Equipment and wiring provided by local telephone and power utilities.

1.02 DRAWINGS

A. Drawings are diagrammatic and show general arrangement of systems and work.

1. Do not scale drawings.
2. Consult drawings, shop drawings, and details for locations of fixtures, thermostats, and equipment. If not definitely located, obtain locations as required from A/E in writing before rough-in.

B. Comply with drawings in laying out the work.

1. Coordinate with the drawings of other trades to verify installation locations.
2. Maintain maximum headroom clearances and space conditions at all locations as required by codes and regulations.
3. Where headroom or space conditions appear inadequate, obtain instructions from A/E before proceeding with installation.

C. Make reasonable modifications in layout to prevent conflict with work of other trades or for proper execution of work, without extra charge to the Owner.

D. Engineering Drawings are schematic for equipment since exact dimensions and rough-in requirements may vary with different manufacturers.

1.03 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLE SUBMITTALS

A. Submit shop drawings, edited catalog cuts of components, product data, or samples for the following:

1. Names, sizes, and catalog numbers of specialty equipment, fixtures, valves, and other similar items.
2. Equipment connections.
3. Details of grills, platforms, pads, hangers, and machine and equipment supports.
4. Details of typical pipe and duct supports.
5. Fabrication shop drawings for ductwork, interior air supply, and exhaust systems, including details of louvers and other components.
6. Wiring diagrams for operating controls, temperature control systems, pneumatic piping diagrams, interlock wiring, security systems, and alarm systems including fire alarm and communications systems.
7. Details and description of temperature control system.
8. Shop drawings of switchgear, switchboards, panelboards, transformers, lighting fixtures, wiring and cable raceways and wireways, outlet boxes, pull boxes, junction boxes, wiring devices, disconnect switches, fuses, circuit breakers, lightning protection, and other electrical items.
9. Submit layout drawings for main electrical equipment spaces such as closets, switchgear rooms, major conduit bank runs, and vaults. Submit layout drawings for review before installation of the work.
10. Complete data and details of fans and motors, air handling units, and similar equipment including performance curves.
11. Irrigation system and site lighting wiring, panels, switches, and controls.
12. Locations of sleeves for piping and ductwork passing through concrete slabs and concrete or steel structure. Do not place slabs or concrete fireproofing before submittal has been accepted.

B. Submit catalog cuts and related shop drawings at the same time. Catalog cuts without shop drawings or vice versa are not acceptable.

1.04 COORDINATION WITH OTHER TRADES

A. To ensure full coordination between trades, furnish information necessary to impacted trades to allow work of all trades to be installed satisfactorily and with the least possible interference or delay.

B. Correct, without extra charge to the Owner, mechanical or electrical work causing interference, unacceptable clearances, or accessibility problems among the work of mechanical, electrical, and other trades caused by lack of coordination.

1.05 SUPERVISION

A. Make subcontracted trade provide services of an experienced superintendent in

charge of installation of the work and skilled workers required to unload, transfer, erect, connect, adjust, start, operate, and test work. Each subcontracted trade superintendent shall be qualified and authorized to make decisions and answer questions directed to the Contractor by A/E regarding progress and details of work.

1.06 INSPECTIONS BEFORE OWNER'S ACCEPTANCE INSPECTION

A. Arrange and schedule as many inspections of the work as necessary. Notify A/E, in writing, of safety-to-life systems functioning according to specifications.

B. During the entire period scheduled for these inspections, Contractor and Contractor's superintendent of mechanical and electrical trades shall be present.

C. Notify A/E of the following test and balance procedures:

1. Test and balance work has been initially performed by the Owner's contracted test and balance agency.
2. Completion of necessary corrective work.
3. Final test and balance work has been performed by test and balance agency.
4. Balance report has been completed.

1.07 CERTIFICATES

A. Upon completion of the Work, obtain certification of compliance or approval from authorities having jurisdiction over the Work and deliver certification to the A/E.

B. See Section 01700 - Contract Closeout for additional certification requirements.

1.08 MANUFACTURERS' NAMEPLATES

A. Each major component of equipment shall have the manufacturer's name, address, model number, and rating on a metal plate securely affixed in a conspicuous place.

B. ASME code ratings or other data die-stamped into surface of equipment shall be in a conspicuous place.

C. Nameplates of distributing agents are not allowed.

1.09 ACCEPTANCE

A. Operation of mechanical and electrical work by Contractor does not constitute acceptance of work. Acceptance will occur after Contractor has adjusted equipment, demonstrated equipment satisfies requirements of drawings and specifications, has corrected defects, and furnished required certification.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Materials and equipment required for the work shall be new, of good quality, furnished, delivered, erected, connected, finished, and arranged to fit properly into

building spaces. Provide accessibility for maintenance and replacement of equipment without need for removing adjacent equipment or piping. If no specific type or quality of material is given, provide materials accepted by A/E.

B. Equipment shall be of type and capacity shown on drawings, specification equipment schedules, and by manufacturers designated in specifications.

C. Use the same manufacturer of equipment for parts replacement and maintenance.

D. Equipment, materials, and components shall be new and current products of manufacturers engaged in production of such equipment and be manufacturer's latest design conforming to Construction Documents. Components by the same manufacturer shall be mechanically and electrically consistent with ratings of installed apparatus. Acceptance or approval is required by authority having jurisdiction. Materials used in fire rated construction and in electrical work shall be UL listed.

E. Hardware and accessory fittings shall be standard sizes designed, intended, or appropriate for the use. Furnish with corrosion protection suitable for the installed atmosphere.

F. Equipment of a similar nature shall be by the same manufacturer.

G. Coordinate space requirements, mounting arrangements, and service connections when substitute equipment is furnished.

1. Before ordering, verify equipment fits assigned spaces and can be moved into position without interference from door clearances, ceiling heights, crane access, and other construction.
2. Be responsible for expenses caused by substitution of equipment used as a basis for design.
3. Maintain clearances for electrical equipment as required by the National Electrical Code (NEC).

PART 3 EXECUTION

3.01 EQUIPMENT INSTALLATION

A. Obtain services of manufacturers' authorized representatives of major ventilating, air-conditioning, electrical, and plumbing equipment at job site during erection or construction of their equipment to insure proper installation. Failure to have such checks by manufacturers authorized representatives shall place full responsibility for proper installations on Contractor who shall make any corrections at no additional cost to the Owner.

B. Where necessary to meet space conditions, bring equipment to its ultimate location disassembled and assemble in place. Provide flanges, studs, and the needed accessories for matching, alignment, and field assembly.

C. Conduct field tests of equipment during and after assembly under direct supervision of manufacturer's authorized representative. Upon satisfactory conclusion of field tests,

manufacturer shall furnish, for each such apparatus or equipment, a written statement certifying there has been no invalidation of any warranties nor impairment of capacity or functioning of equipment. Field tests shall be in addition to factory tests, shop tests, and adjustments.

D. Avoid field assembly wherever possible by suitable scheduling of the Work.

1. Field assembly of equipment or apparatuses shall not be grounds for extra compensation.

3.02 FABRICATION AND INSTALLATION

A. Workers: Use trained and experienced workers, knowledgeable with the items to be installed and manufacturer's current recommended methods of installation for actual fabrication, installation, and testing of work specified.

B. Welding: Perform welding by certified welders.

1. Perform electric arc welding conforming with American Welding Society standards.
2. Clean each weld layer.
3. Chip out trapped slag and unfused areas before applying nest bead.
4. Visually inspect finished weld for cracks, porosity, or imperfections.
5. If weld contains any defects, repair to satisfaction of A/E.

C. Set equipment level, properly aligned, and assembled. Secure equipment and materials firmly in place. Screws, bolts, nuts, clamps, fittings, and other fastening devices shall be tight.

D. Repair to a new condition or replace materials damaged during delivery, storage, or installation. Touch-up scratched or marred finishes on equipment to match original finish or completely refinish.

E. Enclosures, panels, cabinets, relays, safety switches, fixtures, and other exposed equipment or accessories shall be factory painted or finished as indicated otherwise. Group mounted items shall be similar in finish and color.

F. Make connections for air-conditioning and ventilating equipment and controls. Furnish individually mounted starters, thermostats, firestats, and other control devices as specified.

G. Install and connect starters, contactors, and other similar components including wiring requirements as determined by control wiring diagrams furnished under the Work.

H. Do not cut, weld, or otherwise weaken building structure to ease installation of mechanical or electrical equipment and materials.

I. Support electrical raceways, conduits, light fixtures, piping, and HVAC ducts from overhead structure. Support shall not be from ducts, pipes, conduits or other similar non-structural components.

J. Design and coordinate to safely support suspended electrical and mechanical items on combined support systems.

3.03 SUPPORT ACCESSORIES

A. Provide inserts, anchors, bolts, boxes, sleeves, and hangers for foundations, supports, pads, bases, and piers required for support of equipment, piping, pumps, tanks, compressors, motors, transformers, panels, racks, and other equipment specified.

3.04 EXCAVATION AND BACKFILLING

A. Perform excavation, backfilling, and compaction of trenches required for the installation of mechanical and electrical services, tanks, and underground piping to points of connection with exterior underground utilities outside the building as specified in Section 02221 - Excavating, Backfilling, and Compaction for Utilities.

3.05 SLEEVE BLOCKOUTS, CUTTING AND PATCHING, AND CORING AND DRILLING

A. Sleeves:

1. Provide pipes passing through concrete slabs with sleeves constructed of galvanized sheet steel with lock seam joints of the following minimum gages.

   a. 22 gage for pipes 3 inches and smaller.
   b. 20 gage for pipes larger than 3 inches to 6 inches.
   c. 18 gage for pipes over 6 inches.

2. Provide pipes passing through interior concrete or masonry walls and partitions with Schedule 40 steel pipe sleeves.
3. At pipes subject to expansion and contraction, provide sleeves of sufficient diameter to allow free movement of pipe. Where pipes are insulated, sleeves shall be of sufficient diameter to pass pipe insulation. Measure floor and wall construction and finishes to determine the proper length of sleeves for various locations. Actual lengths shall comply with the following:

   a. Terminate sleeves flush with walls and ceilings and 2 inches above the finished floor in areas where the pipes are concealed.
   b. Extend pipe sleeves 1/4" above finished floor in areas where the pipes are exposed.
   c. Pipes passing through concrete slabs resting on earth or fill shall be integral with the concrete.

4. Extend sleeves according to NFPA, in mechanical equipment rooms and areas provided with fire protection sprinkler systems.
5. The annular space between the pipe or pipe covering in sleeves set in fire walls or floors shall be packed according to the recommendations of NFPA.

B. Blockouts:

1. Blockout areas of concrete or masonry to allow passage of ducts or installation

of boxes.

2. Provide extra reinforcement at sides and corners of concrete in size, quantity, and location not impairing structural performance of wall or slab.
3. Refer to Drawings for lintels above masonry wall blockouts, or if not indicated, consult with A/E.

C. Provide shafts and chases where indicated or needed under work of other Sections.

D. Cutting and Patching:

1. Cut and patch as needed for installation of mechanical and electrical equipment. Perform finish patching according to specifications for each finish, by workers skilled in each type of finish.
2. Install work so no undue cutting and patching will be required in building construction. Do no cutting capable of impairing strength of building construction.
3. Cut and patch as needed for pipes if sleeves and inserts were not installed, or where incorrectly located.
4. Provide for access through structural steel webs by noting number, size, and locations on shop drawing submittal and only as accepted by A/E. Reinforce holes as directed by A/E.

E. Coring and Drilling:

1. If a sleeve is omitted, core drill to allow insertion of a pipe sleeve with sufficient clearance to allow grouting in place with specified backer rod and sealant between the hole and sleeve.
2. When core drilling or cutting duct holes in foundations, walls, beams, columns, or structural slabs, determine the location of reinforcement and tendons before coring.

    a. Core or cut to provide 1-1/2" minimum cover over reinforcing steel or tendons below grade, at exterior or wet locations.
    b. Leave 3/4" minimum cover in dry or interior locations.
    c. If cutting tool comes in contact with reinforcement or a tendon, move to a location where steel will not be cut and patch to provide specified concrete coverage over reinforcement.
    d. Drill overhead concrete slabs from underside.

3. Drill structure as needed to install hangers, anchors, and other supporting devices or fasteners only if inserts have been omitted from the concrete.
4. Holes, except for small screws, shall not be drilled in beams or other structural members, without obtaining prior approval of A/E.

3.06 COVERING OF WORK

A. Do not cover, or otherwise hide from view, ducts, piping, fittings, or any other work before such work has been examined or approved by A/E or other authority having jurisdiction.

B. Remove discovered defective work and replace or correct at no additional cost to the

Owner.

3.07 BELT AND COUPLING GUARDS

A. Provide guards for belt-driven units and at chains, gears, couplings, keys, projecting set screws, and other similar rotating or moving parts.

B. Belt guards shall enclose pulleys and belts on exposed sides.

C. Provide coupling guards on direct-connected units. Design guards for easy service removal.

D. Provide UL listings.

3.08 SETTING AND ALIGNMENT OF EQUIPMENT

A. Furnish templates and patterns for installation of equipment. Furnish setting plans and shop details of adjoining work of other trades.

B. Set unattached electric motors in place under mechanical sections for connection under Division 16.

C. Align fan and motor pulleys and adjust belt tension according to manufacturer's instructions.

D. Level and align pumps and motors on bases and foundation pads according to manufacturer's instructions. Provide recommended tolerances using an indicating micrometer before any piping or electrical connections are made.

1. After connections have been made and before placing pump in operation, recheck levels and alignment.
2. Adjust to ensure thrust is balanced, shaft rotates freely when turned by hand, and pump is quiet in operation.
3. When adjustments are completed, tight-bolt and grout motor and pump.

E. Pumps with Mechanical Seals: Do not operate for testing purposes until systems are filled with water. Replace seals if leaks develop during setup and test at no additional cost to the Owner.

F. Manufacturer's representative, qualified millwright, or qualified machinist shall certify pump alignment. Insert certification of alignment in maintenance and instruction manual.

3.09 NOISE ELIMINATION

A. Design, select, and install electrical equipment to eliminate noise from electromagnetic fields, radio frequencies, and any other types and levels of noise capable of interfering with other audio, video, or radio frequency equipment in building.

3.010 NOMINAL VOLTAGE

A. Advise trades and others furnishing equipment of the nominal characteristics, 120/208 volts or 277/480 volts. Equipment furnished shall be suitable for satisfactory operation at such nominal characteristics, either single phase or three phase wye, as shown on Drawings.

3.011 SOUND ISOLATION

A. Back-to-back boxes, either for power, switches, telephone, or audiovisual are not allowed in walls or partitions.

B. Stagger boxes to avoid sound transmission.

3.012 PIPING, DUCTWORK, AND RACEWAY INSTALLATION

A. Provide clearances under beams and over windows for maximum headroom. Verify locations of lines and types of fittings used to obtain these clearances.

B. Coordinate piping, ductwork, raceway, and lighting trades with each other and with other equipment trades. Where insufficient headroom is provided for work above suspended ceilings or in vertical shafts, obtain clarification and instruction from A/E before installing work.

C. Lines and Levels: Each trade is responsible for calculating and installing levels and slopes of ductwork and piping based on Contractor's reference lines and bench marks.

3.013 WATERPROOFING AND ROOFING

A. Where mechanical or electrical work penetrates building envelope or waterproofed construction, the method of installation shall prevent transmission of water, heat, cold, and drafts.

B. Follow details, including architectural, establishing types of waterproofing construction for each penetration condition.

C. Where a detail suitable to an encountered condition is lacking, request written instructions from A/E.

D. Provide necessary sleeves, sealing, and flashing required to make openings watertight.

3.014 PAINTING AND COATINGS

A. Except for pipe and pipe fittings, deliver equipment not galvanized, copper, bronze, or with a factory applied final finish, to the job site with a factory applied prime coat of paint per manufacturer's standard specifications.

B. Apply one coat of asphaltum or other moisture resistant coatings to coil housings and drip pans. Coat insides of drip pans with 2 coats of asphaltum.

C. Provide buried steel pipes and conduit with 2 coats of asphaltum.

3.015 DRIP PANS

A. Examine the Drawings and coordinate the final location of electrical equipment to be installed near piping.

B. Do not locate overhead piping within 2 feet of vertical lines to electric motors, controllers, switchboards, panelboards, or other similar electrical equipment.

1. If installation of piping does not allow such clearances, relocate piping.
2. Where a 2-foot clearance cannot be attained, provide gutters beneath piping. Make gutters watertight. Securely suspend gutters and pitch to a convenient point for drainage. Provide 3/4" copper drain with valve to nearest floor drain or service sink.
3. In place of separate gutters, a continuous protection sheet of 0.025" thick sheet aluminum, adequately supported, braced, properly rimmed, pitched, and drained, shall be provided over electrical equipment, extending 2 feet beyond equipment footprint.

3.016 EXISTING CONDITIONS

A. Work shall be according to the specifications and Drawings and to the complete satisfaction of the Owner and A/E. Materials and patching required to make project complete shall match existing where applicable. Leave alterations and construction in new condition.

B. Items to be reused according to Construction Documents, temporarily removed, or de-energized shall be accomplished without damage. Equipment shall be maintained, if required, and returned to its original operating condition.

C. Perform alterations, demolition, removal, cutting and patching, and other work necessary for construction without additional cost to the Owner. This includes removal, rerouting, etc. of electrical items required to complete installation.

D. Patch or replace damaged floors, walls, ceilings, and other finished surfaces altered to accommodate the new construction. Patched surfaces shall match existing adjacent surfaces.

E. Coordinate cutting, patching, demolition, repairing, or replacement of work.

F. Where alterations take place in occupied areas, clean up daily. Keep noise to a minimum.

G. Do not disrupt services to existing buildings in any way except with the written permission of the Owner.

H. Reroute conduits and extend or replace circuits as required.

I. Execute Work to avoid interference with the use of passage to and from adjoining buildings or areas.

J. Be fully responsible for any damage to existing buildings and contents including machinery, furniture, and equipment due to operations. Repair or replace any damages with the direction of A/E at no additional cost to the Owner.

K. Connection to existing structures shall be made as quickly as possible, and coordinated fully with the Owner in connection with the convenience and safety of all persons involved, including employees.

END OF SECTION

SECTION 01045

CUTTING AND PATCHING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Cutting, fitting, patching, excavation, and backfill as required to complete the Work.

B. Related Sections:

1. 01800 – Recycling and Diversion of Construction Waste from Landfill
2. 02072 – Removals.
3. 02200 - Earthwork.
4. 04530 - Masonry Patchwork.
5. 06100 - Carpentry.
6. 10200 - Wall Louvers.
7. Mechanical - Division 15.
8. Electrical - Division 16.

1.02 SUBMITTALS

A. Written Request:

1. Submit a written request to A/E before any cutting or alteration affecting:

a. Work of other general contractor hired by the Owner.
b. Structural value or integrity of any element of the Work.
c. Integrity of weather-exposed or moisture-resistant elements or systems.
d. Efficiency, operational life, maintenance, or safety of building elements.
e. Visual qualities of sight-exposed elements.
f. Security of facility.

2. Written request shall include:

a. Identification of the Work.
b. Description of proposed work:

1) Scope of cutting, patching, alteration, or excavation.
2) Trades executing the work.
3) Products proposed to be used.
4) Extent of refinishing to be done.

c. Description of affected work.
d. The need for cutting, alteration, or excavation.
e. Effect on work of any separate contractor.
f. Effect on structural or weatherproof integrity of the Work.
g. Alternatives to cutting and patching.
h. Written permission of any separate contractor whose work will be

affected.

i. Date and time the Work will be uncovered.

j. Date and time the Work shall be completed or restored.

1.03 INSPECTION

A. Inspect existing conditions of the Work, including elements subject to damage or to movement during cutting and patching.

1. After uncovering work, inspect conditions affecting installation of products or performance of work.
2. Report unsatisfactory or questionable conditions to A/E in writing. Do not proceed with the Work until A/E has provided further written instructions.

1.04 PREPARATION

A. Provide adequate temporary support as necessary to ensure structural integrity of the Work.

B. Provide devices and methods to protect other portions of the Work from damage.

C. Provide protection from elements for portions of the Work exposed by cutting and patching work. Maintain excavations free from water.

1.05 PERFORMANCE

A. Execute cutting and demolition by methods preventing damage to other work and providing proper surfaces to receive installation of new work.

1. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes:

a. For continuous surfaces, refinish to nearest intersecting plane.

b. For an assembly, refinish entirely.

B. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances, and finishes.

C. Restore temporarily cut or removed work.

D. Fit work airtight to pipes, sleeves, ducts, conduit, and other penetrations.

E. Excavate and backfill using methods preventing settlement or damage to other work.

F. Restore work in a timely manner coordinated with the A/E and the Owner.

END OF SECTION

SECTION 01050

FIELD ENGINEERING

PART 1 GENERAL

1.01 SUMMARY

A. Related Sections:

1. 01410 - Testing Laboratory Services.
2. 01700 - Contract Closeout.

1.02 SUBMITTALS

A. Name and address of a Florida registered professional engineer or Florida registered land surveyor to A/E.

B. On request of A/E, submit documentation to verify accuracy of field survey work.

C. Written certification signed by Florida registered professional engineer or Florida registered land surveyor verifying elevations and locations of improvements are in conformance or non-conformance with Construction Documents.

1.03 QUALITY ASSURANCE

A. Qualifications of Engineer or Surveyor: Florida registered professional engineer or Florida registered land surveyor, acceptable to A/E and the Owner.

PART 2 NOT USED

PART 3 EXECUTION

3.01 PROJECT SURVEY REQUIREMENTS

A. Establish a minimum of 2 permanent benchmarks on the site referenced to data established by survey control points.

1. Record locations, with horizontal and vertical data, on Project Record Documents.

B. Establish lines and levels. Locate and lay out by instrumentation or by similar means for the following:

1. Site Improvements:

a. Stake for grading, fill, and topsoil placement.

C. Verify layouts by same methods periodically.

3.02 SURVEY REFERENCE POINTS

A. Existing horizontal and vertical control points for the Project are designated on Drawings.

B. Notify the A/E, in writing, of discrepancies between actual measurements and those in Construction Documents.

1. Do not proceed with the Work until written instructions involving the discrepancies have been received from A/E.
2. Contractor shall be responsible for any loss or damage when proceeding with the Work before consulting A/E.

C. Locate and protect control points before starting site work, and preserve permanent reference points during construction.

1. Do not change or relocate control points without prior written notice to A/E.
2. Report to A/E when reference point is lost or destroyed, or requires relocation because of accepted changes in grades or locations.
3. Require surveyor to replace lost or destroyed control points and establish replacements based on original survey control.

3.03 FIELD QUALITY CONTROL

A. Records:

1. Maintain a complete, accurate log of control and survey work as the Work progresses.

END OF SECTION

SECTION 01200

PROGRESS MEETINGS

PART 1 GENERAL

1.01 PROGRESS MEETINGS

A. Attend regularly scheduled progress meetings at a time agreed upon by Contractor, A/E, and City of Pompano Beach Construction Management team. Determine meeting times at the preconstruction meeting.

B. Attend meetings scheduled by A/E during the progress of the Work.

C. Location of Meetings:

1. Arrange meetings to be held in Contractor's field office.

D. The following list of suggested agenda items may be incorporated into progress meetings for review or approval as directed by A/E or the Owner.

1. Minutes of previous meeting.
2. Work progress since last meeting.
3. Field observations, problems, and conflicts.
4. Problems impeding the construction schedule.
5. Corrective measures and procedures to regain projected schedule.
6. Revisions to the construction schedule.
7. Off-site fabrication and delivery schedules.
8. Coordination of work for the following work period.
9. Work quality standards.
10. Proposed changes and impact on construction schedule and completion date.
11. Status of Change Orders, Request for Proposals (RFP), and Request for Information (RFI).
12. Other business.

E. Attendance:

1. A/E and A/E's consultants as needed.
2. Contractor or authorized representatives.
3. City of Pompano Beach authorized representatives.
4. Subcontractors as appropriate to the agenda.
5. Manufacturer's representatives or suppliers as appropriate to the agenda.
6. Others as appropriate to the agenda.

PART 2 NOT USED

PART 3 NOT USED

END OF SECTION

SECTION 01312

CONSTRUCTION SCHEDULE CRITICAL PATH METHOD (CPM)

PART 1 GENERAL

1.01 CONSTRUCTION SCHEDULE:

A. The contractor is responsible for creating a baseline schedule and monthly update as specified. The schedule shall be created on Primavera Project Planner Version 2.0 Windows or SureTrak version 2.0 Windows project management software or their latest software version capable of meeting the criteria as specified. Provide a backup copy CD to the A/E for the Owner's use. Baseline schedule and updates shall separately identify labor, material, and equipment.

B. Within 30 days of contract award, prepare and submit to A/E and the Owner a proposed construction schedule for review. No payments shall be made to Contractor until said schedule has been properly submitted.

C. Schedule Approval:

1. The form and content of the schedule and reports prepared are subject to the approval of the A/E and the Owner.
2. Any such approval relates only to complying with scheduling specifications and not to construction means and methods.
3. Contractor's invoices shall not be processed until baseline schedule and current update are approved.
4. Schedules and durations of any tasks and labor efforts required to complete them shall have the agreement of the appropriate following, but not limited to, electrical, mechanical, plumbing, structural, plastering, or fire alarm subcontractors.
5. The baseline schedule shall be signed by each of the aforementioned subcontractors indicating agreement with the durations.

    a. Those listed subcontractors shall be also required to sign the most current schedule update starting one month before their mobilization on the job site, indicating their agreement or disagreement with that current updated schedule.
    b. Failure of a subcontractor to agree with this schedule shall serve as notice to the Contractor of potential schedule difficulties.
    c. Under no circumstances shall the disagreement by a subcontractor be cause for excusable or compensable delay for the Contractor. The full responsibility for completing the project on time remains with the Contractor.

D. Critical Activity Flags/Milestones:

1. Contractor shall identify project flags or milestones occurring at the completion of significant events including, but not limited to, the building code inspections (BCI) or other inspections, completion of major systems or assemblies, or substantial or partial completion dates for each area.
2. Flags shall occur at appropriate intervals of approximately each month.

3. The flags shall be located on the critical path and be incorporated into the baseline, all targets, and the current schedule.
4. A flag for Contract Award will have an Activity ID of 00040V.
5. Each succeeding flag will increment the last two digits by one.
6. No flag will have an activity ID higher than 00099V.
7. Flags will be the first grouping to appear on any schedule layout.

E. Resource Dictionary:

1. Resource crews will be loaded into the resource dictionary by CSI divisions.
2. Each trade crew will be identified by a CSI related crew code consisting of the first 3 digits of the appropriate CSI code for the work being performed.
3. The type of resource will be identified as follows, LAB = Labor, MAT = Material, and EQU = Equipment. (I.e., 010LAB for General Conditions, 022LAB for Earthwork, 033LAB for Concrete, etc.)
4. Each resource crew or equipment type will have reasonable resource limits as established by the appropriate subcontractor as to the normal and maximum number of resources available per day (Labor = Person days, Material = Units, Equipment = Units). Resource budgeted quantities and units per day shall be established for each task and each resource set as a driving resource so the duration of the task is dependent on the quantities assigned.
5. A forward leveled resource run is required for baseline acceptance, proving the defined resources can complete the project/phases at the required time.
6. The contractor's superintendent shall use resource loading reports to insure appropriate numbers of subcontractor personnel are available as work progresses on the project.

F. Cost Accounts:

1. Cost Account Numbers may be established using the appropriate 5 digit CSI number and a cost category code (L=Labor, M=Material, E=Equipment, O=Other).

G. Activity Codes:

1. The following table identifies the Owner’s required activity codes. The contractor may use additional codes for its own requirements.

ACTIVITY ID#	NAME	LENGTH	DESCRIPTION
1	CSI	3	CSI Code
2	STEP	2	Increment to make CSI Unique.
3	BLDG	1	Building/Area
4	SUBA	4	Sub Area/Floor

ACTIVITY CODE#	NAME	LENGTH	DESCRIPTION
1	PHAS	1	Phase
2	DIV	2	CSI Division
3	PROJ	8	Project Number
4	RESP	2	Responsible Party

5	CRIT	1	Critical Flag or Milestone
6	TYPE	1	Task Type

H. Schedule Content:

1. Whenever there is a logical inconsistency in the schedule content, such as insufficient resources to complete tasks within the allotted time, mandatory date constraints that override logical constraints, out of sequence progress, etc., correct the schedule to eliminate the inconsistency.
2. All imposed constraints shall be explained by a log entry in the appropriate task.
3. All tasks are to be scheduled as early as possible unless specific tasks are required to be scheduled otherwise.

1.02 DETERMINATION OF FINAL CONSTRUCTION SCHEDULE

A. Contractor shall identify on the schedule:

1. Any consideration given for working other than normal working hours.
2. Work required by others that impact the contractor's efforts.

B. Any such impacts must be approved in writing by the Owner.

1.03 INITIAL INPUT DATA AND UPDATE

A. Provide initial input data and update monthly to A/E relating to actual work activities accomplished for forecasting future work activities and durations.

1. Report problem areas to A/E, including current, unresolved or anticipated delay factors and impact on other activities and what control steps are being taken or planned.
2. Review monthly progress and recommend ways to improve schedule or anticipate delays and safety problems.
3. Inform and update participants of revisions to construction schedule.
4. Submit revised schedule each month concerning future construction activities.
5. All reports submitted to the Owner, except logic reports, shall be printed on 8.5" x 11" paper and bound into a completed report with cover page identifying project number, project description, project name, and contractor according to 1.10.
6. The bound report, to be submitted in support of the Contractor's Requisition for payment, shall include:

   a. Contractor's narrative report.
   b. Copy of Contractor's requisition for payment.
   c. All required scheduling reports.

1.04 CPM TASKS REQUIRED

A. CPM schedule shall contain between 1500 and 2500 detail tasks, including submittal/approval/fabrication tasks and shall account for the entire duration of the

allocated contract time. Early completion shall not entitle Contractor to acceleration.

1. The Owner may require the addition of up to 100 tasks into the schedule and reports in addition to the tasks that are the responsibility of the Contractor.
2. Activities relating to the project's total duration, such as General Conditions or supervision, will be established as a hammock type so earned value will always equate to percentage completion of the entire project.
3. Each updated schedule will be displayed in Contractor's Field office in monthly update bar chart format according to 1.07 A.4.
4. Adjustments to phasing requirements will be reflected in subsequent schedule updates, at no cost to the Owner.
5. The baseline schedule and all monthly updates shall delineate a continuous critical path, through detail construction work items, from the data date to the completion of the project.

B. Schedule long lead time and special fabrication items and provide appropriate selection codes incorporated into each item to include, as a minimum, the following categories:

1. Submittal.
2. Approval.
3. Fabrication/Delivery.
4. Installation.

C. Code each task to allow selection for preparation of or exclusion from any given set of reports. All reports after the initial reports shall have the submittal, approval, and fabrication tasks segregated from the installation tasks, at the discretion of the Owner.

D. Installation tasks shall be cost loaded to include the cost of equipment (RESOURCE code = xxxEQU), cost of materials (RESOURCE code = xxxMAT), installed and cost of labor (RESOURCE code = xxxLAB).

1. The person hours required to complete the task must be inserted as budgeted quantity (Resource Code = xxxLab) and the units per time period and driving resource must be completed.
2. The costs are the Owner's costs and shall tie to the schedule of values approved by CSI division.

E. Schedule all BCI tasks and tasks identifying the production monthly reports.

F. Schedule task to have a maximum original duration of 20 days except for procurement tasks that may be 30 days without including a follow up task.

G. Schedule tasks identifying the production of monthly updating reports.

H. Schedule tasks in working days (5 working days per week) and in precedence format.

I. Include verbs in task descriptions to describe the action taken. For example, use "Install lighting fixtures" instead of "Light fixtures".

1.05 ACTIVITY (TASK) CODES

A. Code each tasks to minimally define (See Section 1.01 H):

1. Area of Work.
2. Applicable CSI division.
3. Party responsible for performing.
4. Area of work including building and floor, if applicable.
5. Phase of project as defined by specifications.
6. Task type, identifying:

   a. Submittals.
   b. Approvals.
   c. Fabrication/Delivery.
   d. Installation.
   e. Administrative.
   f. Other.

7. Critical Flags and Milestones (see 1.01 E).

1.06 SCHEDULES

A. Designate the original properly submitted schedule as the baseline schedule. Produce a schedule that is updated monthly and referred to as the current schedule. Show in a single report, the baseline and current schedules (see 1.07 A.4).

B. Each update shall include identification of the actual start and actual finish dates and remaining duration of all tasks started.

C. Each approved change order shall be reflected in the current schedule and will update the previous baseline or target schedule. For example, Change Order 1 when reflected in the baseline will create Target 1 (updated baseline including Change Order 1), Change Order 2 will create Target 2, et cetera.

D. Reports requiring comparison between the current schedule and target (updated baseline) will use the most recent target schedule unless directed otherwise.

E. Primavera's 4 digit project name will be supplied to Contractor by the Owner for both the baseline and current schedules. These names will remain consistent throughout the life of the project. Each target and each monthly update of the current schedule shall be backed up on 3.5" diskettes and appropriately labeled and retained until completion of the project and final payment. Supply a copy of each diskette on a monthly basis to the Owner monthly, with the requisition for payment. The requisition number and data date will be inserted in the "Number/Version" field in this format: 01-3/15/97.

F. Each monthly update shall be reviewed for "out of sequence progress" and if logic errors exist, they shall be corrected either by physical adjustment, or by using "progress override" method of scheduling.

1.07 GRAPHIC REPORTS

A. Reports shall be by area and sub-area of work. In addition to the reports specified below, the Owner may request a special report(s) to clarify the status of work or logic of construction.

1. Baseline Network Logic Report:

a. Show all tasks grouped by area, including task number, description, original duration, early start and finish, and total float. This report is required to review the underlying logic sequence and dependencies of the various tasks. A similar report is required for each proposed change order to determine the change order's impact.
b. Prepare on 24" x 36" paper.

2. Detailed Time Logic Chart (if required by A/E and/or Owner):

a. Initial Detailed Time Logic Chart grouped by area showing:

1) Activity numbers.
2) Description of activity.
3) Total float.
4) Duration.
5) Prepare on 24" x 36" paper.

3. Initial S-Curves:

a. An S-Curve of Early and Late Dates including the costs of all tasks that total to the contract price.
b. Prepare on 8.5" x 11" paper.

4. Monthly Update Bar Chart:

a. A bar chart comparing current progress to the most recently approved target schedule.
b. Print on color printer or adjust Primavera grayscale so all shades are readable and meaningful.
c. Sort the chart by area, early start date, and show the activity ID, original duration, percent complete, total float, baseline late finish, current early finish, budgeted cost, earned value in the tabular portion, and activity description in the bar portion.
d. Prepare on 8.5" x 11" paper.

1.08 TABULAR REPORTS

A. Furnish the following reports as initial reports from the baseline schedule and with each required payment request from the current schedule. Unless otherwise specified or revised by the Owner. Organize reports by area of activity and sub-sorted by early start date.

1. Schedule Report:

a. List the current status of all activities, sorted by activity number from

lowest to highest and not by area.

b. Prepare on 8.5" x 11" paper.

2. Total Float Report:

a. List all uncompleted activities sorted by total float and then by early start date.

b. Prepare on 8.5" x 11" paper.

3. Earned Value by CSI/Task:

a. Show the total budget and earned amounts this period and to date for each task. Payment requests will be verified from this report. Amounts shall correspond to the schedule of value identified in General Conditions, paragraph 9.2.1. Report shall be organized by area unless otherwise requested.

b. Prepare on 8.5" x 11" paper.

4. Cost Summary by CSI Division:

a. Show division, description, percent complete, construction amount, earned to date, earned this period, balance to complete, and retainage.

b. Prepare on 8.5" x 11" paper.

1.09 NARRATIVE REPORT

A. A narrative report shall be included in each bound report and submitted with each payment requisition.

B. The purpose of the narrative report is to accurately inform the Owner of the current status of the project, any future anticipated problems, delaying factors, and explanation of any corrective actions taken or proposed to mitigate the problems or delays.

C. If the initial run of any monthly update of the schedule results in negative float, (delay in projected completion date of any phase or final completion) and the project delay can be mitigated by adjusting the schedule through changes in logic or reducing durations of critical items, Contractor may make those changes before the submission of schedule reports provided:

1. A detailed explanation of the amount of negative float and schedule corrective action is included in the narrative report.
2. Changes in duration are realistic and supportable by historic productivity and quantity analyses, if requested by the Owner.
3. Logic changes are consistent with standard industry practices.
4. A copy of the original total float report, showing only those activities with negative float, is included in the volume of bound reports, along with the entire revised total float report.

1.010 SEQUENCE OF BOUND REPORTS

A. Bound reports presented in support of a requisition for payment shall be inserted in

the following sequence:

1. Cover page identifying project location, project number, contractor, requisition number, date.
2. Narrative report.
3. Requisition summary (see 1.08 B.4.)
4. Monthly update bar chart (see 1.08 A.4).
5. Total float report (see 1.08 B.2).
6. Earned value by CSI (see 1.08 B.3).
7. Schedule report (see 1.08 B.1).

END OF SECTION

SECTION 01340

SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Shop drawings, manufacturer's catalog cuts, product data, samples, and attached Shop Drawing/ Catalog Cut Submittal form necessary to satisfy requirements specified.

B. Related Sections:

1. 01310 -Construction Schedule Critical Path Method (CPM).
2. 01600 - Material and Equipment.
3. 01700 - Contract Closeout.
4. 01740 - Warranties.
5. 01900 – Regional Materials
6. 01910 – Special Environmental Requirements
7. 01920 – Construction Indoor Air Quality Management Plan
8. 01930 – Recycled Materials

1.02 DATES FOR SUBMISSION AND REVIEW

A. Designate in the CPM the dates for submission to A/E and review completion dates needed for shop drawings, product data, and samples to maintain the project schedule.

1.03 SHOP DRAWINGS/MANUFACTURER'S CATALOG CUTS

A. Shop Drawings: Submit 6 prints for each required shop drawing. One copy will be returned to the Contractor upon completion of review.

1. Identify each shop drawing with the following information placed on each drawing:

a. Name of the facility.
b. Name of project at the facility.
c. Owner's project number.
d. Name of company submitting the shop drawing.
e. Date of drawing.

2. Provide two (2) blank space 6 inches wide by 4 inches high in the lower right corner of each shop drawing page for the A/E's shop drawing stamp.

B. Manufacturer's Catalog Cuts: Submit 4 copies of each catalog cut or 4 edited catalogs.

C. The Shop Drawing/Product Data Submittal form contained in this specification section shall be attached to each required shop drawing, manufacturer's catalog cut, or other

product data.

D. Submittal of Samples, Color Charts, Color Chips, or Color Samples for Selection and Coordination:

1. Submit 6 copies of all material color charts, color chips, or color samples at time of shop drawing / manufacturer data submittal for A/E verification.
2. Where architectural precast or poured-in-place architectural concrete is required, submit at least 2 architectural concrete finish color and texture samples.
3. Where exposed unpainted concrete masonry units are specified, submit at least 2 sets of masonry samples in manufacturer's full color range.
4. Where roofing tiles or shingles are specified, submit at least 2 sets of finish colors and texture samples.

E. Prints, samples, and color charts shall be at the expense of Contractor.

F. Submit all color selection materials for complete coordination of color scheme. No individual color selections will be approved before receipt of all the colors.

1.04 SUBMITTAL IDENTIFICATION

A. Submit only 1 item or system per letter of transmittal properly identified to include the appropriate specification section and section paragraphs.

B. When shop drawings, edited catalog cuts of components, product data, diagrams, or charts are submitted with more than 1 type of specified product, identify the particular item, including options, intended for use in the Work.

C. Re-submittals shall be identified with original shop drawing number and followed with a dash (-) and a letter A, B, etc. corresponding to the re-submittal sequence.

1.05 SUBMITTAL COMPLETENESS

A. Submit catalog sheets, product data, shop drawings, material samples, color chips, color charts, test data, and warranties at the same time for each item.

1. Submit shop drawings with appropriate data and with the Drawing identification mark numbers as shown, specified, or scheduled.

2. Shop drawings without identification mark numbers or with incomplete performance information will not be reviewed until submission is complete.

1.06 PREPARATION

A. Clearly mark each submittal to identify each appropriate product or model.

B. Show performance characteristics and capacities.

C. Show dimensions and clearances required.

D. Show wiring or piping diagrams and controls.

1.07 IDENTIFICATION

A. Identify details by reference to sheets and details, schedules, or room numbers as shown on Drawings.

B. Manufacturer's standards, schematic drawings, and diagrams:

1. Modify drawings and diagrams to delete information not applicable to the Work.
2. Supplement standard information to provide information specifically applicable to the Work.

1.08 SAMPLES

A. Submit samples of sufficient size and quantity to clearly illustrate:

1. Functional characteristics of product, integrally related parts, and attachment devices.
2. Full range of color, texture, and pattern.

1.09 FIELD SAMPLES AND MOCK-UPS

A. Erect at project site, at a location acceptable to the A/E.

B. Size and Area: As shown on Drawings or specified in respective specification section.

C. Fabricate each sample and complete as acceptable to A/E.

D. Remove mockups at completion of work and when acceptable to A/E.

1.010 CONTRACTOR RESPONSIBILITIES

A. Review shop drawings, catalog cuts, product data, and samples before submission. Determine and verify:

1. Field measurements.
2. Field construction criteria.
3. Catalog numbers and similar data.
4. Conformance with Construction Documents.

B. Coordinate each submittal with requirements of the Work and of Construction Documents.

C. Notify the A/E, in writing at time of submission, of any deviations in submittals from requirements of Construction Documents.

D. Shop drawings shall be stamped, approved, and signed by the Contractor before submittal to A/E, otherwise they will be sent back to the Contractor without being processed by the A/E.

E. Do not ship apparatus or equipment from stock or fabricate until shop drawings have been reviewed and approved by A/E.

F. Always maintain and have available for reference a field copy of accepted shop drawings at the job site.

PART 2 NOT USED

PART 3 NOT USED

END OF SECTION

CITY OF POMPANO BEACH
GOLF COURSE SHELTER & RESTROOM RENOVATION PROJECT

SHOP DRAWING/CATALOG CUT SUBMITTAL No. ____

Date:		**Project Name:**	
Prime Contractor:		**Prime Contractor Project No.:**	
Project No.:		**Review No.:**	
Specified Item or Substitution:		**Prime Contractor:**	
Specification Section:		**Sub-Contractor:**	
Manufacturer:		**Supplier:**	
Submittal Description:			

REVIEW COMMENTS:

Contractor Review Stamp:

☐ NO EXCEPTION TAKEN ☐ APPROVED AS NOTED
☐ AMEND & RESUBMIT ☐ REJECTED

REVIEW IS FOR GENERAL CONFORMANCE WITH THE DESIGN CONCEPT AND CONTRACT DOCUMENTS, MARKINGS AND/OR COMMENTS SHALL NOT BE CONSTRUED AS RELIEVING THE SUPPLIER OR SUBCONTRACTOR FROM COMPLIANCE WITH THE PROJECT PLANS AND SPECIFICATIONS, NOR DEPARTURES THEREFROM. THE CONTRACTOR REMAINS RESPONSIBLE FOR DETAILS AND ACCURACY, FOR CONFIRMING AND CORRELATING ALL QUANTITIES, JOB CONDITIONS AND DIMENSIONS FOR SELECTING FABRICATION PROCESSES, FOR TECHNIQUES OF ASSEMBLY AND CONSTRUCTION, AND FOR PERFORMING HIS WORK IN A SAFE MANNER.

SIGNED: _____ **DATE:** _____

SECTION 01410

TESTING LABORATORY SERVICES

PART 1 GENERAL

1.01 TESTING LABORATORY

A. The Owner will employ and pay for the services of an independent testing laboratory to perform specified testing as noted in various Specification sections.

1. Contractor shall cooperate with laboratory to perform its required services.
2. Employment of laboratory shall not relieve Contractor's obligations to perform the Work.

1.02 LIMITATIONS OF AUTHORITY OF TESTING LABORATORY

A. Laboratory is not authorized to:

1. Release, revoke, alter, or expand requirements of Construction Documents.
2. Approve any portion of the Work.
3. Perform any duties of the Contractor.

1.03 CONTRACTOR'S RESPONSIBILITIES

A. Cooperate with laboratory personnel and provide access to work or manufacturer's operations.

B. Secure and deliver to the laboratory adequate quantities of representative samples of materials requiring testing.

C. Furnish copies of products test reports as required to A/E.

D. Furnish incidental labor and facilities:

1. To provide access to work to be tested.
2. To obtain and handle samples at project site or at source of product to be tested.
3. To facilitate inspections and tests.
4. For storage and curing of test samples.

E. Notify the Owner before testing operation to allow for laboratory assignment.

1.04 AUTHORIZATION FOR TESTS

A. A/E will designate tests to be performed and Contractor shall not obligate the Owner for tests without A/E's acceptance.

1.05 TESTING COSTS PAID BY THE OWNER

A. Tests of various materials, methods, and equipment are required by the Owner and

will be performed by the Owner's Testing Laboratory.

B. The Owner will only pay for initial Owner required tests of materials, methods, and equipment to verify compliance with Construction Documents.

1.06 TESTING COSTS PAID BY CONTRACTOR

A. Tests:

1. Specified tests of Work with non-compliance results shall be retested at no cost to the Owner until satisfactory compliance is achieved.
2. Not Specified in Construction Documents: Tests determined by Contractor to be of Contractor's benefit and ordered by Contractor, shall be paid by Contractor.
3. Contractor's Option: Contractor may employ the Owner's testing laboratory or may employ a separate, equally qualified independent testing laboratory, acceptable to the Owner and A/E, to perform additional inspections, sampling, and testing the Contractor has determined to be of Contractor's benefit or obligated to perform due to failure of specified initial testing.

B. Contractor shall furnish gas, water, electricity, and expendable chemicals as necessary for construction and testing purposes.

C. If substitute materials or equipment are proposed by Contractor, Contractor shall pay testing costs deemed necessary by the A/E to satisfy the A/E and Contract Documents.

PART 2 NOT USED

PART 3 NOT USED

END OF SECTION

SECTION 01510

TEMPORARY UTILITIES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Provision and maintenance of temporary utilities required during construction and removal upon completion of Work.

B. Related Sections:

1. 01010 - Summary of Work.
2. 01590 - Field Offices and Sheds.
3. 01800 – Recycling and Diversion of Construction Waste from Landfill
4. Division 15 - Mechanical.
5. Division 16 - Electrical.

1.02 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:

1. Comply with Federal, State, and local codes and regulations.
2. Comply with National Electrical Code 1999.
3. Comply with utility companies' requirements.

1.03 SITE CONDITIONS

A. Regardless of location or extent of distance, either on or off the project site, provide water, power, sewer, and other required utilities at the project site.

PART 2 PRODUCTS

2.01 MATERIALS

A. Materials may be new or used and shall comply with the following:

1. Be adequate in capacity for the required usage.
2. Must not create unsafe conditions.

B. Temporary Electricity and Lighting:

1. Arrange with utility company to provide service required for power and lighting. Pay all costs for service and power used.
2. Install circuit and branch wiring, with area distribution boxes located to provide power and lighting throughout the construction with construction type power cords.
3. Provide adequate artificial lighting for all areas of Work when natural light is not adequate for work and for areas accessible to the public.

C. Temporary Air-conditioning and Ventilation:

1. Provide air-conditioning and ventilation as required to:

   a. Maintain adequate environmental conditions to facilitate progress of the Work.
   b. Meet specified minimum conditions for the installation of materials.
   c. Protect materials and finishes from damage due to temperature or humidity.
   d. Contractor shall follow all provisions of Division 01920 Construction Indoor Air Quality Management Plan.

2. Provide adequate forced ventilation of enclosed areas for curing of installed materials, to disperse humidity, or to prevent hazardous accumulations of dust, fumes, vapors, and gases.
3. Pay costs of installation, maintenance, operation, removal, and for fuel consumed.

D. Temporary Telephone Service:

1. Arrange with local telephone company to provide direct line telephone service at the construction site for the following:

   a. One direct line instrument in field office.
   b. One direct line instrument in field office for the Owner.
   c. Other instruments at the option of the Contractor, or as required by regulations.

2. Pay costs for installation, maintenance, removal, and service charges for local calls. Contractor may bill toll charges to the party who placed the call.

E. Temporary Internet/Data Service:

1. Arrange with local ISP to provide direct internet/data service at the construction site for the following. Service shall be minimum DSL level service. GC shall provide data terminations for computers as noted in Section 01590.

2. Pay costs for installation, maintenance, removal, and service charges for internet/data.

F. Temporary Water:

1. Arrange with utility company to provide water for construction purposes. Pay all costs for installation, maintenance, removal, and service charges for water used.
2. Install branch piping with taps located to provide water throughout the construction with hoses.

G. Temporary Sanitary Facilities:

1. Provide sanitary facilities according to authorities having jurisdiction.
2. Service, clean, and maintain facilities and enclosures.

PART 3 EXECUTION

3.01 GENERAL

A. Maintain and operate systems to ensure continuous services.

B. Modify and extend systems as work progress requires.

3.02 REMOVAL

A. Remove temporary materials and equipment when no longer required.

B. Clean and repair damage caused by temporary installations or use of temporary facilities.

END OF SECTION

SECTION 01520

CONSTRUCTION AIDS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Scaffolds, staging, ladders, stairs, ramps, runways, platforms, railings, hoists, cranes, chutes, and other construction aids and equipment required to facilitate execution of the Work and later removed upon completion of the Work.

1.02 QUALITY ASSURANCE

A. Comply with federal, state, and local codes and standards.

PART 2 PRODUCTS

2.01 MATERIALS

A. Materials may be new or used, and shall suitable for the intended purpose. Comply with requirements of applicable codes and standards.

B. Maintain facilities, materials, and equipment in a first-class condition.

PART 3 EXECUTION

3.01 PERFORMANCE

A. Review site conditions, adjacent properties, and other factors influencing or affected by construction procedures and construction aids.

B. Comply with applicable requirements specified in other sections.

C. Relocate construction aids as required by progress of construction, storage requirements, or to accommodate requirements of the Owner or other contractors employed at the site.

D. Remove construction aids when construction needs are met by use of permanent construction or at completion of project.

E. Repair damage caused by installation and use of construction aids.

F. Remove foundations and underground installations installed for construction aids.

END OF SECTION

SECTION 01530

BARRIERS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Suitable barriers required to prevent public entry and to protect Work, existing facilities, and landscaping from construction operations, and barrier removals when no longer needed or at completion of Work.

1.02 QUALITY ASSURANCE

A. Comply with applicable federal, state, and local codes and standards.

PART 2 PRODUCTS

2.01 MATERIALS

A. New or used, suitable for the intended purpose and complying with requirements of applicable codes and standards.

B. Fencing: Open-mesh materials per Contractor's option and a minimum height of 6'-0". Construct open-mesh fences according to industry standards.

C. Other Barriers: Materials per Contractor's option and as appropriate to serve the required purpose.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install barriers in a neat and uniform appearance.

B. Maintain barriers as needed during construction period.

C. Relocate barriers as required by progress of construction.

D. Fences:

1. Before starting work at the site, install enclosure fence with suitable locking entrance gates.

a. Locate fences to enclose construction areas and construction staging area.
b. Provide vehicular entrance gates in suitable locations to construction and existing facilities. Avoid interference with traffic patterns.
c. Locate pedestrian entrance gates as required to provide controlled

personnel entry.

3.02 REMOVALS

A. Remove barriers, including foundations, when construction has progressed to the point when barriers are no longer needed and when approved by A/E.

B. Clean and repair damage caused by installation or removal of barriers.

END OF SECTION

SECTION 01600

MATERIALS AND EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: General requirements for delivery, storage, handling, and installation of products and Contractor's options in selecting products and requesting substitutions.

1.02 SUBMITTALS

A. Products Listed: Within 45 days after contract award date, submit to A/E a complete list of specified products to be provided, with names of manufacturers and installing subcontractors.

B. Provide shop drawing submittals as per Section 01340.

C. Manufacturer's Instructions: Comply with manufacturer's printed installation instructions and manufacturer’s Materials Safety Data Sheets (MSDS). Obtain and distribute copies of such information to parties involved in installation, including 3 copies to A/E.

1. Maintain 1 set of complete instructions and 1 set of MSDS at the job site during installation and until project completion.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Arrange deliveries of products according to construction schedules. Avoid conflicts with work and site conditions.

1. Schedule product delivery for minimum storage time at the site.

B. Products shall be delivered in undamaged condition, in manufacturer's original containers or packaging, and with identifying labels intact and legible.

C. Immediately upon delivery, inspect shipments to ensure compliance with Construction Documents and approved submittals. Verify products are undamaged.

D. Handle products without soiling or damaging.

E. Storage and Protection:

1. Store products according to manufacturers printed instructions, with seals and labels intact and legible.
2. Store products prone to damage by elements in weathertight enclosures.
3. Maintain temperature and humidity within range required by manufacturer's instructions.
4. Store products aboveground, on blocking, or skids to prevent soiling or staining.

5. Cover products prone to deterioration with waterproof covers and provide adequate ventilation to avoid condensation.
6. Store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter.
7. Arrange storage to provide easy access for inspection. Inspect stored products periodically to ensure products are maintained under specified conditions and are free from damage or deterioration.
8. Product storage shall be as per SMACNA IAQ Guidelines for Buildings Under Construction.

F. Protection After Installation: Protect installed products from damage. Remove coverings when protection is no longer needed.

1.04 OWNER'S INSTRUCTIONS

A. Contractor's Options:

1. Where products are specified by reference standard only, select any product complying with the requirements of the standard.
2. Where products are specified by naming two or more products or manufacturers, select one of the products or manufacturers named.

   a. For products specified by naming two or more products or manufacturers without the words "or accepted equivalent" or similar language, a substitution option does not exist.

3. For products specified by naming only one product or one manufacturer, and the words "or accepted equivalent" or similar language, any product submitted as an equivalent shall be treated as a substitution to be submitted for consideration only after award of the contract.

   a. For products specified by naming only one product and manufacturer without the words "or accepted equivalent" or similar language, a substitution option does not exist.

B. Product Substitutions: For a period of 45 days after contract award date, A/E will consider written requests from Contractor for substitution of products according to the General Conditions.

C. A request for substitution of a product may be submitted to the A/E after the Contractor:

1. Has investigated the proposed product and determined it is equal or superior to the specified product.
2. Agrees to provide same or better warranty for product substitution as for product specified.
3. Agrees to be responsible for coordinating and installing the substitution.
4. Agrees to pay for any necessary changes to other work required by the substitution selected by Contractor.
5. Agrees to pay costs, including A/E's services required to revise the Construction Documents to make the work complete.

6. Waives all claims for additional costs that may subsequently become apparent due to the substitution.
7. Is offering either a substantial credit to the Owner for acceptance of the substitution or a convincing justification that the product to be provided as the substitution is substantially superior in quality, performance, compatibility with adjacent products, durability, vandal-resistance or other important factors.

D. After the period of 45 days has elapsed, the only substitution requests allowed are for the removal of the specified products from the marketplace or natural catastrophes and other similar acts of God.

1. Scheduling conflicts are not grounds for substitution requests.

PART 2 PRODUCTS

2.01 MANUFACTURED AND FABRICATED UNITS

A. Fabricate and assemble according to referenced standards and approved shop drawings.

B. Manufactured related parts of duplicate units to standard sizes and gages shall be interchangeable.

C. Match similar items by one manufacturer.

D. Do not use material or equipment for other than designated or specified purpose.

PART 3 EXECUTION

3.01 INSTALLATION

A. Handle, install, connect, clean, and adjust products according to manufacturers' instructions and specifications.

1. If job conditions or specified requirements conflict with manufacturer's instructions, notify A/E. Do not proceed with the work until A/E issues clarification.

3.02 FIELD QUALITY CONTROL

A. Upon completion of work and tests, provide necessary skilled labor for operating systems and equipment for 8 continuous hours a day for 3 consecutive days.

B. Notify major subcontractors to be present at inspections with necessary tools and equipment to facilitate easy and safe access to all parts of the buildings and equipment.

END OF SECTION

SECTION 01700

CONTRACT CLOSEOUT

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Fiscal provisions, legal submittals, and administrative requirements.

B. Closeout Submittals Required of Trades: In respective specification sections and as specified in this section.

1.02 RECORD DOCUMENTS

A. Record Drawings:

1. Keep accurate notes on Record Drawings of Work as installed. Include dimensions of underground lines, their offsets, and valve locations.
2. Maintain the set of Record Drawings apart from those used for construction.
3. Mark each page of the Record Drawings with the words "RECORD DRAWINGS" in neat, large printed letters.
4. Record information concurrently as Work progresses.

a. Do not conceal any work until the required information is marked on Drawings.
b. Show locations of internal utilities and appurtenances concealed in the construction to visible and accessible features.
c. Show locations of field changes and details not on original Drawings.

B. Record Specifications and Addenda:

1. Mark each section to record manufacturer, trade name, catalog number, supplier of each product, and item of equipment installed.

C. Update record drawings monthly for A/E review of compliance. Non-compliance will be grounds for A/E to note in the certification for payment of such fact. This will be grounds for not processing the Requisition for Payment.

1.03 CONTRACTOR'S CLOSEOUT SUBMITTALS TO A/E

A. Evidence of compliance with requirements of governing authorities and construction documents as noted in various sections.

1. Project record documents.
2. Operating and maintenance data, instructions to Owner's personnel.
3. Warranties and bonds.
4. Record list of various building finishes including tile, carpet, acoustical finish, wall covering, paints and coatings, giving manufacturers' brand names or types and colors used in various locations.
5. Keys: According to requirements of Section 08710 - Finish Hardware.
6. Spare parts and maintenance materials.

7. Evidence of payment and release of liens.
8. Sustainable design documentation as required in appropriate sections.

1.04 FINAL ADJUSTMENTS OF ACCOUNTS

A. Submit a statement of accounting to A/E. Statement shall reflect all adjustments to contract sum and the following:

1. The original contract sum.
2. Additions and deductions resulting from:

a. Previous change orders.
b. Allowances.
c. Unit prices.
d. Deductions for uncorrected work.
e. Penalties and bonuses.
f. Deductions for liquidated damages.
g. Deductions for additional construction review payments.
h. Other adjustments.

3. Total contract sum, as adjusted.
4. Previous payments.
5. Sum remaining due.

1.05 FINAL CHANGE ORDER

A. Prepare a Final Change Order, reflecting approved adjustments to contract sum not made by previous Change Orders.

1.06 FINAL APPLICATION FOR PAYMENT

A. Submit final Application.

PART 2 NOT USED

PART 3 NOT USED

END OF SECTION

SECTION 01730

OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.01 OPERATION MANUALS AND MAINTENANCE INSTRUCTIONS

A. Submit 1 draft copy of complete operating and maintenance manuals to A/E for review within 60 calendar days after acceptance of mechanical and electrical equipment shop drawings. Submit 6 copies of A/E accepted final operating and maintenance manuals for record documents, bound in durable 3 ring binders, acceptable to A/E, with tabs and index at least 5 days before scheduled acceptance inspection.

1. Properly identify and mark manufacturers' Standard literature to clearly define information applicable to installed equipment.

B. Before substantial completion, instruct the Owner's authorized operating personnel, through qualified individuals, of operation, adjustment, and maintenance during demonstrations of properly operating systems and equipment.

1. Give the Owner at least 5 working day notice of proposed instruction periods for the Owner to schedule at its convenience.
2. Arrange with subcontractors and manufacturers for an instructional period of not more than 3 days for each major item of mechanical and electrical equipment.
3. Prepare in reproducible form, detailed maintenance manuals, as needed for the Owner's personnel, of installed mechanical and electrical equipment and systems. Include description and operation of systems, equipment, and parts replacement.
4. Furnish a separate manual or chapter for each of the following:

   a. Plumbing systems.
   b. Ventilating systems.
   c. Electrical systems.

5. Contents of each manual or chapter shall include, but not be limited to, the following:

   a. Step-by-step procedure for system start-up, including a pre-start checklist. Refer to controls and indicators by nomenclature used on panels and in control diagrams.
   b. Detailed instructions in proper sequence, for each mode of operation.
   c. Emergency Operation: If some functions of equipment can be operated while other functions are disabled, give instructions for operations under such conditions. Include only those alternate methods of operations the operator can follow when there is a partial failure, malfunctioning of components, or other unusual conditions.
   d. Shutdown Procedure: Include instructions for stopping and securing equipment after operation. If a specific sequence is required, give step-by-step instructions in order of sequence.

6. Maintenance Instructions and Requirements: Provide the following categories:

   a. Preventive Maintenance: Provide a tabular form schedule for preventive maintenance listing recommended frequency of performance for each of the following preventive maintenance tasks:

      1) Cleaning: Provide instructions and schedules for routine cleaning and inspection with recommended lubricants.
      2) Inspection: If periodic inspection of equipment is required for operation, cleaning, or other reasons, show items requiring inspection and give inspection criteria for motors, controls, filters, and other maintenance items.
      3) Provide instructions for minor repairs or adjustments required for preventive maintenance routines.
      4) Identify test points and give values for each.

   b. Corrective Maintenance: For a rapid replacement procedure to reduce equipment downtime, provide the following:

      1) For troubleshooting tables, charts, or diagrams of specified procedures, use a 3-column chart entitled "Malfunction, Probable Cause, and Recommended Action."
      2) Indicate repair and replacement procedures most likely to be required in maintenance of equipment.
      3) List safety precautions and instructions to be followed before, during, and after making repairs, adjustments, or routine maintenance.
      4) Manufacturer's literature covering equipment with illustrations, exploded views, and replacement part lists.

7. Notify the A/E of completion of instructional periods in writing. Include names of all personnel attending the instructional periods, for the Owner's record.

PART 2 NOT USED

PART 3 NOT USED

END OF SECTION

SECTION 01740

WARRANTIES

PART 1 GENERAL

1.01 SUMMARY

A. Work Includes: General administrative and procedural requirements for manufacturers' standard or special warranties on products as specified.

B. Related Sections:

1. 01700 - Project Closeout.
2. 01730 - Operation and Maintenance Data.

C. Disclaimers and Limitations: Manufacturers' disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work incorporating the products, nor does it relieve suppliers, manufacturers, or subcontractors required to countersign special warranties with the Contractor.

1.02 DEFINITIONS

A. Standard Product Warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.

B. Special Warranties are written warranties required by or incorporated in the Construction Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

1.03 WARRANTY REQUIREMENTS

A. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work damaged because of such failure or that must be removed and replaced to provide access for correction of warranted Work, at no cost to the Owner.

1. Correction of work shall include shipping, labor, supervision, and related work involved in replacing defective parts or materials provided by manufacturers under their warranties.

B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Construction Documents.

D. The Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights, and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce other duties, obligations, rights, or remedies.

1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Construction Documents.

E. Warranties made by subcontractors to the Contractor are a part of the Contractor's responsibility to the Owner.

F. The Owner reserves the right to refuse acceptance of Work where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments have done so.

1.04 SUBMITTALS

A. Submit written warranties to the A/E before the date certified for Substantial Completion. If the A/E's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work or a designated portion of the Work, submit written warranties upon request of the A/E.

1. When a designated portion of the Work is completed and occupied or used by the Owner by separate agreement with the Contractor during the construction period, submit properly executed warranties to the A/E within 15 days of completion for the designated portion of the Work.

B. When a special warranty is required to be executed by the Contractor or the Contractor and a subcontractor, supplier, or manufacturer, prepare a written document containing appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner through the A/E for approval before final execution.

1. Refer to individual Sections of Divisions 2 through 16 for specific content requirements and requirements for submittal of special warranties.

C. Form of Submittal: At Final Completion, compile 2 copies of each required warranty properly executed by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the specifications.

D. Provide warranties in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders.

1. Use thicknesses as necessary to accommodate contents and sized to receive 8-1/2" by 11" paper.
2. Identify each binder on the front and the spine with the typed or printed title

"WARRANTIES," the Project title or name, and the name of the Contractor.

3. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark tabs to identify products or installations.
4. Provide a typed description of the product or installation, including the name of the product.
5. Give reference to the applicable specification section, and the name, address, and telephone number of the installer.
6. When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

PART 2 NOT USED

PART 3 EXECUTION

3.01 SCHEDULE OF WARRANTIES

A. Schedule: In addition to all standard manufacturer's warranties for all products provided on the project, provide warranties on products and installations as specified in the following Sections and as summarized below:

SITEWORK

02975 Premanufactured Shelters: Limited 5 year warranty after project acceptance.
02900 Landscaping: Limited to 60 and 90 days after project acceptance.

DOORS AND WINDOWS

08110 Hollow Metal Doors and Frames: 1 year for defects in material or installation.

FINISHES

09310 Ceramic and Porcelain Tile: Warranty 5 years for defects in material or installation.
09730 Epoxy Resin Flooring: Warranty 5 years for defects in material or installation.
09900 Painting of Unpainted Surfaces: Warranty 6 years labor and materials from paint manufacturer.

SPECIALTIES

10170 Solid Plastic Toilet Partitions: Warranty 10 years for product and installation.

MECHANICAL

15010 General Provisions: Furnish the Owner copies of all warranties extending beyond the period specified in General Conditions.

ELECTRICAL

16500 Battery Powered Emergency Incandescent Lighting Units: 3 years unconditional, 5 years pro-rata.

END OF SECTION

SECTION 02060

BUILDING DEMOLITION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Removal of structures by demolition and disposition of debris legally off-site.

1.02 SUBMITTALS

A. Demolition Schedule: Include detailed schedule showing start and completion dates for each area of demolition and for completion of demolition work. Submit method of demolition and plan of removing work.

B. Certification: Submit copy of demolition firm's current license to operate in Broward County, Florida.

1.03 QUALITY ASSURANCE

A. Organize and perform demolition work to avoid damage to construction intended to remain.

B. Demolition and transportation of debris shall comply with applicable codes and regulations governing these operations. Fees shall be paid by the Contractor.

C. Demolition and removal operations shall be conducted in an expedient manner, with precautions taken to prevent demolition site from being an "attractive nuisance".

D. Notify the Owner and A/E of any conditions capable of affecting the safety of occupants of adjacent buildings, the normal use of these facilities, or the physical condition of the structures.

1. In case of accidental disruption of utilities or the discovery of previously unknown utilities, stop work immediately and notify the Board and A/E.
2. Do not continue work until the Owner, A/E, and Contractor agree on a plan to correct the situation or identify utility service line.

1.04 SEQUENCING AND SCHEDULING

A. Scheduling: Areas next to demolition and removal work may be occupied and their activities cannot be interrupted or disturbed during normal working hours. Demolition schedule shall be according to drawings and as accepted by the Owner and A/E.

B. Coordinate with applicable utility companies and the Owner for utility line removal, capping, and utility shutdowns required by removal work.

1.05 PROJECT CONDITIONS

A. Existing work not specified for removal that is temporarily removed, damaged, exposed, or in any way disturbed or altered by removal work shall be repaired, patched, or replaced to the Owner and A/E□s satisfaction at no additional cost to the Owner.

B. Provide barriers and warning devices to protect the public and users of adjacent facilities.

C. Environmental Protection:

1. Control amount of dust resulting from construction or demolition to prevent spread of dust to other buildings and to avoid creation of a nuisance in surrounding areas. Use of water to control dust will not be allowed when it will result in flooding or other objectionable or hazardous or conditions.
2. Use of explosives is not allowed.
3. Disposition of demolished materials by burning is not allowed.

D. Traffic Maintenance:

1. Conduct removal operations to maintain traffic along existing streets and walks.
2. Keep paved streets and walkways free of debris.
3. Remove material and other matter tracked or fallen onto traffic surfaces.

E. Disposition of Materials:

1. Title and responsibility to materials and equipment to be removed, excepting salvageable equipment to be retained by the Owner, is vested in the Contractor upon receipt of Notice to Proceed.
2. The Owner will not be responsible for the condition, loss, or damage to such materials and equipment after the Notice to Proceed.

PART 2 NOT USED

PART 3 EXECUTION

3.01 DEMOLITION

A. Structures:

1. Demolish existing indicated structures according to accepted schedule.
2. Indicated buildings shall be demolished completely, except foundation construction.
3. Remove building to top of foundation walls. Do not damage foundation.

B. Perform removal and demolition according to Demolition Schedule and take necessary precautions to protect existing adjacent buildings, furnishings, and equipments.

C. Existing Utilities: Perform utility related work according to these specifications for the type of utility service involved.

D. Removal:

1. Remove demolished construction materials and related debris from the site on a regular basis.
2. Accumulation of debris on the site will not be allowed.
3. Selling of salvageable building materials or equipment or furnishings is not allowed at the site.

3.02 CLEAN UP

A. Remove materials, including debris and dust, and dispose of legally off site. Use methods approved by A/E before beginning cleanup operations. Use of blowers to distribute dust is not allowed.

END OF SECTION

SECTION 02072

REMOVALS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Removal work as required on drawings and as specified in this section and repair of damage to existing facilities to remain.

B. Related Sections:

1. 02200 – Earthwork for Sitework.
2. 02201 – Earthwork for Buildings.

1.02 SUBMITTALS

A. Removal Procedure for Site Work: If requested by A/E, submit proposed procedure of removal work.

1. Procedure shall provide:

a. Means for safe conduct of work, careful removal, and disposition of materials specified to be salvaged for the Owner.
b. Protection of property to remain undisturbed.
c. Timely disconnection of utility services.

2. Procedure shall include a detailed description of methods and equipment to be used for each operation, and sequence of each operation.

1.03 PROJECT/SITE CONDITIONS

A. Existing sidewalks, curbs, paving, landscaping, or other existing work not specified for removal that is temporarily removed, damaged, exposed, or disturbed or altered by removal work shall be repaired, patched, or replaced at no cost to the Owner.

B. Existing Trees:

1. Do not damage trees within project site specified to be left in place.
2. Protect trees indicated to remain as required with acceptable barricades or temporary fencing during construction.

C. Environmental Protection:

1. Dust Control:

a. Control dust resulting from demolition to prevent spread of dust to occupied portions of buildings and to avoid creation of a nuisance in surrounding

areas.

b. Do not use water to control dust when it will result in flooding or pollution or other hazardous or objectionable conditions.

2. Fire: Do not dispose of demolished materials or trees, etc., by burning.
3. Explosives: The use of explosives is not allowed.

D. Site Inspection: Inspect entire project area to determine extent of removal, salvage, and patching work.

1.04 SCHEDULING

A. Activities in areas next to removal areas cannot be interrupted or disturbed during normal facility hours.

1. Consult with the Owner and A/E to schedule work. See Section 01310 - Construction Schedule.

B. Utility Companies:

1. Coordinate with applicable utility companies and the Owner for utility line removal, if any, and related capping and utility shutdowns required by such removal work.

C. Removals:

1. Assign removals to appropriate trades under respective sections, best suited for this type of work to avoid unnecessary damage due to the efforts of unskilled workers.

PART 2 PRODUCTS

2.01 DISPOSITION OF MATERIALS NOT INDICATED OR SPECIFIED TO BE SALVAGED

A. Title to Materials:

1. Title to materials and equipment to be removed, except salvageable equipment to be retained by the Owner, is vested in the Contractor upon receipt of Notice to Proceed.

a. The Owner will not be responsible for condition, loss of, or damage to such materials and equipment after receipt by Contractor of Notice to Proceed.

B. Remove excess materials and equipment not specified to be salvaged from site and premises upon completion of removal operations.

PART 3 EXECUTION

3.01 REMOVAL WORK

A. Perform removal work indicated on drawings or as specified in an orderly manner according to accepted construction schedule.

1. Protect work specified to remain.
2. Protect adjacent areas from damage or undue dirt and dust.
3. Wet down debris or rubbish, if necessary, to minimize flying dust.

3.02 EXISTING UTILITIES

A. Utility work shall be performed according to these specifications for the particular type of utility service involved.

3.03 EXISTING WORK

A. Existing work may be cut, altered, removed, or temporarily removed and replaced as necessary for the performance of work required.

1. Exception: Unless otherwise indicated on drawings, do not cut or alter structural members without authorization by the A/E.

B. Filling: Holes and other hazardous openings created by removal work shall be filled following procedures specified in Section 02200 – Earthwork for Sitework and Section 02201 – Earthwork for Buildings.

C. Restore damaged or defaced areas or items, remaining in place, of work performed under this Contract to comparable conditions existing before the work.

END OF SECTION

SECTION 02200

EARTHWORK FOR SITEWORK

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 General Requirements apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Preparing sub-grades for slabs-on-grade, foundations, walks, pavements, and lawns.
   2. Excavating and backfilling for buildings and structures.
   3. Excavating and backfilling trenches within building lines.
   4. Excavating and backfilling trenches for buried mechanical and electrical utilities and pits for buried utility structures.

1.3 DEFINITIONS

A. Backfill: Soil materials used to fill an excavation.
   1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
   2. Final Backfill: Backfill placed over initial backfill to fill a trench.
B. Bedding Course: Layer placed over the excavated sub-grade in a trench before laying pipe.
C. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.
D. Excavation: Removal of material encountered above sub-grade elevations.
   1. Additional Excavation:
      a. Excavation below sub-grade elevations as directed by Owner.
      b. Additional work paid per contract provisions.
   2. Bulk Excavation: Excavations more than 10' wide and pits more than 30' length or width.
   3. Unauthorized Excavation:
      a. Excavation below sub-grade elevations or beyond indicated dimensions without direction by Owner.
      b. Unauthorized excavation, as well as remedial work directed by Owner, shall be without additional compensation.
E. Fill: Soil materials used to raise existing grades.
F. Rock: Rock material in beds, ledges, un-stratified masses, and conglomerate deposits and boulders or rock material ¾-cy. or more in volume that when tested by an independent geo-technical testing agency, according to ASTM D1586, exceeds a standard penetration resistance of 100 blows/2".
G. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
H. Sub-grade: Surface or elevation remaining after completing excavating, or top surface of a fill or backfill immediately below base or topsoil materials.

I. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.4 SUBMITTALS

A. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
   1. Classification according to ASTM D2487 of each on-site or borrow soil material proposed for fill and backfill.
   2. Laboratory compaction curve according to ASTM D1557 for each on-site or borrow soil material proposed for fill and backfill.

1.5 QUALITY ASSURANCE

A. Geo-technical Testing Agency Qualifications: Owner will engage and pay for an independent testing agency qualified according to ASTM E329 to conduct soil materials and rock-definition testing, as documented according to ASTM D3740 and ASTM E548.

1.6 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Owner and then only after arranging to provide temporary utility services according to requirements indicated:
   1. Notify Owner not less than two days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without Owner's written permission.
   3. Contact utility-locator service before excavating. (Sunshine 811)
B. Demolish and completely remove from site existing underground utilities indicated for removal, coordinate with utility companies to shut off services if lines are active.

1.7 TRENCH SAFETY

A. In accordance with Florida Statute 553.63, trench excavations in excess of 5' deep shall require the Contractor to submit in writing.
   1. Reference to the trench safety standards that will be in effect during the period of construction of the project.
   2. Written assurance that Contractor will comply with the applicable trench safety standards.
   3. Identify the cost of compliance with the applicable trench safety standards.
B. As a minimum the Contractor shall:
   1. Comply with the excavation safety standards applicable to the project.
   2. Adhere to any special shoring requirement, which may be applicable to such a project.

PART 2 PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: ASTM D2487 soil classification groups GW, GP, GM, SW, SP, and SM, or a combination of these group symbols; free of rock or gravel larger than 3" in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter. The top 6 inches of satisfactory soil shall be free of all debris and any rock or gravel larger than ¼ inch in any dimension.
C. Unsatisfactory Soils: ASTM D2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT, or a combination of these group symbols.
   1. Unsatisfactory soils also include satisfactory soils not maintained within 2% of optimum moisture content at time of compaction.
D. Backfill and Fill: Satisfactory soil materials.
E. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940; maximum material size of 3" with at least 95% passing a 1-1/2" sieve and not more than 5% passing a No. 200 sieve.
F. Bedding: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940; except with 100% passing a 1" sieve and not more than 8% passing a No. 200 sieve.

2.2 ACCESSORIES

A. Detectable Warning Tape: Acid and alkali resistant polyethylene film warning tape manufactured for making and identifying underground utilities, minimum 6" wide and 4-mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30" deep; colored as follows:
   1. Red: Electric
   2. Yellow: Gas, oil, steam, and dangerous materials
   3. Orange: Telephone and other communications
   4. Blue: Water systems
   5. Green: Sewer systems
   6. Purple: Reclaimed water system

2.3 CONCRETE

A. Concrete formulation using type I cement and having a 28-day compressive strength of at least 3,000 psi.

PART 3 EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
B. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared sub-grades, and from flooding Project site and surrounding area.
B. Protect sub-grades from softening, undermining, washout, and damage by rain or water accumulation.
   1. Reroute surface water runoff away from excavated areas.
      a. Do not allow water to accumulate in excavations.
      b. Do not use excavated trenches as temporary drainage ditches.
   2. Install a dewatering system to keep sub-grades dry and convey ground water away from excavations.
      a. Maintain until dewatering is no longer required.
      b. Draw down the water table 1' below the bottom of any excavation or compaction surface.
C. Comply with South Florida Water Management District requirements for dewatering systems.

3.3 EXPLOSIVES

A. Explosives: Do not use explosives.

3.4 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavation to sub-grade elevations regardless of the character of surface and sub-surface conditions encountered, including rock, soil materials, and obstructions.
   1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.5 EXCAVATION FOR STRUCTURES

A. Excavate to required elevations and dimensions within a tolerance of plus or minus 1".
   1. Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
   2. Do not disturb bottom of excavation for Footings and Foundations.
      a. Excavate by hand to final grade just before placing concrete reinforcement.
      b. Trim bottoms to required lines and grades to leave solid base to receive other work.
   3. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures:
      a. Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1".
      b. Do not disturb bottom of excavations intended for bearing surface.
B. Use the following building pad preparation procedures to achieve the required design soil bearing.
   1. Cleaning and grubbing shall consist of the complete removal of all trees, roots, stumps, grass, shrubbery, rubbish, building materials, and debris on the surface of the ground or beneath the surface of the ground or the excavated areas or beneath the excavated areas.

a. Rubbish, etc., if found, shall be removed entirely at whatever depth found.
b. Roots, 2" and larger shall be removed to a depth of 4' below the surface, below the bottom of the excavation or below the bottom of the footing.
c. Roots less than 2" shall be removed to a depth of 2' below the bottom of the footing.
d. Extend the cleaning and grubbing area outside the building pad by 5' in all directions.

2. Excavate the entire building pad, plus 5', to 4' below the existing grade, unless the geotechnical report identifies other limits.

3.6 EXCAVATION FOR WALKS

A. Excavate surfaces under walks to indicated cross sections, elevations, and grades.

3.7 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.
B. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit.
C. Excavate trench walls vertically from trench bottom to 12" higher than top of pipe or conduit, unless otherwise indicated.
   1. Clearance: 12" on each side of pipe or conduit.
D. Trench Bottoms: Excavate trenches 4" deeper than bottom of pipe elevation to allow for bedding course. Hand excavate for bell of pipe.
   1. Excavate trenches 6" deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.8 APPROVAL OF SUB-GRADE

A. Notify Owner when excavations have reached required sub-grade.
B. If Owner determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
   1. Additional excavation and replacement material paid per contract provisions.
C. Proof roll sub-grade with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.
   1. Do not proof roll wet or saturated sub-grades.
D. Reconstruct sub-grades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Owner.

3.9 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation.
   1. Fill unauthorized excavations under other construction or utility pipe as directed by Owner.

3.10 STORAGE OF SOIL MATERIALS

A. Stockpile borrow materials and satisfactory excavated soil materials.

1. Stockpile soil materials without intermixing.
2. Place, grade, and shape stockpiles to drain surface water.
3. Cover to prevent windblown dust.
4. Stockpile soil materials away from edge of excavations and out of the drip line of remaining trees.

3.11 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:
   1. Construction below finish grade including, where applicable damp-proofing, waterproofing, and perimeter insulation.
   2. Surveying locations of underground utilities for record documents.
   3. Inspecting and testing underground utilities.
   4. Removing concrete formwork.
   5. Removing trash and debris.
   6. Removing temporary shoring and bracing, and sheeting.
   7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

3.12 UTILITY TRENCH BACKFILL

A. Place and compact bedding course on trench bottoms and where indicated.
   1. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
B. Backfill trenches excavated under footings and within 18" of bottom of footings; fill with concrete to elevation of bottom of footings.
C. Provide 4" thick, concrete-base slab support for piping or conduit less than 30" below surface of roadways.
   1. After installing and testing, completely encase piping or conduit in a minimum of 4" of concrete before backfilling or placing roadway sub-base.
D. Place and compact initial backfill of sub-base material, with soil no more than 8% passing the number. 200 sieve, with a maximum particle size of 1".
   1. Place the trench backfill in maximum loose lifts of 6" and compacted to at least 98% of the modified Proctor maximum dry density, to a height of 12" over the utility pipe or conduit.
   2. Carefully compact material under pipe haunches bringing backfill up evenly on both sides and along the full length of utility piping or conduit to avoid damage or displacement of utilities.
E. Coordinate backfilling with utilities testing.
F. Fill voids with approved backfill materials while removing sheeting, shoring and bracing.
G. Place and compact final backfill of satisfactory soil material to final sub-grade.
H. Install warning tape directly above utilities, 12" below finished grade, except 6" below sub-grade under pavements and slabs.

3.13 FILL

A. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills.

B. Plow, scarify, bench, or break up sloped surface steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
C. Place and compact fill material in layers to required elevations as follows:
   1. Under building slabs, use engineered fill.
   2. Under footings and foundations, use engineered fill.
   3. Under grass and planted areas, use satisfactory soil material.
   4. Under walks, use engineered fill.

3.14 MOISTURE CONTROL

A. Uniformly moisten or aerate sub-grade and each subsequent fill or backfill layer before compaction to within 2% of optimum moisture content.
   1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
   2. Remove and replace, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2% and is too wet to compact to specified dry unit weight.

3.15 COMPACTION OF BACKFILLS AND FILLS

A. Following building pad preparation procedures and, perform the following:
   1. Provide soil compaction using a 20-ton self-propelled non-vibratory roller to provide 98% compaction to a depth of 2' below the surface.
      a. Subject each section of the building sub-grade to at least ten overlapping (20% overlap) passes of the compactor traveling at a speed of no more than 1.5 MPH.
      b. Densification operations shall continue until no further settlement is visually discernible at the excavation bottom and the in-site soils at the cut grade are compacted to 98% of the ASTM D 1557 maximum dry density.
      c. Frequent wetting of the rolled sub-grade may be necessary to prevent drying and loosening of the upper 6" to 12" of soil.
      d. Contractor shall monitor nearby structures before and during proof-compaction operations, taking care to ensure that vibrations induced by the compaction operations does not cause any distress to nearby structures.
   2. Place the structural fill raising the site to the building's design grades in thin lifts (12" thick loose measure); near the optimum moisture content for compaction, and compact to at least 98% of maximum dry density (ASTM D1557).
   3. A SDPBC building inspector shall inspect the footing excavation bottoms.
   4. Compact the footing bottoms to 98% of the ASTM D1557 maximum dry density.
   5. Completely remove any soft or organic soils detected in the footing bottoms, and replaced with clean granular fill compacted to the degree specified above.
B. Place backfill and fill materials in layers not more than 12" in loose depth for material compacted by heavy compaction equipment, and not more than 6" in loose depth for material compacted by hand-operated tampers.
C. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

3.16 GRADING

A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes.

B. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
   1. Provide a smooth transition between adjacent existing grades and new grades.
   2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
C. Site Grading: Slope grades to direct water away from buildings and to prevent ponding.
D. Finish sub-grades to required elevations within the following tolerances:
   1. Lawn, Walks, or Unpaved Areas: Plus or minus 1".
E. Grading inside Building Lines: Finish sub-grades to a tolerance of ½" when tested with a 10' straightedge.

3.17 FIELD QUALITY CONTROL

A. Soil Borings: If the City did not provide soil borings for this site, the Contractor shall take a series of standard split spoon soil borings to ascertain the sub-surface soil conditions to verify the acceptability of the sub-grade to support the 2500 psf bearing capacity noted.
B. Testing Agency: Owner will engage a qualified independent geo-technical engineering testing agency to perform field quality- control testing.
C. Testing agency to inspect and test sub-grades and each fill or backfill layer.
   1. Contractor may proceed with subsequent earthwork only after test results for previously completed works comply with requirements.
D. Testing Agency will test compaction of soils in place according to ASTM D1556, ASTM D2167, ASTM D2922, and ASTM D2937, as applicable, at the following locations and frequencies:
   1. Building Slab Areas: At sub-grade and at each compacted fill and backfill lift, at least one test for every 2500 SF per lift or less of building slab, but in no case fewer than five tests.
   2. Foundation Backfill: At each compacted backfill lift, at least one test for each column footings, but no fewer than two tests.
      a. One compaction test per 50 linear feet of wall footing with a minimum of one density test per perimeter wall footing.
   3. Trench Backfill: Test at each compacted initial and final backfill layer, and at least one test for each 100' or less of trench length, but no fewer than two tests.
   4. General Fill: One density test per 5,000 SF of fill per lift.
E. When testing agency reports that sub-grades, fills, or backfills do not achieve the degree of compaction specified, contractor shall take following action:
   1. Scarify and moisten
   2. aerate or
   3. Remove and replace soil to depth required, re-compact and retest until specified compaction is obtained.
   4. Correction of failing work shall occur without additional cost to the owner. Contractor shall reimburse Owner for all re-testing costs due to failed tests.

3.18 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion.
   1. Keep free of trash and debris.

B. Repair and re-establish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
   1. Scarify or remove and replace soil material to depth as directed by Owner; reshape and re-compact.
C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and re-construct surfacing.
   1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.19 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION

SECTION 02201

EARTHWORK FOR BUILDINGS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Earthwork for Buildings as indicated on Drawings and specified in this section. Section includes:

1. Preparing subgrades for slabs-on-ground.
2. Excavating and backfilling for buildings and structures.
3. Excavating and backfilling for utility trenches within buildings.

B. Related Sections:

1. 02200 – Earthwork for Sitework.
2. 02202 – Geotechnical Report
3. 02221 - Excavating, Backfilling, and Compaction for Utilities.
4. 02280 - Soil Treatment.
5. 02511 - Asphaltic Concrete Paving.
6. 02900 - Landscaping.

1.02 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Bedding Course: Course placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Building Area: The area bounded by lines not less than 4 feet beyond the outside line of the building perimeter footings. Increase the 4 foot dimension by 1 foot for each foot of excavation depth required exceeding 4 feet. Site outside the Building Area as defined above shall be governed by Section 02200 (Earthwork for Sitework).

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

G. Fill: Soil materials used to raise existing grades.

H. Structures: Buildings, foundations, retaining walls, slabs, curbs, pads for mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

I. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill.

J. Utilities: Underground services within buildings.

1.03 SUBMITTALS

A. Product Data: For the following:

1. Controlled low-strength material, including design mixture.

B. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:

1. Classification according to ASTM D 2487 of each on-site and borrow soil material proposed for fill and backfill.
2. Laboratory compaction curve according to ASTM D 1557 for each on-site and borrow soil material proposed for fill and backfill.

1.04 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated.

1. Notify Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.
3. Contact utility-locator service for area where Project is located before excavating.

B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: ASTM D 2487 Soil Classification Groups GW, GP, GM, SW, SP, and SM, or a combination of these groups; free of rock or gravel larger than 3 inches (75 mm) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487 or a combination of these groups.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.

E. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch (25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.

2.02 CONTROLLED LOW-STRENGTH MATERIAL

A. Controlled Low-Strength Material: Low-density, self-compacting, flowable concrete material as follows:

1. Portland Cement: ASTM C 150, Type I or II.
2. Fly Ash: ASTM C 618, Class C or F.
3. Normal-Weight Aggregate: ASTM C 33, 3/4-inch (19-mm) nominal maximum aggregate size.
4. Foaming Agent: ASTM C 869.
5. Water: ASTM C 94/C 94M.
6. Air-Entraining Admixture: ASTM C 260.

B. Produce conventional-weight, controlled low-strength material with 140-psi (965-kPa) compressive strength when tested according to ASTM C 495.

PART 3 - EXECUTION

3.01 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. For building area, remove muck or organic material above the limestone layer. Clean potholes, larger than 6 inches in any horizontal direction, in rock filled with muck or organic material. Prepare all areas as directed by Geotechnical Report (Section 02202).

C. Protect and maintain erosion and sedimentation controls.

3.02 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

C. Pump out any standing water in footing excavations prior to casting footings. Maintain pumping until foundation is fully cast.

3.03 EXCAVATION, GENERAL

A. Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Excavated materials may include rock, soil materials, and obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.04 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand tools to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch (25 mm). Do not disturb bottom of excavations intended as bearing surfaces.

3.05 EXCAVATION FOR UTILITY TRENCHES WITHIN BUILDINGS

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

B. Provide all appropriate excavation stabilization and bracing.

C. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches (300 mm) higher than top of pipe or conduit, unless otherwise indicated.

1. Clearance: 12 inches (300 mm) each side of pipe or conduit or as otherwise indicated.

D. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. For pipes and conduit less than 6 inches (150 mm) in nominal diameter and flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
2. For pipes and conduit 6 inches (150 mm) or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.

E. Trench Bottoms: Excavate trenches 4 inches (100 mm) deeper than bottom of pipe elevation to allow for bedding course. Hand excavate for bell of pipe.

3.06 SUBGRADE INSPECTION

A. Notify Architect when excavations have reached required subgrade.

B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade below slabs with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade. Limit vehicle speed to 3 mph (5 km/h).
2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.07 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.08 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing and waterproofing.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.9 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Backfill trenches excavated under footings and within 18 inches (450 mm) of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Division 3 Section "Cast-in-Place Concrete."

D. Place and compact initial backfill of satisfactory soil, free of particles larger than 1 inch (25 mm) in any dimension, to a height of 12 inches (300 mm) over the utility pipe or conduit.

1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

E. Controlled Low-Strength Material: Place initial backfill of controlled low-strength material to a height of 12 inches (300 mm) over the utility pipe or conduit.

F. Backfill voids with satisfactory soil while installing and removing shoring and bracing.

G. Place and compact final backfill of satisfactory soil to final subgrade elevation.

H. Controlled Low-Strength Material: Place final backfill of controlled low-strength material to final subgrade elevation.

3.10 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.11 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.12 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 12 inches (300 mm) in loose depth for material compacted by heavy compaction equipment, and not more than 6 inches (150 mm) in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:

1. 95 percent.

3.13 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch (13 mm) when tested with a 10-foot (3-m) straightedge.

3.14 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.

D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

1. Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least 1 test for every 2000 sq. ft. (186 sq. m) or less of building slab, but in no case fewer than 3 tests.
2. Trench Backfill: At each compacted initial and subsequent backfill layer, at least 1 test for each 150 feet (46 m) or less of trench length, but no fewer than 2 tests.

E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.15 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

D. Comply with the Trench Safety Act, sections 553.60 through 553.64 Florida Statutes.

3.16 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

B. Disposal: Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Architect.

1. Remove waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION

SECTION 02280

SOIL TREATMENT

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Termiticide application to soil under new buildings as indicated on drawings and specified in this section.

B. Use of chlordane, heptachlor, aldrin, dieldrin and chlorpyrifos class of chemicals are not allowed.

C. Related Sections:

1. 02200 – Earthwork for Sitework.
2. 02201 – Earthwork for Buildings
3. 03300 - Cast-In-Place Concrete.
4. 07190 - Vapor/Radon Barrier.

1.02 SUBMITTALS

A. Submit the following for review before starting work:

1. Product data, including manufacturers specifications, chemical analysis, with recommended dilution, application directions, and safety precautions.

2. Sample copy of applicator's warranty for review.

3. Applicator's experience evidence with copies of current local and state licenses and current Certified Operator-in-Charge certificate.

1.03 QUALITY ASSURANCE

A. Work shall be done by a bonded Contractor whose principal business is pest control and termite treatment and can show evidence of at least 5 years of successful operation in this field.

1.04 PROTECTION

A. To avoid surface flow or overspray of toxicant from application site, do not apply soil poisons when soil or fill is excessively wet or after heavy rains.

B. Unless treated areas are to be immediately covered, take precautions to prevent disturbance of treatment by human or animal contact.

C. Comply with applicable laws, codes, ordinances of Federal, State, and local regulatory agencies having jurisdiction over use of soil poisons.

D. Provide warning signs and instruct workers to use protective measures for their safety.

1.05 WARRANTY

A. Upon completion of soil treatment and as a condition of substantial completion, furnish the Owner with a written warranty, from the applicator, which shall provide that:

1. Application was made at concentration, rates, and methods complying with these specifications.
2. Effectiveness of treatment is warranted for not less than 5 years without additional cost to the Owner, by means of a 5-year repair and replacement bond.
3. Upon evidence of subterranean termite activity, retreat area at no additional charge to the Owner. Additional treatment shall be sufficient to prevent termites from attacking building or its contents.
4. Upon occurrence of damage to building or to its contents within warranty period, retreat soil and replace damage at no cost to the Owner.
5. Warranty bond shall be drawn in favor of the Owner, successor, or assigns and shall be non-cancelable by all parties to the contract except the Owner.

PART 2 PRODUCTS

2.01 MATERIALS

A. Florida Registered Soil Termiticides:

1. Biflex, bifenthrin, FMC Corporation.
2. Talstar, bifenthrin, FMC Corporation.
3. Demon TC, cypermethrin, Zeneca.
4. Prevail, cypermethrin, FMC Corporation.
5. Tribute, fenvalcrate, Aventis Environmental Science.
6. Termidor, fipronil, Aventis Environmental Science.
7. Premise, imidicloprid, Bayer Corporation.
8. Dragnet SFR, permethrin, FMC Corporation.
9. Prelude, permethrin, Zeneca.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.02 APPLICATION

A. Before mixing concentrate and water as recommended by the manufacturer for specific application and conditions, contact the Owner 48 hours in advance.

B. Apply termiticide mixture to the following:

1. Soil and earth that will be covered by or lie next to buildings.
2. Masonry foundations.
3. Areas around pipes and conduits penetrating slabs on fill to provide a lethal barrier to subterranean termites.

C. Apply termiticide mixture after subgrade has been made ready for placement of any floor slab vapor barrier, and as soon as practical before placement of concrete slabs and caps on masonry piers. Piling, pile caps, grade beams, foundation walls, and below grade waterproofing shall have been completed.

D. Apply at least 12 hours before placement of concrete slabs and during normal working hours to be subject to inspection. Notify applicator at least 24 hours before application of termiticide mixtures will be completed.

E. Soil Conditions: Apply termiticide mixtures when moisture content soil is sufficiently low to allow uniform distribution of chemical throughout specified areas.

F. Application Under Slabs on Fill:

1. Apply termiticide mixtures uniformly to all areas beneath concrete slabs-on-grade, including beneath walkways and entrance platforms and beneath sidewalks within 5 feet of buildings.
2. A minimum of 1 gallon of termiticide mixtures shall be uniformly applied to each 10 square feet of area to be treated.
3. Ground areas beneath concrete slabs-on-grade and paving abutting building slabs shall be similarly treated for a distance not less than 3 feet from building.

G. Application Along Foundation Walls, Pipes, and Conduits:

1. Treat critical areas along both sides of exterior and interior foundation walls, columns, and around utility pipes, conduits, ducts, and other similar items extending through soil beneath, and next to new construction, to a depth of 1 foot in a strip 6 inches wide, at a rate of 4 gallons of termiticide mixture to each 10 linear feet.
2. Mix chemical with soil as it is placed against walls and utility lines.
3. Apply at least 1 gallon of termiticide mixture around each pipe.

H. Application to Masonry Foundation Walls: Treat voids of unit masonry foundation walls, top of course occurring at or just above grade level, with additional treatment of not less than 2 gallons of chemical for each 5 linear feet.

I. Retreatment of Disturbed Soil: Retreat soil surfaces disturbed after treatment and before placement of slabs and covering structures.

3.03 CLEAN UP

A. Improper disposal of pesticide, spray mixture, or rinsate is a violation of federal law. Comply with manufacturer's instructions for disposal of these materials and empty containers. Do not allow supplies of chemicals to remain on site unattended.

END OF SECTION

SECTION 02315

TRENCHING, BACKFILLING AND COMPACTING FOR UTILITY SYSTEMS

PART 1 – GENERAL

1.1 WORK INCLUDED

A. The included under this Section consists of clearing, excavating, grading and backfilling as required for the construction of the utility systems consisting of piping and appurtenances as shown on the Drawings and specified herein.

1.2 RELATED WORK

A. Section 02746 - Paving
B. Section 02510 - Water Distribution System
C. Section 02530 - Waste Water Collection
D. Section 02574 - Pavement Removal and Replacement
E. Section 02630 - Storm Drainage Structures, Pipe and Fittings

1.3 REQUIRED SAFETY REGULATION

A. The contractor shall be required to comply with chapter 90-96 of the Laws of Florida (The Trench Safety Act) and OSHA Standard 29 CFR, Section 1926.650 Subpart P. The contractor shall submit with his contract, a signed and notarized copy of the trench safety act compliance statement.

PART 2 – PRODUCTS

2.1 BEDDING MATERIAL

A. Bedding material for use below the water table or in wet trenches shall be pea rock, drainfield limerock or similar material as approved by the Project Consultant. Pipe bedding material for use in dry trenches shall be limerock screenings, sand or other fine inorganic material as approved by the Project Consultant.

2.2 ADDITIONAL BACKFILL MATERIAL

A. Additional backfill material shall be classified as A-l, A-3 or A-2-4 in accordance with AASHTO Designation M 145 and shall be free from vegetation and organic material. No stones or rocks shall be larger than six inches in diameter, and when placed within one foot of piping and appurtenances stones or rocks shall be no larger than two inches in diameter (one inch for PVC).

2.3 FILL BROUGHT FROM OFFSITE

A. All fill brought from offsite sources shall be tested and certified that they do not contain any hazardous materials, i.e. heavy metals, petroleum products, etc. Submit certifications to Project Consultant prior to placing imported fill.

PART 3 – EXECUTION

3.1 CLEARING

A. The Contractor shall perform all clearing necessary for the proper installation of all piping and appurtenances in the locations shown on the Drawings. Plantings, shrubbery, trees, utility poles, or structures subject to damage resulting from the excavation shall be transplanted, relocated, braced, shored, or otherwise protected and preserved unless otherwise directed by the Project Consultant.

3. 2 EXCAVATION

A. The Contractor shall perform all excavation of every description and of whatever substances encountered, to the dimensions and depth shown on the Drawings, or as directed. All excavations shall be made by open cut. All existing utilities such as pipes, poles and structures shall be carefully supported and protected from injury, and in case of damage, they shall be restored at no cost to the Owner.

B. Trench walls shall be kept vertical, and, if required to protect the safety of workmen, the general public, this or other work or structures, or to maintain trench widths within the limits hereinafter specified, shall be properly sheeted and braced. Where wood sheeting or certain designs of steel sheeting are used, the sheeting shall be cut off at a level two feet above the top of the installed pipe and that portion below that level shall be left in place. If interlocking steel sheeting is used, it may be removed providing removal can be accomplished without disturbing the bedding, pipe or alignment of the pipe. Any damage to the pipe bedding, pipe or alignment of the constructed utility caused by removal of sheeting shall be cause for rejection of the affected portion of the work. Not more than 100 feet of trench shall be opened ahead of pipe laying operations at one time unless a greater length of open trench is approved by the Project Consultant.

C. In areas where trench widths are not limited by right-of-way and/or easement widths, property line restrictions, existing adjacent improvements, including pavements, structures and other utilities, and maintenance of traffic, the trench sides may be sloped to a stable angle of repose of the excavated material. A substantially and safely constructed movable shield, "box" or "mole" may be used in place of sheeting when the trench is opened immediately ahead of the shield and closed immediately behind the shield as pipe laying proceeds inside the shield.

D. Ladders or steps shall be provided for and used by workmen to enter and leave trenches.

E. Pipe trenches for utility lines shall be excavated to a width within the limits of the top of the pipe and the trench bottom so as to provide a clearance on each side of the pipe barrel, measured to the face of the excavation or sheeting, if used, of 8 inches to 12 inches. All pipe the excavation or sheeting, if used, of not less than 12 inches. Manhole excavations shall be carried to sufficient depth to permit their construction on the undisturbed bottom of the excavation.

F. Materials removed from the trenches shall be stored and disposed of in such a manner that they will not interfere unduly with traffic on public streets and sidewalks and they shall not be placed on private property. In congested areas, such materials as cannot be stored adjacent to the trench or used immediately as backfill shall be removed to convenient places of storage.

G. All materials suitable for use as backfill shall be hauled to and used in areas where not enough suitable material is available from the excavation.

H. Excess suitable material shall remain the property of the Owner and shall be disposed of within the limits of the project as directed by the Project Consultant. The disposal area shall be finish graded upon completion of the work.

3.3 REMOVAL OF WATER

A. It is a basic requirement of these specifications that excavations shall be free from water before pipe or structures are installed. However, it is realized that in certain sections of the work this cannot be accomplished economically and the Contractor may elect to use the Method of Construction noted under Section 3.10.

B. Contractors for the various Divisions of work will not be permitted to allow trench water from their particular Division to flow into the work of the adjacent Contractor. The Contractors shall coordinate their work to prevent the water flow between Divisions. In order to accomplish this, the Contractor may install temporary dams or plugs within the pipe provided they are suitably removed and do not damage the lining of the pipe. Water within the pipe shall be pumped out and shall not be permitted to enter into the existing treatment plant screening facility. The installed lines, except for water distribution lines, may be used to convey trench water, provided the pipe lining is not damaged and the line is cleaned out prior to acceptance of the work.

C. The Contractor shall provide all necessary pumps, underdrains, well-point systems, and other means for removing water from trenches and other parts of the work. The Contractor shall continue dewatering operations until the backfill has progressed to a sufficient depth over the pipe to prevent flotation or movement of the pipe in the trench and so that it is above the natural water table.

D. Water from the trenches and excavation shall be disposed of in such a manner as will not cause injury to public health, to public or private property, to the work completed or in progress, to the surface of the streets, or cause any interference with the use of the same by the public. The Contractor shall submit his proposed methods of handling trench water and locations at which the water will be disposed of to the Project Consultant for approval and shall receive approval before starting the excavation.

3.4 PIPE BEDDING

A. As described above, all pipe trenches shall be excavated to a level eight inches below the outside bottom of the proposed pipe barrel. The resulting excavation shall be backfilled with approved pipe bedding material, up to the level of the lower one-third of the proposed pipe barrel. This backfill shall be tamped and compacted to provide a proper bedding for the pipe and shall then be shaped to receive the pipe. Bedding shall be provided under the branch of all fittings to furnish adequate support and bearing under the fitting. Bedding material for piping shall be pea rock, drainfield limerock, or similar materials as approved by the Project

Consultant. Limerock screenings, sand or other fine inorganic material from the excavation may be used for bedding material when pipe is installed above the natural water table.

B. Any excavation below the levels required for installation of the pipe bedding, except for "Additional Excavation," as hereinafter specified, shall be backfilled with approved bedding material, tamped, compacted and shaped to provide proper support for the proposed pipe, at no additional cost to the Owner.

3.5 BACKFILL UNDER MANHOLES, INLETS AND METER VAULTS

A. Any excavation below the levels required for the proper construction of manholes or meter vaults shall be filled with Class C concrete. The use of earth, rock, sand or other materials for this purpose will not be permitted.

3.6 TRENCH STABILIZATION

A. No claim for extras, or additional payment will be considered for cost incurred in the stabilization of trench bottoms which are rendered soft or unstable as a result of construction methods, such as improper or inadequate sheeting, dewatering or other causes. In no event shall pipe be installed when such conditions exist and the Contractor shall correct such conditions so as to provide proper bedding or foundations for the proposed installation at no additional cost to the Owner.

3.7 BACKFILL

A. Backfilling of utility trenches will not be allowed until the work has been approved by the Project Consultant, pressure tested if required, and the Project Consultant indicates that backfilling may proceed. Any work which is covered or concealed without the knowledge and consent of the Project Consultant shall be uncovered or exposed for inspection at no cost to the Owner. Partial backfill may be made to restrain the pipe during pressure testing.

B. Backfill material shall be non-cohesive, nonplastic material free of all debris, organic material, lumps, clods and broken paving. Backfill material placed within one foot of piping and appurtenances shall not contain any stones or rocks larger than two inches in diameter (one inch for PVC) and no stones or rocks larger than six inches in diameter will be permitted in any backfill.

C. If a sufficient quantity of suitable backfill material is not available from the trench or other excavations within the site of the work, the Contractor shall provide additional material suitable for this purpose. The additional material shall be installed as specified herein.

D. Selected backfill material containing no stone or rocks larger than two inches shall be placed in six-inch layers and thoroughly tamped to a depth of 12 inches over the top of the pipe. Particular attention and care shall be exercised in obtaining thorough support for the branch of all service connection fittings. Care shall be taken to preserve the alignment and gradient of the installed pipe.

E. After the backfill has been placed to a level 12 inches over the waterline or force main pipe, the remainder of the backfill shall be placed in layers, not to exceed twelve inches, and compacted with mechanical vibrators or other suitable equipment to obtain a density of the backfilled material of not less than 95 percent of its maximum density as hereinafter defined

for landscaped areas and 100 percent of maximum density for paved areas. Provide density tests for each lift.

F. After selected backfill has been placed to a depth of 12 inches over the sewer pipe, backfilling shall proceed to a depth of 30 inches over the pipe by placing the backfill material in twelve-inch layers and thoroughly compacting it with mechanical vibrators. Backfill in this portion of the work shall be compacted to 95 percent of maximum density of the material as hereinafter defined for landscaped areas and 100 percent of maximum density for paved areas. Provide density tests for each lift.

G. After the backfill has been placed to a level 30 inches over the sewer pipe, the remainder of the backfill shall be placed in layers, not to exceed twelve inches, and compacted with mechanical vibrators or other suitable equipment to obtain a density of the backfilled material of not less than 95 percent of its maximum density as hereinafter defined for landscaped areas and 100 percent of maximum density for paved areas. Provide density tests for each lift.

H. Within paved areas of trench excavation, the base and surfacing shall be reconstructed as specified on the Roadway Restoration Detail shown on the plans.

I. No more than 800 feet of trench with pipe in place shall be partially backfilled at any time.

3.8 COMPACTION AND DENSITIES

A. Methods of control and testing of backfill construction to be employed in this work are:

1. Maximum density of the material in trenches shall be determined by AASHTO Designation T 180.

2. Field density of the backfill material in place shall be determined by AASHTO Designation T 238.

B. Laboratory and field density tests which, in the opinion of the Project Consultant, are necessary to establish compliance with the compaction requirements of these specifications, will be conducted at the Owner's expense at intervals indicated in the Compaction Test Schedule on the plans. Tests will be made at depths and locations selected by the Project Consultant.

C. Trench backfill which does not comply with the specified densities, as indicated by such tests, shall be reworked and recompacted until the required compaction is secured, at no additional cost to the Owner. The costs for retesting such work shall be paid for by the Contractor.

3.9 ADDITIONAL EXCAVATION AND BACKFILL

A. Where organic material, such as roots, muck, or other vegetative matter, or other material which, in the opinion of the Project Consultant, will result in unsatisfactory foundation conditions, is encountered below the level of the proposed pipe bedding material, it shall be wholly or partially removed as directed by the Project Consultant and wasted. Sheeting shall be installed if necessary to maintain pipe trenches within the specified limits. The resulting excavation shall be backfilled with suitable backfill material, placed in six-inch layers, tamped and compacted up to the level of the bottom of the proposed pipe bedding material. Sufficient

compaction of this material shall be performed to protect the proposed pipe against settlement. Construction shall then proceed in accordance with the provisions of Article 3.04 Pipe Bedding.

B. Additional excavation shall be performed only when ordered by the Project Consultant. Where organic or other unsuitable material is encountered in the excavation, the Contractor shall bring the condition to the attention of the Project Consultant and obtain his determination as to whether or not the material will require removal, prior to preparing the pipe bedding.

C. Additional backfill material, if required, shall be furnished in accordance with the provisions therefore in Article 3.07

3.10 TRENCHING IN EXTREME WATER CONDITIONS

A. General:

1. A combination of conditions in the substrata, water table, or method of disposal may be encountered during the course of the work which make dewatering impossible, or only possible through the use of unusual methods, the cost of which is excessive. When such conditions are encountered, but only after all reasonable means to dewater the excavation have been employed without success, the Contractor, with the concurrence of the Project Consultant, may elect to employ the following method of construction. The concurrence of the Project Consultant shall be obtained in writing and shall limit the use of this method of construction to such specific portions of the work as the Project Consultant shall determine.

2. The construction specifications contained in the preceding parts of this section shall establish the required standards of construction quality for this work. Use of this method of construction described hereinafter shall in no way be construed as relieving the Contractor of his basic responsibility for satisfactory completion of the work. No additional payment will be made to the Contractor for excavation, backfill, sheeting or any costs incurred for work or materials, or any other costs incurred as a result of the use of this method of construction.

3. Subject to all of the requirements stated herein above, including written approval of the Project Consultant, construction will be permitted in accordance with the following specifications. All requirements of Article 3.01 through Article 3.09, inclusive, of these specifications shall apply to this construction unless otherwise specifically modified herein.

B. Removal of Water: The installation of pipe, manholes and appurtenances under water will be permitted and the requirements of Article 3.03 Removal of Water will be waived.

C. Excavation:

1. Excavation of pipe trenches to the level of the bottom of the proposed pipe bedding shall be performed in accordance with Article 3.02 Excavation. If rock, such as limerock or other similar hard, cemented material providing firm, unyielding trench bottoms is encountered at the level of the bottom of the proposed pipe bedding, no additional excavation will be required. If material such as sand, marl, or other material which cannot be classified as rock as herein above defined, is encountered at the level of the bottom of the proposed pipe bedding, the pipe trench shall be excavated to an

additional depth of 10 inches minimum, below that level. This additional excavation, and the additional backfilling made necessary thereby, is an essential part of this alternate construction method and no additional payment will be made for this work, regardless of the type of material encountered.

2. Excavation for manholes to be installed under water shall be continued to a depth, below the outside bottom of the proposed structure, which will provide a minimum space of 12 inches in rock, or 24 inches in sand, as the same are defined herein above, for the placement of drainfield limerock as herein after specified.

3. The excavation of pipe trenches at their junction with excavations for manholes shall be modified in the following manner: A longitudinally sloping plane bottom surface, for the placement of pipe bedding material, shall be provided from the bottom of the manhole excavation, at its extremity, to a line of intersection with the bottom of the typical excavation of 10 feet measured horizontally, from the vertical plane of the manhole excavation.

D. Pipe and Manhole Bedding: The pipe trench or manhole excavation shall be backfilled to receive the pipe or manhole with drainfield limerock as the same is commonly referred to in this area, up to the level of the lower one-third of the proposed pipe barrel, or to the outside bottom of the proposed manhole as applicable. This backfill shall be tamped and compacted to provide a proper bedding for the pipe or manhole, as also specified herein. Under no circumstances will material other than drainfield limerock be considered satisfactory for use as bedding material for underwater construction.

E. Backfill:

1. After the pipe is installed, backfilling shall proceed in accordance with the provisions of Article 3.07 Backfill, except that drainfield limerock shall be used to backfill around the pipe and to a level even with the top of the pipe bell. Under no circumstances will material other than drainfield limerock be considered satisfactory for this purpose.

2. If this Method of Construction is used, all backfill material, including drainfield limerock, shall be carefully lifted into the trench and released to fall freely therein when the bucket or container is at or just above water level. Under no circumstances shall backfill material be dumped or pushed into trenches containing water. Below the existing water level, backfill material shall be carefully rammed into place in uniform layers. Above the water level, backfill material shall be placed and compacted as specified in Article 3.07 Backfill and Article 3.08 Compaction and Densities.

3.11 RESTORATION OF EXISTING SURFACES

A. Paved and grassed areas disturbed by the operations required under this Section shall be restored as indicated on the Drawings and/or specified herein.

END OF SECTION

SECTION 02510

WATER DISTRIBUTION SYSTEM

PART 1 – GENERAL

1.1 SCOPE

A. The Contractor shall furnish all labor, equipment, and materials and perform all operations necessary to construct the water distribution system complete. All materials and work performed shall be in accordance with plans and specifications and of first-class workmanship.

1.2 SAFETY PROVISIONS

A. It shall be the responsibility of the Contractor to protect persons from injury and to avoid property damage, adequate barricades, construction signs, torches, red lanterns and guards, as required, shall be placed and maintained during the progress of the construction work and until it is safe for traffic to use the trenches roadway.

1.3 Existing Utilities

A. Temporary support, adequate protection and maintenance of all underground and surface utility structures, drains, sewers, and other obstructions encountered in the progress of the work shall be furnished by the Contractor at his own expense.

B. Where the grade or alignment of the pipe is obstructed by existing utility structures such as conduits, ducts, pipe branch connections to main sewers, or main drains, the obstructions shall be permanently supported, relocated, removed, or reconstructed by the Contractor in cooperation with the Owners of such utility structures. No deviation shall be made from the required line or grade except as directed in writing by the Project Consultant.

C. The Contractor shall obtain an UNCLE (Underground Utilities Notification Center of Florida) Certification number and an existing utility field location at least 48 hours prior to beginning any excavation.

D. Prior to beginning construction, the Contractor shall verify the size, location, elevation, and material of all existing utilities within the area of construction by use of record drawings and/or electronic locating devices.

E. Existing utility locations shown on these plans are approximate. The Project Consultant assumes no responsibility for the accuracy of existing utilities shown or for any existing utilities not shown.

F. The Contractor shall be responsible for damage to any existing utilities for which he fails to request locations from the utility owner. He is responsible as well for damage to any existing utilities which are properly located.

G. If upon excavation, an existing utility is found to be in conflict with the proposed construction or to be of a size or material different from that shown on the plans; the Contractor shall immediately notify the Project Consultant.

1.4 SHOP DRAWINGS AND SUBMITTALS

A. The Contractor shall furnish to the Project Consultant manufacturers' literature and data for all materials to be installed under this section. These submittals must be stamped "Approved" by the Project Consultant prior to installation by the Contractor.

B. Complete "As-Built" information relative to manholes, valves, services, fittings, length of pipe, and the like, shall be accurately recorded by the Contractor and submitted to the Project Consultant prior to final acceptance of the work. All horizontal and vertical information shall be taken by an independent Registered Surveyor and included in the As-Built information furnished by the Contractor. Final approval of the project is subject to the final review and approval of the As-Built information furnished to the regulatory agencies.

1.5 APPLICABLE CODES

A. General: All construction and materials shall conform to the Standards and Specifications of Chapter 6A-2.045 (5) FAC, and all local and national codes where applicable.

B. Construction Safety: All construction shall be done in a safe manner, specifically, the rules and regulations of the Occupational Safety and Health Administration (OSHA) and the Manual of Uniform Traffic Control Devices (MUTCD) shall be strictly observed.

C. Survey Data: All elevations on the plans or referenced in the specifications are based on North American Vertical Datum of 1988 (NAVD).

1.06 RELATED WORK

A. Section 02315 - Trenching, Backfilling, & Compaction for Utility Systems.

PART 2 – PRODUCTS

2.1 PIPE

A. The water main shall be either polyvinyl chloride (PVC) or Ductile Iron Pipe (DIP) and shall have push-on rubber gasket joints.

B. PVC pipe shall be pressure pipe with iron O.D., Class 150 (SDR 18), conforming to ANSI/AWWA C900-97.

C. S.D.R. 18 PVC pipe shall be of pressure class 150 suitable for use at hydrostatic working pressure of 150 psi at 72 degrees F. All pipe must meet requirements as set forth in AWWA C900-89, with standard dimensions ratio SDR-18, and bearing the National Sanitation Foundation seal for potable water pipe. Provisions must be made for contraction and expansion at each joint. Pipe and fittings must be assembled with nontoxic lubricant. Laying lengths shall be 20 feet + or - one inch. Pipe shall be supplied with cast-iron pipe equivalent outside diameter, unless otherwise noted on the plans.

D. Ductile iron pipe shall conform to AWWA/A.N.S.I. C151/ A-21.51 with class 3 wall thickness for pipe 12" and smaller, Class 2 for larger, as shown in Table 6, A.N.S.I. A-21.51 Pipe shall be cement lined in accordance with AWWA/A.N.S.I. C104/A-21.4.

Miscellaneous 3/4" Threaded Tie Rods: shall be cadmium plated. Rods shall be painted with a coal tar base paint following installation.

2.2 FITTINGS

A. Fittings shall have a pressure rating of 250 psi and conform to the latest revision of ANSI/AWWA ClIO/A21.10-93.

B. Mechanical joint fittings shall conform to the latest revision of ANSI/AWWA C-lIO/A21.10-93.

C. Flanged fittings shall conform to ANSI Specifications for Class 125.

D. Brass fittings shall conform to ANSI/AWWA C 800-89. All exposed threads shall be covered with a protective plastic coating.

E. Fittings for PVC pipe shall be cast iron mechanical joint type having a pressure rating of 250 psi and conforming to ANSI/AWWA C-lIO/A21.10-93.

2. 3 VALVES

A. Gate valves 2-1/2" or less in size shall be standard 125 pound, non-rising stem, bronze, double-disc, screwed type, equipped with hand wheel.

B. Gate valves over 2-1/2" size shall be resilient seat gate valves with iron body, non-rising stem, and fully coated disc with rubber seat ring manufactured in accordance with ANSI/AWWA C509-94.

2.4 VALVE BOXES

A. Valve boxes shall be of standard extension design and manufactured with top cover marked "water". The top section shall be adjustable for elevation and shall be set to allow equal movement above and below grade. Size of valve box shall be as required for the valve. Base of valve box shall be centered over the valve and rest firmly on compacted backfill and the entire assembly shall be plumb. Valve boxes shall be Figure H-10364, as manufactured by Mueller Company, or an approved equal.

2.5 HYDRANTS

A. Hydrants shall have a minimum 6" mechanical joint base pipe connection, 5-1/4" main valve opening, two 2-1/2" hose nozzles, and one 4-1/2" pamper nozzle. Threads shall be National Standard. Hydrants shall be cast iron body, fully bronze mounted, suitable for a working pressure of 150 pounds, and shall be in accordance with the latest specification of the ANSI/AWWA. They shall be of the O-ring seal type. Operating nut shall open counter-clockwise and be of the pentagonal shape, measuring 1-1/2" from point to opposite flat.

B. Hydrants shall be furnished with a breakable feature that will break cleanly upon impact. This shall consist of a two part breakable safety flange with a breakable stem coupling. The upper

and lower barrels shall be fluted and ribbed above and below the safety flange or have an extra strength lower barrel.

C. Hydrants shall be painted one coat of zinc chromate primer and two finish coats of an approved paint of the color directed. Hydrants shall be Number A-423, Traffic Type, as manufactured by Mueller Company, or an approved equal.

2.6 SERVICE CONNECTION AND METER

A. The Contractor shall install or have the City install water meters complete with backflow preventor, valves and meter vault, at the locations shown on the drawings, and in accordance with the specifications as shown on the drawings. Contractor shall submit shop drawings for meter, valves, and backflow preventor. Contractor is responsible for all costs associated with providing and installing water meters, vaults, backflow preventors, valves, and connections in accordance with the applicable City or County Standards.

2.7 SERVICE METERS

A. Service water meters shall be of the rotating disc, bronze split case housing type. The meter register shall be of the straight reading type, recording flow in gallons, and shall be of the sealed register type. Meters shall conform to applicable specifications of ANSI/AWWA and shall be as manufactured by Neptune Meter Company, or an approved equal.

2.8 METER BOXES

A. Meter boxes shall be precast concrete with a two-piece reinforced concrete cover including a round concrete reading lid. Meter boxes for 5/8" or 3/4" meters shall be Model 36R, as manufactured by Brooks Products, Inc. Meter boxes for larger meters shall be of suitable size for the enclosed meter. Shop drawings must be submitted for meter boxes larger than 3/4”.

2.9 BACKFLOW PREVENTORS

A. Backflow preventors shall conform to AWWA Standard C506 and shall be of the reduced pressure type. Backflow preventors shall be painted with one coat of zinc chromate primer and two finish coats of an approved paint of the color directed. Valves on all backflow preventors shall be chained together and locked with a padlock.

2.10 PRESSURE GAGES

A. Pressure Gages: Pressure gages for line pressure measurement shall conform to Federal Specifications GG-G-76, Class 1, Style A, Type 1, 3-1/2 inches in diameter with phenolic case, or as indicated on the drawings.

2.11 PIPE HANGERS

A. Pipe Hangers: Pipe hangers shall comply with the applicable requirements of Federal Specification WW-H-171, hangers and Supports, Pipe. The type shall be as shown on the

plans. Where a manufacturer's identification number is shown it is to indicate the type of hanger and the material to be used.

2.12 CHECK VALVES

A. Check valves shall be A.W.W.A. standard for 175 working pressure, swing type, iron body, bronze mounted, leather faced disc, suitable for vertical or horizontal position. Valves shall be Mueller Figure A-2600 or approved equal. Where designated on the plans, check valves shall be spring loaded, double half disc wafer check valve, manufactured by TRW Mission, or approved equal. Spring shall be of sufficient tension so valve will close without appreciable slam.

2.13 WATER SERVICES

A. Polyethylene Tubing - Polyethylene extrusion compound from which the polyethylene tubing is extruded shall comply with applicable requirements for PE-3406 or 3408 ultra high molecular weight polyethylene plastic material. Material shall be as described in A.S.T.M. D-1248 and shall comply with the following:

1. Tubing Shall have a working pressure of 160 P.S.I. at 73.4^{o}F.

2. Tubing must be capable of maintaining pressures of 340 P.S.I. at 73.4^{o}F for 1,000 hours when tested in accordance with A.S.T.M. D-1598, and must have a minimum quick burst of 630 P.S.I. when tested in accordance with A.S.T.M. D-1599.

3. Tubing surfaces shall be free from bumps and irregularities. Materials must be completely homogeneous and uniform in appearance.

4. Tubing dimensions and tolerances shall correspond with the valves listed in A.S.T.M. D-2737 with a standard dimension ration (SDR) of 9.

5. Tubing shall be fully labeled with brand name and manufacturer, NSF Seal, size, type of plastic material, and A.S.T.M. Applicable designation with which the tubing complies.

B. Copper tubing shall be type "K" and shall conform to A.W.W.A. Specification 75-CR and A.S.T.M. B-88.

C. Other service materials may be considered for specific installations upon submissions of specifications and approval by the Project Consultant.

D. Joints

1. Joints for polyethylene or copper tubing shall be of the compression type utilizing a totally confined grip seal and coupling nut. Stainless steel tube stiffener insert shall also be used for P.E. tubing service.

2. Other type joints may be considered for specific installations upon submissions of specifications and approval by the Project Consultant.

2.14 METER VALVES

A. Meter valves shall be of bronze construction in accordance with A.S.T.M. B-62.

B. Meter valves shall be closed bottom design and resilient "o" ring sealed against external leakage at the top. Shut-off shall be affected by a resilient pressure actuated seal so positioned in the plug as to completely enclose the flow way in the closed position. The inlet side of all meter valves shall have a compression type fitting as detailed in Section C Part 1. Meter valves for meter size l" and under shall be equipped with a meter coupling nut on the outlet sides.

C. Meter valves for 1 1/2" and 2" meters shall have flanged connections on the outlet sides. Meter valves over 2" will be considered on individual basis for the particular installation involved.

2.15 CURB STOPS

A. Curb stops shall be of the inverted key type with tee-head shut off. Curb stops shall be made of brass alloy in accordance with A.S.T.M. B-62.

2.16 CORPORATION STOPS

A. Corporation stops shall be manufactured of brass alloy in accordance with A.S.T.M. B-62. Inlet thread shall be A.W.W.A. taper thread in all sizes in accordance with A.W.W.A. C-800 latest revision. Outlet connections shall have a compression type fitting as detailed in Section C Part 1.

2.17 TAPPING SLEEVES

A. D.I. Tapping sleeves shall be of the mechanical joint type having a flat faced D.I. flange, recessed for a tapping valve. All end and side gaskets shall be totally confined.

B. The contractor shall determine the outside diameter of the existing main before ordering the sleeve.

PART 3 - EXECUTION

3.1 UNLOADING MATERIAL

A. The Contractor shall exercise care in unloading and handling pipe, valves, fittings, and all other material. Dropping pipe from trucks and allowing pipe to roll against other pipe will not be permitted.

3.2 EXCAVATION

A. Pipe line trenches shall be excavated to required depth as shown on the plans or as directed by the Project Consultant. In general, water distribution lines shall have a minimum of 36" cover. If rock is encountered, excavation shall be carried a minimum of 6" below bottom of pipe, and trench backfilled with sand or earth and thoroughly tamped. Width of trench shall be sufficient to allow workmen to perform all operations incidental to constructing the pipeline. Hand dug bell holes shall be provided to permit proper joint making. No section of pipe shall bear on rock. All excavation to conform with Section 02221.

3.3 SEPARATION OF WATER AND SEWER MAINS

See design plans for water and sewer separation statement and requirements.

3.4 INSTALLATION OF PIPE

A. All installation of pipe shall conform to AWWA C600 latest revision. Pipe shall not be rolled or pushed into the trench from the bank. Before pipe is lowered into the trench, it shall be thoroughly inspected by the Contractor, as necessary, to insure its sound condition and eliminate the possibility of leakage or bursting under test pressure. Pipes and valves, fittings and all other materials showing defects shall not be used for construction. All such defective materials shall be removed from the construction site immediately. Before pipe is lowered into the trench, it shall be swabbed or brushed to insure that no dirt or foreign matter will be in the finished line.

B. Pipe shall be laid on a flat bottom trench and backfill tamped to 6" above the top of the pipe. Pipe installation shall conform to "Type B Method" as adopted by Committee A21 of the American Standards Association. A firm even bearing shall be provided throughout the length of each section of pipe. Pipe shall not bear on any unyielding structures, nor shall it support any other structures. All dead ends shall be plugged or capped, anchored and held in place with concrete backing as required. Except while work is in progress, all pipe openings shall be suitably plugged to prevent entrance of water or any foreign matter. Material deemed unstable for providing adequate support for pipe shall be removed and replaced by suitable material. Adequate backfill shall be deposited on the pipe to prevent floating. Any pipe which has floated shall be removed from the trench and re-laid as directed by the Project Consultant.

C. Connection of all new systems to existing mains shall be done using one of the three following methods:

1. Method A per BCHD Standards which involves a reduced size temporary connection between the existing main and the new main.

2. Method B per BCHD Standards which involves a direct connection between the new and existing mains using two gate valves separated by a sleeve with a vent pipe.

Connection method must be approved and witnessed by the water utility company.

3.5 JOINTS

All joints shall be suitable for the type of pipe being jointed and shall be made in accordance with manufacturer's recommendations.

A. Mechanical Joints: Mechanical joints shall be of the stuffing box type. The gland, followed by the rubber gasket, shall be placed over the plain end of the pipe which is inserted into the socket. The gasket is then pushed into position so that it is evenly seated in the socket. The gland shall be moved into position against the face of the socket, bolts inserted and made finger tight. Bolts shall be tightened by a ratchet wrench suitable for the size of pipe being connected alternately, bottom then top, etc., until the joint is completed.

B. Compression Joints: Compression joints shall be a rubber seal joint, made pressure tight by a molded rubber gasket and lubricant to facilitate assembly. The joint shall be made tight by inserting the plain end into the bell after lubrication. The compression joint shall be similar and equal to "Altite" as manufactured by Alabama Pipe Company. Joints shall be made up as recommended by the manufacturer.

C. Flanged Joints: Flanged joints shall be made with rubber or fiber asbestos gaskets. Bolts shall have rough square hands and hexagonal nuts made to American Standard rough dimensions and shall be chamfered and trimmed. Bolts shall be the recommended size for the diameter of pipe being jointed and shall be tightened as to distribute evenly the stress in the bolts and bring the pipe in alignment.

3.6 INSTALLATION OF FITTINGS

A. Applicable portions of these specifications shall apply to installation of fittings. Reaction or thrust blocking shall be applied at bends and tees, and where changes in pipe diameter occur at reducers or in fittings. Refer to details for concrete strength and dimensions. Restrained joints shall be used for all fittings in the Public ROW.

3.7 INSTALLATION OF FIRE HYDRANTS

A. Applicable portions of these specifications shall apply to installation of fire hydrants. All hydrants shall stand plumb and burial line shall be set at finished grade. Sufficient concrete thrust blocking shall be placed as shown on the plans or as directed by the Project Consultant.

3.8 INSTALLATION OF VALVES

A. Applicable portions of these specifications shall apply to installation of valves. All valves shall stand plumb unless otherwise shown on the plans or directed by the Engineer. The operation of installing tapping sleeves and valves shall be done by an experienced organization who has been engaged in this type of work not less than one (l) year with a representative list of successful installations.

3.9 PRESSURE TESTS

A. After pipe has been adequately backfilled, and not less than seven days after placing the last concrete thrust blocking, all laid pipe shall be subjected to a pressure test for two hours at 150 psi minimum, in accordance with ANSI/AWWA C600-05. The pressure test shall not vary more than +/-5 psi during the test. Care shall be taken to insure that all air has been removed from the pipe previous to pressure tests. The Contractor shall provide such means of venting the pipe as are required. Any material or installation proving defective shall be replaced by the Contractor. The pressure test shall be witnessed by a representative of the City/County and the Engineer of Record.

3.10 LEAKAGE TESTS

A. After the main has been brought up to test pressure, it shall be held at this pressure and make up water shall be carefully measured by use of a displacement meter or by pumping the water from a vessel of known volume. The pipeline shall be walked and all visible joints

inspected for leakage and movement of pipe. All visible leaks shall be repaired. Should any section of pipeline disclose joint leakage greater than that permitted, the Contractor shall, at his own expense, locate and repair the defective joints until leakage is within the permitted allowance.

B. All pipe, etc. shall be tested under a constant pressure of 150 psi (fire main at 200 psi)for a minimum test of two hours and shall not exceed the leakage requirements as per ANSI/AWWA specifications of C600-87 leakage formula:

$$\frac{Q=SD\,p^{.5}}{148{,}000}$$

Q= allowable leakage in gallons per hour
S= total length of pipe tested in feet
D= diameter of the pipe tested in inches
P= average test pressure in pounds per square inch

3.11 BACKFILL

A. All backfill shall be carefully placed to avoid movement of the pipeline. Backfill shall be free from rock, large stones, boulders, brush, or other unsuitable material. It shall be placed in the trench uniformly on both sides of the pipe for the full width of the trench and to the horizontal diameter of the full length of the pipe. This backfill shall be thoroughly tamped to provide compaction under and on each size of the pipe to support free from voids. Additional backfill shall then be placed between joints to an average depth of 12" over the top of the pipe where pipe is of 8" and smaller diameter, and 24" over the larger pipe. Pipe joints shall remain exposed until completion of the pressure and leakage tests unless otherwise directed by the Project Consultant.

B. On completion of pressure and leakage tests, the exposed joints shall be backfilled to a depth of 12" above the top of the pipe. Backfill shall be carefully compacted until 12" of cover exists over the pipe. The remainder of the backfill shall then be placed and compacted thoroughly by puddling and tamping as required. Where directed, puddling and tamping may be omitted, and backfill shall be neatly rounded over the trench to a sufficient height to allow for settlement to grade after consolidation. Backfill shall be in compliance with Section 02315.

3.12 STERILIZATION OF COMPLETED PIPELINE

A. Before final acceptance of completed pipeline, all requirements of the County and State Board of Health shall be satisfied. Satisfactory bacteriological test results from these agencies shall be forwarded to the Engineer of Record and Project Consultant.

B. Prior to chlorination of mains, all dirt and foreign matter shall be removed by high velocity flushing through fire hydrants or other approved blow-offs. The main shall then be disinfected in accordance with the application sections of AWWA C651-92 and with local health department requirements. The Contractor will furnish and place the disinfecting agent, a chlorine solution of at least 50 part per million of chlorine, in the main, and then retain the solution in the pipe not less than 24 hours. Chlorine residual after retention period shall be not less than 25 parts per million. After chlorination, the mains shall be thoroughly flushed and required samples taken for bacteriological analysis.

3.13 RESTORATION OF SURFACES AND/OR STRUCTURES

A. The Contractor shall restore and/or replace paving, curbing, sidewalks, fences, sod, survey points, or other disturbed surfaces or structures to a condition equal to that before the work was begun and to satisfaction of the Project Consultant, and shall furnish all labor and materials incidental thereto. Restoration of surfaces and/or structures shall comply with all requirements of the applicable governing agencies including City, Town, County, and State.

3.14 CLEANING UP

A. Surplus pipeline material, tools, temporary structures, etc., shall be removed by the Contractor. All dirt, rubbish, and excess earth shall be disposed of by the Contractor as directed by the Project Consultant. The construction site shall be left clean, to the satisfaction of the Project Consultant.

3.15 INSPECTIONS

A. The Contractor shall notify the City, Project Consultant, and the Engineer of Record at least 24 hours prior to beginning construction to arrange the required inspection of the water system.

3.16 PROJECT RECORD DOCUMENTS

A. The Contractor shall maintain accurate and complete records of work items completed.

B. Prior to the placement of any asphalt or concrete pavement, the Contractor shall submit to the Project Consultant, "as-built" plans showing water improvements. Paving operations shall not commence until the Project Consultant has reviewed the "as-builts".

C. All "as-built" information submitted to the Project Consultant shall be sufficiently accurate, clear and legible to satisfy the Project Consultant that the information provides a true representation of the improvements constructed.

D. Upon completion of construction, the Contractor shall submit to-the Engineer of Record complete sets of "as-built" construction drawings as required and one CD with AutoCAD file. These drawings shall be marked to show "as-built" construction changes and dimensioned locations and elevations of all improvements and shall be signed by the Contractor. As-built drawings must be signed and sealed by a Professional Land Surveyor registered in the State of Florida.

E. "As-built" information on the water system shall include vertical and horizontal locations of all valves, fittings, fire hydrants, water services, and connection points. As-builts shall show the associated pipe size and material type. As-built must also show the sample points and the sample point numbers must conform to the numbers used on the bacteriological test results.

END OF SECTION

SECTION 02520

CONCRETE PAVING

PART 1 GENERAL

1.1 SECTION INCLUDES:

A. Extent of concrete curbs, walks, and paving as show on drawings.
B. Earthwork and prepared sub-base.
C. Concrete and related materials.
D. Joint Fillers and Sealers

1.2 QUALITY ASSURANCE

A. Comply with local governing regulations if more stringent than herein specified.

1.3 JOB CONDITIONS:

A. Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 PRODUCTS

2.1 MATERIALS:

A. Form: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal.
   1. Use straight forms, free of distortion and defects.
B. Use flexible spring steel forms or laminated boards to form radius bends as required.
C. Coat forms with a non-staining form release agent that will not discolor or deface the surface of the concrete.
D. No Earth Forming allowed.
E. Concrete Materials: Comply with requirements of applicable sections for concrete materials, admixture, bonding materials, curing materials, and others as required.
F. Expansion Joint Materials: Comply with requirements of Sections for performed expansion joint fillers and sealers.

2.2 CONCRETE MIX, DESIGN AND TESTING:

A. Comply with requirements of applicable Section for concrete mix design, sampling and testing, and quality control, and as herein specified.
B. Design mix to produce standard-weight concrete consisting of portland cement, aggregate, air-entraining admixture and water to produce the following properties:
C. Compressive Strength: 3000 psi, minimum at 28 days.
D. Slump Range: 2" to 4".
E. Air Content: 5% to 8%.

PART 3 EXECUTION

3.1 INSPECTION:

A. Examine the areas and conditions for the installation of concrete curbs, walks, and paving, if there are conditions detrimental to the proper and timely completion; notify the A/E in writing immediately.
B. Do not proceed with work until unsatisfactory conditions are corrected.

3.2 SURFACE PREPARATION:

A. Remove loose material from the compacted subgrade surface immediately before placing concrete.
B. Proof-roll prepared subgrade surface to check for unstable areas and need for additional compaction.
C. Do not begin paving work until such conditions correct and ready to receive paving (95%, modified proctor).

3.3 FORM CONSTRUCTION:

A. Set forms to the required grades and lines, rigidly braced and secured. Install sufficient quantity of forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement.
B. Check completed formwork for grade and alignment to the following tolerances:
C. Top of forms not more than $^{1}/_{8}$" in 10' deviation in alignment.
D. Vertical face on longitudinal axis, not more than ¼" in 10'.
E. Clean forms after each use and coat with form release agent as often as required to ensure separation from concrete without damage.

3.4 REINFORCEMENT:

A. Use unreinforced concrete unless otherwise noted.

3.5 CONCRETE PLACEMENT:

A. General: Comply with the requirements of Sections for mixing and placing concrete, and as specified.
B. Do not place concrete until subgrade and forms are checked and Architect approves for line and grade.
   1. Moisten subgrade if required to provide a uniform dampened condition at the time concrete is placed.
   2. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
C. Place concrete using methods, which prevent segregation of mix.
   1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator.
   2. Keep vibrator away from joint assemblies, reinforcement or side forms.
   3. Use only square-faced shovels for hand spreading and consolidation.
   4. Consolidate with care to prevent dislocation of reinforcing, dowels and joint devices.
D. Deposit and spread concrete in continuous operation between transverse joints, as far as possible.
   1. If interrupted for more than ½- hour, place a construction joint.

E. Curbs and Gutters:
   1. Contractor, with the Architect's approval, may use an automatic machine for curb and gutter placement.
   2. If machine placement is used, submit revise mix design and laboratory test results, which meet or exceed minimums specified.
   3. Machine placement must produce curbs and gutters to required cross-section, lines, grades, finish, and jointing as specified for formed concrete.
   4. If results are not acceptable, remove and replace with formed concrete as specified.
   5. Do not extrude curbs on bituminous paving.

3.6 JOINTS:

A. General: Construct expansion, weakened-plane (contraction), and construction joints true-to-line with face perpendicular to surface of the concrete, unless otherwise indicated.
   1. Construct transverse joints at right angles to the centerline, (distance equal to width) unless otherwise indicated.
B. Weakened-plane (Contraction) Joints: Provide weakened-plane (contraction) joints, sectioning concrete into areas as shown on the drawings or every ten linear feet for curbs.
   1. Construct weakened-plane joints for a depth equal to at least ¼ of the concrete thickness.
C. Sawed Joints: Form weakened-plane joints using powered saws equipped with shatterproof abrasive or diamond-rimmed blades.
   1. Cut joints into hardened concrete as soon as surface will not be torn, abraded or otherwise damaged by cutting action, but no latter than 48 hours.
D. Construction Joints: Place construction joints at end of all pours and locations where concrete placement operations stop for a period of more than ½- hour, except where such pours terminate at expansion joints.
E. Construct joints as shown or, if not shown, use standard metal key-way section forms.
F. Expansion Joints: Provide pre-molded joint filler for expansion joints abutting concrete curbs, catch basins, manholes, inlets, structures, walks, buildings and other fixed objects, and changes in direction, and as shown on plans.
G. Locate expansion joints in pavement vehicle traffic lane 20'-0" o.c., unless otherwise indicated.
H. Locate expansion joints the length of the sidewalk 48'-0” o.c., unless otherwise indicated
I. Extend joint fillers full-width and depth of joint, and not less than ½" or more than 1", and 1" below finished surface for joints sealer.
J. Provide dummy joints in sidewalk slabs 6' o.c., joints may be tool-struck or saw cut.

3.7 CONCRETE FINISHING:

A. After striking-off and consolidating concrete, smooth surface by screeding and floating.
   1. Use hand methods only where mechanical floating is not possible.
   2. Adjust floating to compact surface and produce a uniform texture.
B. After floating, test surface for trueness with a ten-foot straight edge.
   1. Distribute concrete as required to remove surface irregularities, and re-float repaired areas to provide a continuous smooth finish.
C. Work edges of slabs, gutters, back top edge of curb, and formed joints with an edging tool, and round to ½" radius, unless otherwise indicted. Eliminate any tool marks on concrete surface.

D. After completion of floating and when excess moisture or surface sheen has disappeared, complete surface finishing, as follows:
E. Broom finish, by drawing fine-hair broom across concrete surface, perpendicular to line of traffic. Repeat operation if required to provide a fine line texture acceptable to Architect.
F. Do not remove forms for 24 hours after placing concrete.
   1. After form removal, clean ends of joints and point-up any minor honeycombed areas.
   2. Remove and replace areas or section with major defects, as directed by Architect.

3.8 CURING:

A. Protect and cure finished concrete paving, complying with applicable requirements of Division 3 Concrete, using moist-curing methods for initial curing whenever possible.

3.9 REPAIRS AND PROTECTIONS:

A. Repair or replace broken or defective concrete, as directed by Architect.
B. Drill test cores when directed by Architect, when necessary to determine magnitude of cracks or defective areas.
   1. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with suitable bonding agent.
C. Protect concrete from damage until acceptance of work.
   1. Exclude traffic from pavement for at least 14 days after placement.
   2. Once construction traffic resumes, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.
D. Sweep concrete pavement as wash free of stains, discolorations, dirt and other foreign material just prior to final inspection.
E. Repair/Replace existing sidewalks adjacent to property and on property if broken.

3.10 CONCRETE THICKNESS

A. Sidewalks shall be 4" thick (6"at driveways) on 4" compact subgrade minimum 6' wide, with 3000 psi no reinforcement.
   1. Slopes between 1:12 and 1:20 indicate accessible ramps and shall comply with the requirements of chapter 11 of the Florida Building Code-Building (FBC-Building).
   2. Cross slopes on sidewalks shall be a maximum of 1:50.
   3. Extend curbs/sidewalks a minimum 24" from covered walkway columns.
   4. Provide raised sidewalks or curbs to separate students from vehicle traffic.
B. Concrete Pavement for vehicle traffic areas shall be a minimum 6" thick 3000 psi concrete with 6" x 6" x #6 x #6 welded wire mesh 2" from the bottom of slab on 6" limerock base.
   1. Slope concrete $^{1}/_{8}$" per foot.
   2. Provide accessible ramps meeting the requirements of chapter 11 of FBC-Building.

END OF SECTION

SECTION 02530

WASTE WATER COLLECTION

PART I – GENERAL

1.1 SCOPE

A. The Contractor shall provide for the furnishing of all labor, equipment, and materials to perform all operations necessary to construct and test the waste water collection system in accordance with the plans and specifications.

1.2 EXISTING UTILITIES

A. The Contractor shall obtain an UNCLE (Underground Utilities Notification Center of Florida) Certification number at least 48 hours prior to beginning any excavation.

B. Prior to beginning construction, the Contractor shall verify the size, location, elevation, and material of all existing utilities within the area of construction by use of record drawings and/or electronic locating devices.

C. Existing utility locations shown on these plans are approximate. The Project Consultant assumes no responsibility for the accuracy of existing utilities shown or for any existing utilities not shown.

D. The Contractor shall be responsible for damage to any existing utilities for which he fails to request locations from the utility owner. He is responsible as well for damage to any existing utilities which are properly located.

E. If upon excavation, an existing utility is found to be in conflict with the proposed construction or to be of a size or material different from that shown on the plans; the Contractor shall immediately notify the Project Consultant.

1.3 SHOP DRAWINGS AND SUBMITTALS

A. The Contractor shall furnish to the Project Consultant manufacturers' literature and data for all materials to be installed under this section. These submittals must be stamped "Approved" by the Project Consultant prior to installation by the Contractor.

B. Complete "As-Built" information relative to manholes, cleanouts, services, fittings, pipe size, pipe material, length of pipe, and the like, shall be accurately recorded by the Contractor and submitted to the Project Consultant prior to final acceptance of the work. All horizontal and vertical information shall be taken by an independent Registered Surveyor and included in the As-Built information furnished by the Contractor. Final approval of the project is subject to the final review and approval of the As-Built information furnished to the regulatory agencies. Contractor must supply As-Builts in a format approved by the regulatory agencies.

1.4 RELATED WORK

A. Section 02315 - Trenching, Backfilling, and Compacting for Utility Systems.

1. 5 APPLICABLE CODES

A. General: All construction and materials shall conform to the Standards and Specifications of Chapter 6A- 2.045 (5) FAC, and all local and national codes where applicable.

B. Construction Safety: All construction shall be done in a safe manner, specifically, the rules and regulations of the Occupational Safety and Health Administration (OSHA) and the Manual of Uniform Traffic Control Devices (MUTCD) shall be strictly observed.

C. Survey Data: All elevations on the plans or referenced in the specifications are based on North American Vertical Datum of 1988 (NAVD).

PART 2 – PRODUCTS

2.1 SEWER PIPE AND FITTINGS

A. All sewer pipe and fittings shall be non-pressure polyvinyl chloride (PVC) pipe conforming to ASTM D 3034, SDR 35, with push-on rubber gasket joints.

B. All fittings and accessories shall be as manufactured or supplied by the pipe manufacturer or approved equal.

In addition to the above cited specification, all PVC sewers shall conform to the following additional requirements:

1. The PVC sewer piping shall be of a product having a dimension ratio (DR) of 35 and minimum pipe stiffness (PS) of 46 psi.

2. Joints: The integral bell gasketed joint is designed so that when assembled, the elastomeric gasket inside the bell is compressed radially on the pipe spigot to form a positive seal. The joint shall be so designed to avoid displacement of the gasket when installed in accordance with the manufacturer's recommendation.

3. Joining of the pipe shall utilize lubricants as recommended by the manufacturer. No solvent cement joints shall be accepted. The jointing of the pipe on the job shall be done in strict accordance with the pipe manufacturer's instructions and shall be done entirely in the trench unless otherwise directed by the Project Consultant.

4. Gaskets: All gaskets shall be molded in a circular form or extruded to the proper section and then spliced into circular form, and shall consist of a properly vulcanized high grade elastomeric compound. The basic polymer shall be natural rubber, synthetic elastomer or a blend of both. The gaskets shall be manufactured of materials resistant to domestic sewage and shall be as recommended by the manufacturer. The gasket shall provide an adequate compressive force so as to affect a positive seal under all combinations of joint tolerance. The gasket shall be the only element depended upon to make the joint flexible and water tight.

5. Pipe and Fittings: The pipe shall be made of PVC plastic having a cell classification of 12454-B or 12454-C or 13364-B (with minimum tensile modulus of 500,000 psi) as defined in specification D 1784. The fittings shall be made of PVC plastic having a cell classification of 12454-B, 12454-C or 13343-C as defined in specification D 1782.

Compounds that have different cell classifications because one or more properties are superior to those of the specified compounds are also acceptable. Clean rework material generated by the manufacturers own production may be used so long as the pipe or fittings produced meet all the requirements of the specification.

The pipe and fittings shall be homogenous throughout and free from visible cracks, holes, foreign inclusions or other injurious defects. The pipe shall be as uniform as commercially practical in color, opacity, density and other physical properties. PVC pipe and fittings which show signs of ultra-violet degradation will not be allowed.

6. Pipe Marking: Each standard and random length of pipe in accordance with this standard shall be clearly marked per the following example at intervals of 1.5 m (5 feet) or less:

   Manufacturer's Name or Trademark
   Nominal Pipe Size
   The PVC Cell Classification
   The Legend "Type P# 1DR 35 PVC Sewer Pipe"

7. Fittings Marking: The fittings in compliance with this standard shall be clearly marked per the following example:

   Manufacturer's Name or Trademark
   Nominal Size
   The Material Designation "PVC" PSM.

8. Adapters: Adapters as required by the field conditions shall be as approved by the Project Consultant.

9. Plugs: Service plugs shall be flexible virgin polyvinyl chloride as supplied by Fernco Joint Sealer Company.

PART 3 – EXECUTION

3.1 EXCAVATIONS

A. Trenches shall be kept as nearly vertical as possible and if required, shall be properly sheeted and braced. Where in the opinion of the Contractor, damage could result from withdrawing sheeting; the sheeting shall be left in place.

B. Except in rock, water-bearing earth, or where a granular or concrete base is to be used, mechanical excavation of trenches shall be stopped above the final grade elevation so that the pipe may be laid on a firm, undisturbed native earth bed. If over digging occurs, all loosened earth shall be removed and the trench bottom brought back to grade with granular material.

C. Excavations and trenches in rock shall be carried to a depth of not less than 4 inches below the pipe bottom. This space shall be filled with granular material or washed rock.

D. Width of trenches shall be such as to provide adequate space for placing and jointing pipe properly, but in every case the trench shall be kept to a minimum width.

E. Any unstable soil encountered shall be removed and replaced with gravel, crushed rock, or rock and sand suitably compacted.

F. All excavations shall be in conformance with Section 02221.

3.2 DEWATERING

A. The Contractor shall provide adequate equipment for the removal of storm or surface water which may accumulate in the excavation areas. If subsurface water is encountered, the Contractor shall utilize approved means to adequately dewater the excavation so that it will be suitably dry for working, form setting, concrete pouring, and pipe installation. A wellpoint system or other approved equipment shall be installed if necessary to maintain the excavation in a dry condition for such operations. All cost for this equipment and work shall be at the Contractor's expense.

3.3 PREPARATION OF TRENCH BOTTOM

A. Water shall not be allowed in the trenches while the trench bottom is being prepared or while pipe is being installed, unless directed by the Project Consultant.

B. A continuous trough shall be shaped to receive the bottom quadrant of the pipe barrel. Bell holes shall be excavated so that after placement, only the barrel of the pipe receives bearing pressure from the trench bottom.

C. Preparation of the trench bottom and placement of the pipe shall be carefully made so that when in final position, the pipe is true to line and grade.

D. When sand, crushed rock, gravel or pea rock are used to support the pipe, such material shall be placed in the trench bottom a minimum of 4 inches below the bottom of the pipe, and a trough as described above shall be formed to uniformly support the bottom quadrant of the pipe barrel.

3.4 INSTALLATION OF SEWER PIPE

A. Sewer pipe shall be installed in accordance with ASTM D 2321 and the Uni-Bell Plastic Pipe Association's "Recommended Practice for the Installation of PVC Sewer Pipe".

B. Pipe shall be protected during handling against impact shocks and free falls. Pipe shall be kept clean at all times and no pipe shall be used that does not conform to the specifications.

C. The laying of the pipe shall be commenced at the lowest point, with spigot ends pointing in the direction of flow. All pipe shall be laid with ends abutting and true to line and grade. They shall be carefully centered, so that when laid, they will form a sewer with a uniform invert. Pipe shall be laid in accordance with manufacturer's requirements as reviewed by the Project Consultant.

D. Pipe shall be laid accurately to the line and grade as designated on the plans. Preparatory to making pipe joints, all surfaces of the portions of the pipe to be jointed or of the factory-made jointing material shall be clean and dry. Lubricant, primers, adhesives, etc., shall be used as recommended by the pipe or joint manufacturer's specifications. The jointing materials or

factory fabricated joints shall then be placed, fitted, joined and adjusted in such a manner as to obtain a watertight line. As soon as possible after the joint is made, sufficient backfill material shall be placed along each side of the pipe to prevent movement of pipe off line and grade.

E. The exposed ends of all pipe shall be suitably plugged to prevent earth, water or other substances from entering the pipe when construction is not in progress.

F. Harco or approved equal manhole couplings shall be grouted in place at each pipe connection into a manhole wall.

3.5 BACKFILLING TRENCHES

A. All trenches and excavations shall be backfilled immediately after pipe is laid unless otherwise directed. Under no circumstances shall water be permitted to rise in unbackfilled trenches after pipe has been placed. Backfilling shall be in compliance with Section 02315.

B. Trenches shall be backfilled with approved material free from large clods, stones or rocks larger than l" in diameter, and carefully deposited in layers, not to exceed 6", until enough fill has been placed to provide a cover of not less than 12" above the pipe. Each layer shall be placed, then carefully and uniformly tamped, so as to eliminate the possibility of pipe displacement. The remainder of backfill material shall then be placed, moistened, and compacted, to 95% of AASHTO Specifications T-180 in landscaped areas and 100% of maximum density in paved areas.

C. Whenever the trenches have been improperly filled, or if settlement occurs, they shall be refilled, compacted, smoothed off, and made to conform to grade. Unless otherwise directed, or shown on the plans, backfill in trenches in or through roadways shall be made as specified above, except that the entire fill above 1” over the pipe shall be deposited in layers not to exceed 12" in thickness, moistened, and compacted to density equal to greater than that of adjacent material so that pavement can be placed immediately.

3.6 CONCRETE ENCASEMENT OF SEWER PIPE

A. Trenches in which encasements for pipe are to be placed may be excavated completely with mechanical equipment. Prior to formation of the encasement, temporary supports consisting of timber, wedges or masonry shall be used to support the pipe in place. Temporary supports shall have minimum dimensions and shall support the pipe at not more than two places, one at the bottom of the barrel of the pipe adjacent to the shoulder of the socket, and the other near the spigot end.

After jointing of the pipe has been completed, concrete shall be uniformly poured beneath and on both sides of the pipe. Sufficient concrete shall be used so that encasement is at least 4" thick at all points.

3.7 MANHOLES

Manholes shall be constructed of precast concrete with 4000 psi concrete and grade 40 steel. Other materials may be used upon prior review by the Project Consultant. The manholes shall be constructed to the requirements of ASTM C-478 and shall conform and contain the following:

A. Minimum wall thickness shall be 8". Minimum inside diameter of base sections shall be 48".

B. The precast reinforced base shall be a minimum of 8" thick and be cast monolithically with the bottom section of manhole walls. The base slab shall extend a minimum of 4" from the outside of the manhole.

C. Lifting holes through the structures shall not be permitted. All holes shall be grout filled to a smooth surface.

D. Minimum height of base sections shall be 3' from the bottom of base slab.

E. Manhole sections shall be joined with a mastic compound or a round compression ring of neoprene material set in annular spaces cast into the spigot end of a bell spigot-type joint. The mastic compound of ring shall be uniformly compressed between the positioned sections so as to form a watertight joint. After the sections are assembled, the remaining space in the joint shall be pointed up and filled with a dense cement mortar and finished so as to make a smooth, continuous surface inside and outside the wall sections.

F. Precast manhole cones, when used, shall terminate at such elevations as will permit laying up a minimum of 2 and maximum of 4 courses of clay brick under the manhole frame to make allowance for future street grade adjustment.

G. Brick for manhole construction shall be dense, hard burned, common clay brick conforming to ASTM Specification C-62 latest revision, except that brick absorption shall be between 5 and 25 grams of water absorbed in 1 minute by dried brick, set flat face down, in 1/8" of water. All brick shall be thoroughly wet before laying up and shall be laid with a shove joint in full beds and shall be thoroughly slushed up with mortar at every corner.

H. Invert channels shall be constructed smooth and semicircular in shape conforming to inside of adjacent sewer section. Changes in direction of flow shall be made a smooth curve of as large a radius as the size of the manhole will permit. Changes in size and grade of channels shall be made gradually and evenly. Invert channels shall be formed by one of the following methods: form directly into concrete manhole base, build up with block and mortar, lay half tile in concrete, or lay full section of sewer pipe through manhole and break out top half after the surrounding concrete has hardened. The manhole floor outside of channels shall be made smooth and sloped toward channels on a slope of l" per foot.

I. Where shown on the drawings, the contractor shall place stubouts for future extensions. The manhole ends of all such stubouts shall be closed with a plug and marked with a metallic locating device.

J. Service laterals will not be permitted through manhole walls.

K. Outside drop connections will be required when the vertical distance between pipe inverts exceeds 2'. Drop connections, where required, shall be cast monolithically with the manhole elements.

L. Steps or ladders will be omitted unless specifically required by the Project Consultant.

M. The entire inside and outside of the manhole shall be sealed with 2 coats (8 mil each) of Koppers 300-M Bitumastic Paint. The inside of the manhole surfaces shall be cleaned of all dust, oils, compounds and other foreign matter. The surfaces shall be etched with 18% to 20% muriatic acid solution. All surfaces shall be thoroughly rinsed with clean, clear water prior to paint application. The acid solution shall be completely diluted prior to removal from the system.

N. Jointing and Plastering: Mortar for jointing and plastering shall consist of 1 part Portland Cement and 2 parts of find sand. For block work, lime may be added for workability but shall not exceed 20% of the cement by volume. Joints shall be completely filled and shall be free from surplus mortar. The entire exterior and interior surfaces of block manholes shall be plastered with 3/4" of cement mortar.

O. Influent and effluent sewers shall be grouted in place using a waterproof, expanding grout, acceptable to the Project Consultant. All openings and joints shall be sealed watertight.

P. All castings for manhole frames and covers shall be made of clean even grain, tough gray cast iron. The castings shall be smooth, true to pattern, and free from projects, sand holes, warp and other defects. The horizontal surfaces of the frame cover seat and the under surface of the cover which rests upon the cover seat shall be machined. After machining, it shall not be possible to rock any cover after it has been seated in any position in its associated frame. Machining shall be required only on those frames and covers intended for vehicular traffic.

1. Castings shall be coated with coal tar pitch varnish which shall make a smooth coating, tough and tenacious when cold, not tacky and not brittle. Iron used for castings shall conform to ASTM Designation A-48 for Class 30, gray iron.

2. The words "Sanitary Sewer", and the name of the Owner shall be casted in the cover. The manhole frames and covers shall set so that the top cover shall be flushed with the finished grade or as indicated on the drawings. The manhole frame and corner type shall be as indicated on the drawings. Frames will be suitable for the future addition of cast iron rings for upward adjustment of top elevation. The seating surfaces between frames and covers shall be machined to fit true. No plugging or filling will be allowed. Pick type lifting holes will be cast into lids, but will not go clear through the lid.

3. When a manhole is in low lying areas or when in the opinion of the Engineer an unusual condition exists, a sealed locking type lid may be required. Installation of this type will be carried out as directed by the Engineer.

3.8 CROSSING OF WATER LINES WITH SEWERS

A. Separation between water and sewer lines shall conform to the "Notes on Water Sewer Separation" as shown on the plan sheets.

3.9 SEWER TEST

A. On completion of each block or section of sewer, or such other times as the Project Consultant may direct, the block or section of sewer is to be cleaned, tested and lamped. Each section of the sewer is to show on examination from either end, a full circle of light between manholes. Each manhole, or other appurtenance to the system, shall be of the specified size and form, be watertight, neatly and substantially constructed, with the top set permanently to exact position and grade. All repairs shown necessary by the inspection are to be made; broken or cracked pipe replaced, all deposits removed, and the sewers left true to line and grade, entirely clean and ready for use. The sewer lamping shall be witnessed by the Engineer of Record and the City/County.

B. The allowable limits of infiltration or exfiltration for the entire system, or any portion thereof, shall not exceed a rate of 100 gallons per inch of inside pipe diameter per mile of pipe per 24

hours. No additional allowance will be made for house service lines. The allowable limits of infiltration or exfiltration of manholes shall not exceed a rate of four gallons per manhole per 24 hours. Any part or all of the system may be tested for infiltration or exfiltration, as directed by the Project Consultant. Prior to testing for infiltration, the system shall be pumped out so that normal infiltration conditions exist at the time of testing. The amounts of infiltration or exfiltration shall be determined by pumping into or out of calibrated drums, or by other methods approved by the Project Consultant.

C. The exfiltration test will be conducted by filling the portion of the system being tested, with water, to a level equal to the lowest part of the manhole frame. An air test may be substituted for the water exfiltration test, upon review of the Engineer of Record and the City.

D. Tests shall be conducted on portions of the system not exceeding three manhole sections or 1000' whichever is greater, unless otherwise directed by the Project Consultant. Tests shall be run continuously for 2 hours.

E. Where infiltration or exfiltration exceeds the allowable limits specified herein, the defective pipe, joints, or other faulty construction shall be located and repaired by the Contractor. If the defective portions cannot be located, the Contractor shall remove and reconstruct as much of the work as is necessary in order to conform to the specified allowable limits.

F. The Contractor shall provide all labor, equipment and materials, and shall conduct all testing required, under the direction of the Project Consultant. No separate payment will be made for this work, and the cost for this work shall be included in the contractor's base bid.

3.10 INSPECTIONS

A The Contractor shall notify the City and the Engineer of Record at least 24 hours prior to beginning construction in order to arrange inspection of the sanitary sewer.

B. T.V. Inspection

1. After all other testing has been successfully completed; a television inspection of any or all lines may be requested by the Project Consultant. Should any defects be found, the Contractor will pay the complete cost of inspection and repairing the manhole to manhole section where the defect was found. If no defects are found, the inspection will be at the Owner's expense. Any defective work or necessary corrections from this inspection must be corrected by the Contractor, at his expense, before the lines can be accepted.

3.11 RESTORATION OF SURFACES AND/OR STRUCTURES

A. The Contractor shall restore and/or replace paving, curbing, sidewalks, fences, sod, survey points, or any other disturbed surfaces or structures to a condition equal to that before the work was begun and to the satisfaction of the Project Consultant and shall furnish all labor and materials incidental thereto. Restoration of surfaces and/or structures shall comply with all requirements of the applicable governing agencies.

3.12 PROJECT RECORD DOCUMENTS

A. The Contractor shall maintain accurate and complete records of work items completed.

B. All "as-built" information submitted to the Project Consultant shall be sufficiently accurate, clear and legible to satisfy the Project Consultant that the information provides a true representation of the improvements constructed.

C. Upon completion of construction, the Contractor shall submit to the Project Consultant and Engineer of Record complete sets of "as-built" construction drawings as required. These drawings shall be marked to show "as-built" construction changes and dimensioned locations and elevations of all improvements and shall be signed by the Contractor.

D. All "as-built" information for water and sewer lines shall be certified by a registered land surveyor and shall be submitted in a format acceptable to all local reviewing agencies.

END OF SECTION

SECTION 02875

PREMANUFACTURED SHELTERS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Prefabricated framework and roof deck for a clear span without center columns delivered to a site for installation by Contractor.

B. Related Sections:

1. 03300 - Concrete.
2. 07310 - Asphalt Shingles.
3. 07600 - Flashing and Sheet Metal.
4. 09900 - Painting.
5. Division 7 - Thermal and Moisture Protection.

1.02 REFERENCES

A. American Institute of Steel Construction.

B. American Society of Civil Engineers (ASCE) 7 (current version).

C. Florida Building Code.

1.03 SYSTEM DESCRIPTION

A. Steel columns, glulam framing, and wood deck.

B. Sloped roof system and foundations as specified elsewhere.

1.04 SUBMITTALS

A. Provide signed and sealed shop drawings by the Florida registered professional engineer.

1. Shop drawings shall include, but not be limited to, all shelter components and complete shelter assembly including, but not limited to roof panels, columns, beams, and all required connections and details for approval by A/E.

B. Wind loading design shall comply with American Society of Civil Engineers (ASCE) 7.

1. Provide calculations and connection details, signed and sealed by a Florida registered professional engineer, establishing wind velocity pressure values according to ASCE 7 based on a wind speed of 146 mph, exposure category "C", and a wind load importance factor of 1.15.

C. Provide Florida Building Code NOA for entire shelter assembly.

1.05 QUALITY ASSURANCE

A. Pre-Installation Meeting: Review and coordinate shop drawings, construction documents,

foundation plans, anchor bolt placements, roofing installation, roof drainage systems, and plumbing and electrical connections, if any.

1.06 WARRANTY

A. Provide manufacturer's 5 year limited warranty.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Manufacturer shall crate, ship, and deliver to project site.

B. Acceptance at Site: Verify entire inventory has been delivered and in undamaged condition. Document missing and damaged items.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Shelters:

1. Ramada 30X44 by Poligon/Portercorp
2. A/E approved equal.

2.02 MATERIALS

A. Columns: Structural tubes by shelter manufacturer.

B. Roof Deck: 2”X6" nominal tongue and grooved decking.

C. Fascia: Integral metal fascia by shelter manufacturer.

D. Roofing: Standing seam panels by shelter manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Before erection, verify foundation layout, anchor bolts location, and other items for the timely and proper installation of the prefabricated shelter.

3.02 INSTALLATION

A. Contractor shall install prefabricated shelter according to accepted shop drawings and manufacturer's recommendations.

END OF SECTION

SECTION 02910
TREES, PLANTS AND GROUNDCOVER

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide all necessary labor, materials, equipment, and services to complete all work, as indicated on the Drawings, and/or as specified herein, except for items specifically indicated as "NIC ITEMS".

1.02 RELATED WORK

A. Examine Contract Documents for requirements that affect the work of this Section. Other specification Sections which directly relate to the work of this Section include, but are not limited to:

1 Section 02810, IRRIGATION SYSTEMS
2. Section 02935, SODDING

1.03 REFERENCES

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

1. American National Standards Institute, Inc. (ANSI)
Z60.1 American Standard for Nursery Stock (Sponsor: American Association of Nurserymen, Inc.)
2. American Society for Testing Materials (ASTM):
C136 Sieve Analysis of Fine and Course Aggregates.
E 11 Wire-Cloth Sieves for Testing Purposes.
3. "Hortus Third", A Concise Dictionary of Plants Cultivated in the United States and Canada, Cornell University, L.H. Bailey Hortorium, MacMillan Publishing Company, New York, New York.
4. State of Florida Department of Agriculture and Consumer Services (FDACS),
Grades and Standards for Nursery plants, 2ND Edition, February 1998.

1.04 SUBMITTALS

A. Certificate of inspection of plant material by State Authorities.

B. Samples: the following samples shall be submitted:

Material	Sample Size or Quantity
Mulch	1 Cu. Ft.
Planting Soil	1 Cu. Ft.
Webbing Tape	1 yard
Topsoil from	

Off-site Sources	1 Cu. Ft.
Weed Control Fabric	1 Sq. Ft.
Soil Moisturizer	8 oz.

C. Certificates: Labels from the manufacturer's container certifying that the product meets the specified requirements shall be submitted for the following materials:

Commercial fertilizer

D. Test Reports: test reports from an approved testing agency indicating compliance with the specifications shall be submitted for topsoil, peat, planting soil mixture, and any other materials designated by the Landscape Architect.

E. If requested by Landscape Architect, submit a written schedule of sources or suppliers of all materials for inspection and approval by Landscape Architect before they are delivered and installed on project.

1.05 PERMITTING

A. Permits and Fees: Obtain all permits and pay required fees to any governmental agency having jurisdiction over the work. Inspection required by local ordinances during the course of construction shall be arranged as required. On completion of the work, satisfactory evidence shall be furnished to the Landscape Architect to show that all work has been installed in accordance with the ordinances and code requirements.

1.06 OWNERS INSPECTION AND TESTING

A. Work shall be subject to inspection at all times by the Landscape Architect. The Owner reserves the right to engage an independent testing laboratory in accordance with requirements of the conditions of the Contract to analyze and test materials used in construction of the work. Where directed by the Landscape Architect, the testing laboratory will make material analysis and will report to the Landscape Architect whether materials conform to the requirements of this specification. The Owner/ Landscape Architect reserves the right to engage and independent expert to evaluate work conditions, installation and work product.

1. Cost of tests and materials analyses made by the testing laboratory shall be borne by the Owner when they indicate compliance with the specification and by the Contractor when they indicate non-compliance.

2. Testing equipment shall be provided by and tests performed by the testing laboratory. Upon request by the Landscape Architect, the Contractor shall provide such auxiliary personnel and services needed to accomplish the testing work.

3. Gradation of granular material shall be determined in accordance with ASTM C 136. Sieves for determining material gradation shall be as described in ASTM E-11.

1.07 CONTRACTORS INSPECTION AND TESTING

A. Testing analysis, and inspection required by the Contractor for his own information or guidance shall be at his own expense.

B. The Contractor shall engage an independent testing agency, acceptable to the Landscape Architect, to perform the following tests and analysis:

Material	Tests and Analysis Required
Planting Soil	Determination of pH, organic content, and nutrient content. Recommendation shall be made by the testing agency as to the type and quantity of soil additives required to bring nutrient content and pH to satisfactory levels for planting.

1.08 SOURCE QUALITY CONTROL

A. Identification of plant names shall be as in *Hortus Third*.

B. Selection of plant materials

1. Contractor shall submit to the Landscape Architect the names and locations of nurseries proposed as sources of acceptable plant material, and inspect all nursery materials to determine that the materials meet the requirements of this Section. Proposed materials shall be flagged at the nurseries by the Contractor prior to viewing by the Landscape Architect.

2. Contractor shall schedule with the Landscape Architect a time for viewing plant material at the nursery. Trips to nurseries shall be efficiently arranged to allow Landscape Architect to maximize his/her viewing time. A minimum of six weeks shall be allowed for this viewing prior to the time that the plants are to be dug.

   a. The Landscape Architect shall make up to two planting selection trips in connection with the work specified in this Contract.

   b. Costs of any subsequent plant selection trips shall be borne entirely by the Contractor. The cost of a planting materials selection trip shall include reimbursable expenses such as the cost of transportation, meals, lodging and all other ordinary and necessary costs associated with plant selection. The cost shall also include inspection time to be charged at the rate of $85.00/hour. The Contractor shall be billed for these expenses for each additional trip the Landscape Architect must make in order to secure acceptable plant materials in conformance with the requirements of this specification.

3. Landscape Architect may choose to attach his seal to each plant, or representative samples.

4. Where requested by the Landscape Architect, photographs of plant material or representative samples of plants shall be submitted.

5. Viewing and/or sealing of plant materials by the Landscape Architect at the nursery does not preclude the Landscape Architect's right to reject material at the site of planting.

C. Permits and Fees: Obtain all permits and pay required fees to any governmental agency having jurisdiction over the work. Inspection required by local ordinances during the course of the work shall be arranged as required.

1.09 UNAVAILABILITY OF PLANT MATERIAL

A. Before changes or substitutions can be made due to unavailability of plant material, Contractor shall submit satisfactory evidence that he/she has advertised for one month in a trade journal such as the "Landscape Information Services", with no response, or has undertaken other methods of locating plant material satisfactory to the Landscape Architect. The Landscape Architect shall approve all substitutions before they are delivered and installed. DO NOT DELIVER AND INSTALL ANY MATERIAL, WHICH IS ANTICIPATED TO BE A SUBSTITUTE, BEFORE IT HAS BEEN SUBMITTED IN WRITING AND APPROVED AS A SUBSTITUTE BY THE LANDSCAPE ARCHITECT.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Digging Plant Material

1. Plants shall not be dug at the nursery or approved source until the Contractor is ready to transport them from their original locations to the site of the work or acceptable storage location.

2. Root-pruning of field-grown or collected plants shall be performed at least 4 to 6 weeks prior to digging, as determined by industry standards for that species.

B. Transportation of Plant Material

1. Plants transported to the project in open vehicles shall be covered with tarpaulins or other suitable covers securely fastened to the body of the vehicle to prevent injury to the plants. Closed vehicles shall be adequately ventilated to prevent overheating of the plants.

2. Plants shall be kept moist, fresh, and protected at all times. Such protection shall encompass the entire period during which the plants are in transit, being handled, or are in temporary storage.

3. Unless otherwise authorized by the Landscape Architect, Contractor shall notify the Landscape Architect at least two working days in advance of the anticipated delivery date of any plant material. A legible copy of the bill of lading, showing quantities, kinds, and sizes of materials included for each shipment shall be furnished to the Landscape Architect.

C. Storage

1. Unless specific authorization is obtained from the Landscape Architect, plants shall not remain on the site of the work any longer than two days prior to being installed.

2. Plants that are not installed immediately shall be protected as follows:

   a. Plants shall be stored in an area protected from high winds, extreme temperatures, flooding, theft, vandalism, or other potential causes of damage.
   b. Shade-grown plants shall be stored in a shaded location.
   c. Rootballs shall be kept moist and intact.
   d. Plants shall not be allowed to dry out.

3. Both the duration and method of storage of plant materials shall be subject to the approval of the Landscape Architect.

D. Handling of Plant Materials

1. Exercise care in handling plant materials to avoid damage or stress.

1.11 REJECTION OF MATERIALS

A. Evidence of improper digging, transportation, storage, or handling of plant material shall be cause for rejection.

B. Upon arrival at the temporary storage location or the site of the work, plants shall be inspected by the Landscape Architect for damage or stress due to improper digging, transportation, storage, or handling of plant material. Any plants which are damaged or stressed due to such causes shall be rejected.

C. Contractor shall remove all rejected plants from the area of work and replace them with plants of the same quantities, species, sizes, and qualities specified.

1.12 PLANTING SEASON

A. Planting shall be performed when weather and soil conditions are suitable for planting the material specified, in accordance with locally accepted practice.

1.13 TRAFFIC CONTROL

A. The Contractor shall at their cost, observe all safety regulations including: placing and display of safety devices, provisions of police to control traffic, etc., as may be necessary in order to conduct the public through the project area in accordance with FDOT's "Manual of Traffic Controls and Safe Practices for Street and Highway Construction, Maintenance and Utility Operations."

1.14 SUBSTANTIAL COMPLETION

A. Landscape Architect shall inspect all work for Substantial Completion following written notice of completion from the Contractor, which must be received by the Landscape Architect at least ten calendar days before the anticipated date of inspection.

B. Final Acceptance of plant material by the Landscape Architect shall be dependent upon general conformance to specified size, character, and quality, and shall not diminish responsibility for full conformance with the Contract Documents.

C. Upon completion and re-inspection of all repairs or renewals deemed necessary by the Landscape Architect, the Landscape Architect shall recommend to the Owner that the work of this Section be accepted as Substantially Complete.

D. Acceptance in Part

1. The work may be accepted in parts when it is deemed to be in the Owner's best interest to do so, and when permission is given to the Contractor in writing to complete the work in parts.

2. Acceptance and use of such areas by the Owner shall not waive any other provisions of this Contract.

1.15 GUARANTEE

A. Plants shall be guaranteed for a period of one year after the date of Final Acceptance.

1. When the work is accepted in parts, the guarantee periods shall extend from each of the partial acceptances to the terminal date of the last guarantee period. Thus all guarantee periods terminate at one time.

B. Contractor shall make as many inspections as necessary during the guarantee period, at no additional cost to the Owner, to evaluate the condition of all plant material. Contractor shall submit a written report of each inspection to the Owner and the Landscape Architect outlining corrective measures required in order to keep the guarantee valid.

C. At the end of the guarantee period plants shall be healthy, vigorous, and free of pests, diseases, nutritional deficiencies, dieback, stress, or decline.

D. Contractor shall replace dead plants and all plants not in a vigorous, thriving condition, as determined by the Landscape Architect, before the end of the guarantee period, without cost to the Owner, as soon as weather conditions permit and within the specified planting period.

1. Replacements shall closely match adjacent plants of the same species. Replacements shall be subject to all requirements stated in these specifications.

2. Contractor shall make all necessary repairs to surrounding areas caused by plant replacement activities. Such repairs shall be performed at no additional cost to the Owner.

3. The guarantee period for all replacement plants shall be extended for an additional one year period from the date of their acceptance after

replacement. In the event that a replacement plant is not acceptable during or at the end of the said extended guarantee period, the Owner may elect either one more replacement, without guarantee, or credit for each item.

E. At the end of the guarantee period, and no less than five days prior to final inspection or as approved by the Owner, all staking and guying materials, and tree wrap and ties shall be removed from the site.

F. At the end of the guarantee period, Landscape Architect shall inspect all work for Final Acceptance following written notice of completion from the Contractor, which must be received by the Landscape Architect at least ten calendar days prior to the anticipated date for Final Inspection.

G. Upon completion and re-inspection of full repairs or replacements deemed necessary by the Landscape Architect at that time, the Landscape Architect shall recommend to the Owner that Final Acceptance of the work of this Section be given.

PART 2 - PRODUCTS

2.01 PLANTS

A. Except as otherwise specified, all plant material shall conform to FDACS Grades and Standards for Nursery Plants, 1998.

B. Plant material shall be Florida No. 1 quality or better. Plants shall have outstanding form; symmetrical, heavily branched with an even branch distribution, densely foliated and/or budded, and a strong, straight, distinct leader where this is a characteristic of the species. Plants shall possess a normal balance between height and spread. Rootball size shall meet the requirements specified for a Grade No. 1 specimen. The Landscape Architect shall be the final arbiter of the acceptability of plant form.

C. Plants shall be healthy and vigorous, and free of disease, insects and pests and their eggs, and larvae.

D. Plants shall have a well developed fibrous root system.

E. Plants shall be free of physical damage such as scrapes, broken or split branches, scars, bark abrasions, sunscalds, fresh limb cuts, disfiguring knots, or other defects.

F. Plants shall meet the size requirements indicated on the plant list. Plants larger or smaller than specified may be used only if accepted by the Landscape Architect.

G. Where a caliper or size range is specified, at least 50% of the material shall be closer to the top of the range stated.

H. Plants shall not be pruned before or after delivery, except as required to correct minor damage incurred during handling.

I. Plants indicated as "B&B" shall be balled and burlapped.

1. Unless otherwise permitted by the Landscape Architect plants shall be nursery grown, not collected.

2. Plants shall be grown for at least two years under climatic conditions similar to those in the locale of the project.

3. Nursery grown plants shall be properly root-pruned and freshly dug. No healed in plants or plants from cold storage will be accepted unless otherwise permitted by the Landscape Architect.

J. Container grown plants shall be well rooted and established in the container in which they are growing. They shall have grown in the container for a sufficient length of time for the root system to hold the planting medium when taken from the container, but not long enough to become root bound. Container grown plants exceeding the sizes indicated in ANSI Z60.1 shall have containers which are not less than 75% of the ball sizes for comparable B&B plant material. Circling roots shall be severed or spread apart when the specimen is planted. Each container plant shall be inspected and root pruned as needed.

1. Canes or Trunk(s) and Branches:

a. Very well formed and sturdy.
b. Branching plentiful and uniformly distributed to form a well balanced plant.
c. Scars shall be free from rot and shall not exceed 1/4 the diameter of the wood beneath in greatest dimension unless completely healed (except pruning scars).
d. Pruning scars shall be clean cut leaving little or no protrusion from the trunk or branch.
e. Graft union completely healed.
f. No mechanical or pest damage.
g. No extreme succulence.

2. Foliage:

a. Densely supplied with healthy, vigorous leaves of normal size, color, and texture.
b. No holes, cavities, or depressed areas caused by broken or dead branches or insufficient foliage.
c. No chlorosis.
d. No more than 5% of total foliage affected by pest or mechanical damage.

3. Root system:

a. Sturdily established in container.
b. Shall not be rootbound except plants deliberately grown rootbound to produce a dwarf plant or bonsai.
c. No large roots growing out of containers.

2.02 SOIL MATERIALS

A. Sand: sand shall be a well-washed, medium to coarse grade sand free of silt and sludge. Cyclone or builder's sand is not acceptable.

B. Muck: Peat shall be peat material removed from areas marked "Florida Everglades Peat" on Soil Conservation Service Soils Maps. Muck shall be suitable for plant growth, capable of sustaining vigorous plant growth, and specifically pulverized for agricultural use. Florida peat shall be free of deleterious materials that would be harmful to plant growth, shall be free of nematodes, shall be uniform in quality, and shall have a pH of between 5.5 and 6.5 as determined by ASTM E70. Muck shall be sterilized to make it free of all viable nut grasses and other undesirable weeds.

2.03 PLANTING SOIL

A Planting soil shall be a mixture of 60% sand and 40% muck, by volume, except for palms, which shall be a mixture of 80% sand and 20% muck by volume.

B. Before planting materials are installed, test planting soil and amend planting soil as recommended by the Testing Laboratory such that planting soil pH falls within the range of 6.5 to 7.5 ph and have an Infiltration Rate (K-sat) of 8-16 inches/hour.

2.04 BIOSTIMULANTS

A. Biostimulants shall be Die Hard Transplant by Horticultural Alliance (800)628-6373 or approved equal and shall contain miccorhizal fungi and water absorbing polymers.

1. Proportions: Planting soil shall be amended by the addition of Biostimulants in accordance with the amounts recommended by the manufacturer.
2. Biostimulants shall be mixed into the backfill planting soil. Placement shall be in the upper 8-10 inches for trees/palms, and upper 4-6 inches for shrubs; making sure Biostimulants mix is in contact with root ball.

2.05 WATER

A. Water shall be suitable for irrigation and shall be free of salts or other potentially phytotoxic materials.

2.06 COMMERCIAL FERTILIZER

A. Fertilizer content shall conform to the following:

Constituent	% Present by Weight	
Nitrogen (N)	8	(at least 50% in slow release form)
Phosphorus (P)	4	
Potassium (K)	12	(at least 50% in slow release form)

1. At least 50% of nitrogen shall be derived from slow-release (polymer coated) sulfur-coated urea.
2. Available phosphorus shall be derived from super-phosphate, bone meal, or tankage.
3. At least 50% of potassium shall be derived from slow-release (polymer coated) sulfur-coated potassium.
4. Product shall contain at least 4% magnesium sulfate, derived from Kieserite.
5. Product shall contain the micronutrients iron (chelated with EDTA), manganese sulfate, copper, zinc, boron, and sulfur.

B. Fertilizer shall be delivered in manufacturer's standard container printed with manufacturer's name, material weight and guaranteed analysis.

C. Controlled-release fertilizer shall be equal to the following:

Product	Manufacturer
8-4-12 Palm Mix and General Fertilizer	Atlantic F.E.C. 18375 S.W 260 Street Homestead, FL 33031

2.07 MULCH

A. Mulch shall be shredded Grade "A" Eucalyptus mulch, manufactured by AAction Nursery Products, Inc., Fort Myers, FL 33911, or approved equal.

2.08 GUYING AND STAKING MATERIALS

A. Wood Stakes: Straight, sound, rough sawn lumber not less than 2 x 4 in.

B. Black Webbing Tape: as supplied by Terra International, Inc., Miami, Florida, Landscape Supplies, Miami, Florida or approved equal.

C. Deadmen: Sound, rough sawn lumber 2 x 4 in., 12 in. long or other material approved by the Landscape Architect.

2.09 WEED CONTROL FABRIC

A. Weed control fabric shall be Pro5 Weed Barrier by Dewitt or approved equal.

PART 3 - EXECUTION

3.01 EXAMINATION OF SUBGRADE

A. Prior to the work, carefully inspect the installed work of other trades and the site conditions and verify that all such work and site conditions are complete to the point where this installation may properly commence. Examine subgrade and rough grade before planting. Alert Landscape Architect about unacceptable rough grading or subgrade.

B. Start of work shall imply acceptance of the site conditions.

C. Utilities (Overhead and Underground)

1. The work area may have existing utilities, such as, but not limited to, fuel, phone, electrical and storm sewer. The locations of some of these existing utilities have been indicated on the Plans. However, no guarantee is implied that the Plans are accurate or complete. It shall be the responsibility of the Landscape contractor to verify the location of all such utilities, structures, etc., by hand excavation or other appropriate measures before performing any work that could result in damage or injury to persons, utilities, structures or property. The Landscape contractor shall make a thorough search of the site for utilities, structures, etc., before work is commenced in any particular location.

2. The Landscape contractor shall take immediate steps to repair, replace, or restore all services to any utilities or other facilities, which are disrupted due to his or her operations. Further, the Landscape contractor shall engage any additional outside repairs on a continuous "around the clock" basis until services are restored. He or she shall also provide and operate any supplemental temporary services to maintain uninterrupted use of the facilities. All costs involved in the repairs and restoring of disrupted service resulting from negligence on the part of the Landscape contractor shall be borne by the Landscape contractor and he or she shall be fully responsible for any and all claims resulting from the damage.

3. Should utilities, structures, etc., be encountered which interfere with the work the Landscape Architect shall be consulted immediately in order for a decision to be made on the relocation of the work so it will clear the obstruction, if the obstruction cannot be relocated.

4. The Landscape contractor shall not purposefully disrupt or disconnect any type of utility whatsoever without first obtaining the written permission of the Owner. Requests for disconnection must be in writing and received by the Owner at least 72 hours prior to the time of the requested interruption.

3.02 DRAINAGE OF SOILS

A. The Landscape contractor shall notify the A/E, in writing, of all soil or drainage conditions that he considers detrimental to growth of plant material.

B. Subsurface Conditions: Some or all work areas may be compacted and/or contain existing material such as limerock which may interfere with adequate vertical drainage and/or proper plant survival and growth and therefore removal of this material is part of the scope of work for the project. The Landscape contractor shall be responsible for insuring adequate drainage in these areas and shall remove this existing material, as required, by such means as auguring, drilling or roto-tilling. THEREFORE, THE LANDSCAPE CONTRACTOR MAY BE REQUIRED TO PERFORM ADDITIONAL EXCAVATION ON THE HOLES FOR ALL PALMS AND TREES. This additional excavation shall be to a depth beyond

the required excavation depth indicated below for the holes, in order to insure proper vertical drainage necessary for plant survival and growth.

3.03 LAYOUT OF PLANTING AREAS

A. Individual tree and palm (as per plant list on the drawings) locations and outlines of shrub and groundcover areas to be planted shall be staked by the Contractor in ample time to allow inspection by the Landscape Architect.

B. Digging shall not begin until locations of trees and shrub beds are approved by the Landscape Architect.

3.04 PREPARATION OF SUBGRADE

A. Subgrade of planting areas shall be loosened or scarified to a minimum depth of 3 inches prior to spreading planting soil. Subgrade shall be brought to true and uniform grade and shall be cleared of stones greater than 2 inches, sticks, and other extraneous material.

3.05 PLANTING PIT EXCAVATION

A. Planting pits for trees, palms, shrubs and groundcovers shall be excavated to the depth and dimension indicated on the Drawings. Planting pits shall be the same depth as the plant rootball and at least two times as wide.

B. Excavation shall not begin until locations are approved by the Landscape Architect.

3.06 SPREADING OF PLANTING SOIL

A. Planting soil shall be spread and placed to required depths.

B. Surfaces shall be graded and smoothed, eliminating all sharp breaks by rounding, scraping off bumps and ridges, and filling in holes and cuts.

3.07 PLANTING

A. Walls of planting pits shall be dug so that they are vertical and scarified.

B. Plants shall be set as indicated on Drawings. Final placement shall be such that the top of the original rootball - with the first primary root visible at the soil surface - is located at or slightly above (no more than 1 to 2 inches) final grade. If nursery-grown plants have excess soil covering the original rootball (if the first primary root is not visible at the soil surface), excess soil should be removed to that point. If fine roots have grown into excess soil, they should be removed prior to installation.

C. Plants shall be turned to the desired orientation when required by the Landscape Architect.

D. Containerized plants shall be removed from container taking care not to damage roots. If circling roots are present, they shall be severed or spread apart.

E. Planting shall be positioned in the center of the plant pit, set plumb, and rigidly braced in position until all planting soil has been placed solidly around the ball.

F. All ropes or strings on top of balls shall be cut and pulled back. Burlap or cloth wrapping shall be left intact around ball except that portions of wrap that are exposed on top of the ball shall be turned under and buried. Non-biodegradable ball wrapping and support wire shall be totally removed from ball and plant pit. There shall be no wrapping materials left on top of the rootball or against/surrounding the stem or trunk.

G. Incorporate the specified quantity of soil moisturizer in the landscape soil mix and backfill around the plant. Soil mix shall be worked carefully, and thoroughly watered in to fill voids and wash out air pockets.

3.08 WEED CONTROL FABRIC

A. Weed control fabric shall be installed as shown on details and as per manufacturer's recommendations.

3.09 APPLICATION OF FERTILIZER

A. Upon completion of plant installation, and prior to mulch applications, Contractor shall apply granular fertilizer as specified in Section 2.07. It shall be evenly broadcast on the soil surface of all shrub beds at the rate of 10 pounds per 1,000 square feet of surface area. It shall be evenly distributed beneath trees and shrubs, but not allowed to accumulate against stems or trunks, or in plant crowns. It shall be watered in immediately after installation.

B. Fertilizer shall be applied as specified in 3.9, A, above, one time each 3 months during the guarantee period.

3.10 STAKING AND GUYING

A. Contractor shall stake or guy all trees and palms as needed, immediately after planting. Plants shall stand plumb after staking or guying. (See drawings for staking details)

3.11 MULCHING

A. Contractor shall apply mulch to a depth of 3 inches in all shrub bed areas and beneath individual trees and palms as shown on details. It shall be evenly distributed and not allowed to accumulate directly against stems or trunks, or over plant crowns.

3.12 WATERING

A. Initially, water the plant material to develop uniform coverage and deep-water penetration of at least six inches. Avoid erosion, puddling, and washing soil away from plant roots.

B. Provide continuous watering of plant material and sod after planting in order to achieve optimum growth conditions to establish plants. Water shall be applied as necessary and the amount of water and frequency of watering shall be based on the specific needs of each plant type, the time of year, amount of rainfall and other

environmental conditions it is exposed to. This watering shall begin after the plant is planted, and continue until final acceptance or for a minimum of sixty (60) consecutive calendar days, whichever is greater in time. ALL TREES AND PALMS SHALL BE HAND WATERED, ONLY, DURING THIS PERIOD. DO NOT RELY ON THE IRRIGATION SYSTEM, IF THERE IS ONE, TO ACHIEVE THIS TASK. It cannot deliver the volume of water required, without flooding areas beyond where water is needed and/or over watering other landscape material. Shrubs and ground cover may be watered by using the irrigation system.

C. If there is no source for water available at the project, such as a hose bib(s) or fire hydrant(s) if approved for use, then the Landscape contractor shall be responsible for supplying water for hand watering by means of a truck or tank.

3.13 PRUNING

A. Contractor shall prune each tree and shrub as needed to remove dead or damaged branches.

B. Pruning shall be done with sharp, clean tools. Bypass clippers are preferred over anvil-type.

C. Cuts shall be made at appropriate nodes or laterals, leaving no stubs. No pruning paint shall be used.

3.14 MAINTENANCE OF PLANTING

A. Contractor shall provide landscape maintenance, which shall begin immediately after each plant is planted and continue until Final Acceptance.

B. Landscape maintenance shall consist of pruning, watering, cultivating, weeding, mulching, removal of dead material, repairing and replacing tree stakes, tightening and repairing guys, resetting plants to proper grades and upright position, and furnishing and applying such treatments as are necessary to keep plants free of insects and disease, and in a healthy growing condition.

C. Contractor shall promptly replace Impaired or dead plants and shall not wait until the end of the guarantee period to replace plants which have become unacceptable.

3.15 CLEANING

A. Contractor shall fill all pits and depressions in holding area and rough grade to meet surrounding elevations. Remove any debris resulting from the planting process.

B. Contractor shall sweep and wash all paved surfaces.

END OF SECTION

SECTION 02935

SODDING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Work in this Section includes furnishing and planting grass of the species, sizes and quality specified, fertilizing, watering, maintaining plants, guarantee and obtaining all permits from municipalities having jurisdiction over this work.

B. Provide all labor, materials, necessary equipment and services included, but not limited to, all related work to complete the Sodding work, as indicated on the Drawings, as specified herein, or both, except for items specifically indicated as "NIC ITEMS".

C. All areas within Limit of Work not covered by buildings, pavement, playgrounds, shrubs and groundcover shall be sodded.

D. All sodded areas impacted by construction shall be repaired and replaced with new sod.

1.02 RELATED WORK

A. Examine Contract Documents for requirements that affect the work of this Section. Other Specifications Sections that relate directly to work of this Section include but are not limited to:

1. Section 02810, IRRIGATION SYSTEMS; Irrigation.
2. Section 02910, TREES, PLANTS, AND GROUNDCOVER; Plantings.

1.03 REFERENCES

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specification requirements, the most restrictive requirements shall govern.

1. American Society For Testing and Materials (ASTM):

D1557 Moisture-Density Relations of Soils and Soil Aggregate Mixtures Using 10 lb(4.54kg) Rammer and 18 in (457mm) Drop.

2. State of Florida Department of Transportation (FDOT):
Standard Specifications for Road and Bridge Construction.

1.04 SUBMITTALS

A. Test report of the topsoil shall be submitted to the Landscape Architect. Report shall include recommendations on the type and quantity of additives required to achieve the required pH and nutrients to maintain healthy growth of sod growth.

B. Certificates:

1. Growers certification:
   a. Sod should be certified, including specification of field location from which sod is cut.
   b. Manufacturer's certification of fertilizer and herbicide composition.

C. Maintenance Instruction.

1. Prior to the end of the maintenance period, furnish two copies of written maintenance instructions to the Owner and one copy to the Landscape Architect for maintenance and care of the sod areas throughout a full growing season.

1.05 QUALITY ASSURANCE

A. Testing Agency: An Independent Testing Laboratory.

B. Requirements of Regulatory Agencies: Conform to the requirements of the State Department of Agriculture.

1.06 DELIVERY STORAGE AND HANDLING

A. Digging

1. Do not dig sod at the nursery or other approved source until ready to transport sod to the Project site or approved storage location.
2. Before stripping sod, mow to a uniform height of 2 to 2.5 inches for St. Augustine, 2.5 to 3.0 inches for Bahia.
3. Cut sod to specified thickness and to standard width and length desired.

B. Transporting

1. Deliver sod on pallets. Protect sod against dehydration, contamination and heating during transport and delivery. Sod transported to the Project in open vehicles shall be covered with tarpaulins or other suitable covers securely fastened to the body of the vehicle to prevent injury to the sod material and to protect root system from exposure to wind or sun. Closed vehicles shall be adequately ventilated to prevent overheating of the sod. Evidence of inadequate protection against drying out in transit shall be the cause for rejection.

2. Sod shall be kept moist, fresh, and protected at all times, under shade or covered with moistening burlap. Such protection shall encompass the entire period during which the sod is in transit, being handled, or in temporary storage. Do not pile sod more than 1 pallet deep.

3. Upon arrival at the temporary storage location or the site of the work, sod shall be inspected for proper shipping procedures. Should the roots be dried out, the Landscape Architect will reject the sod. When sod has been rejected, the Contractor shall remove it at once from the area of the work and replace it.

4. Unless otherwise authorized by the Landscape Architect, the Contractor shall notify the Landscape Architect at least 48 hrs in advance of the anticipated delivery date of the sod material. A legible copy of the invoice showing species and variety of the sod included for each shipment shall be submitted to the Landscape Architect. Certificate of inspection when required must accompany each sod shipment.

C. Storage of Sod

1. Do not deliver more sod than can be installed within 24 hrs.
2. Sod shall be kept moist and stored in a compact group to prevent drying out.

D. Handling of Sod

1. Contractor shall take extreme care in the handling of sod material to avoid breaking, stretching, tearing, and dropping strips. The Landscape Architect may reject sod that has been damaged by poor handling.

1.07 JOB CONDITIONS

A. Begin installation of sodding only after the preceding related work is accepted.

B. Install sod during months acceptable to the Landscape Architect.

C. Do not install sod on saturated soil.

D. Protection: Erect signs and barriers against vehicular traffic over the areas prepared for sod.

1.08 SUBSTANTIAL COMPLETION

A. The Engineer will inspect all work for Substantial Completion upon written notice of completion. The request shall be received at least ten calendar days before the anticipated date of inspection.

B. Acceptance of material by the Engineer will be for general conformance to specified requirements and shall not diminish responsibility for full conformance with the Contract Documents.

C. Upon completion and re-inspection of all repairs or renewals necessary in the judgment of the Engineer, the Engineer will recommend to the Owner that the work of this Section be accepted as Substantially Complete.

D. Sod areas will be accepted as substantially complete when in compliance with the following conditions:

1. Roots are thoroughly knit to the soil;
2. Absence of visible joints;
3. All areas show a uniform stand of the specified grass in a healthy condition.

E. Acceptance in Part

1. The work may be accepted in parts when it is deemed to be in the Owner's best interest to do so, and when permission is given to the Contractor in writing to complete the work in parts.

2. Acceptance and use of such areas by the Owner shall not waive any other provisions of this Contract.

1.09 GUARANTEE AND MAINTENANCE OF SOD

A. Guarantee sod for a period of six months from the date of acceptance of the completed overall project.

B. Replacement sod under this guarantee shall be guaranteed for an additional six months from the date of installation.

C. Repair any damage caused by sod replacement at no cost to the Owner. During the guarantee period, the Contractor shall replace any grass which is diseased, dead or visually unsightly within 3 days when requested in writing.

1.10 QUALITY GUARANTEE

A. Sod shall be uniform in color, leaf texture, leaf and root density, and free from weeds, diseases, and other visible imperfections at acceptance.

B. Guarantee does not cover damage as a result of fertilizers, pesticides, or other applications not supervised by the Contractor or as a result of acts of God or vandalism.

1.11 MAINTENANCE

A. Maintain sod as described in PART 3 of this section.

PART 2 PRODUCTS

2.01 SOLID SOD

A. Sod shall be nursery grown on cultivated mineral agricultural soils. Sod shall have been mowed regularly and carefully and otherwise maintained until harvest.

Grass Species:	Bahia Grass, *Paspalum notatum* St Augustine 'Floratam'

B. Thickness of cut: Sod shall be machine cut at a uniform soil thickness of 5/8 in. Measurement of thickness shall exclude top growth and thatch.

C. Strip Size: Sod shall be cut to the supplier's standard width and length. Maximum allowable deviation from standard widths and lengths shall be plus or minus 1/2 in. on width and 5% on length. Broken strips and torn or uneven ends will not be accepted.

D. Strength of Sod Strips: Sod strips shall be strong enough to support their own weight and retain their size and shape if suspended vertically when grasped in the upper 10% of the section.

E. Moisture Content: Sod shall not be harvested or transplanted when moisture content (excessively wet or dry) may adversely affect its survival.

F. Time Limitations: Sod shall be harvested, delivered, and transplanted within a 30 hour period unless a suitable preservation method is approved by the Landscape Architect prior to delivery. Sod not transplanted within this period shall be inspected and approved by the Landscape Architect prior to its installation.

G. Thatch: Sod shall be relatively free of thatch. A maximum of 1/2 in. (uncompressed) thatch will be permitted.

H. Diseases, Nematodes, and Insects: Sod shall be free of disease, nematodes and soil borne insects. State Nursery and Plant Laws require that all sod be inspected and approved for sale. The inspection and approval must be made by the State Agriculture Department, Office of the State Entomologist.

I. Weeds: Sod shall be free of grassy and broadleaf weeds.

2.2 SOIL MATERIALS

A. Sand: sand shall be a well washed, medium to coarse sand free of silt and sludge. Cyclone sand is not acceptable.

B. Muck: Muck shall be peat material removed from areas marked "Florida Everglades Peat" on Soil Conservation Service Soils Maps. Muck shall be suitable for plant growth, capable of sustaining vigorous plant growth, and specifically pulverized for agricultural use. Florida peat shall be free of deleterious materials that would be harmful to plant growth, shall be free of nematodes, shall be uniform in quality, and shall have a pH of between 5.5 and 6.5 as determined by ASTM E70. Muck shall be sterilized to make it free of all viable nut grasses and other undesirable weeds.

2.3 PLANTING SOIL

A Planting soil shall be 80% coarse sand and 20% muck. Contractor shall be responsible for spreading the planting soil to the required depths.

B Before sod is installed, test planting soil and amend as recommended by the Testing Laboratory such that planting soil ph falls within the range of 6.5 to 7.5 ph and have an Infiltration Rate (K-sat) of 8-16 inches/hour.

2.4 WATER

A. Free of substances harmful to plant growth, objectionable odor or staining agents.

2.5 FERTILIZER

A. The chemical designation for granular fertilizer shall be 12-8-8, with at least 50 percent (50%) of the nitrogen from a non-soluble organic source for all planting.

B. Apply and distribute by methods and rates as recommended by the manufacturer.

2.6 HERBICIDES

A. Post-emergent Herbicide: Roundup as manufactured by Monsanto Corp. or approved equal.

B. Pre-emergent Herbicide: Ron-Star or approved equal.

C. Certify that herbicide and application technique will not damage plant material prior to application, and replace or repair damage to any plants injured by herbicide application at no cost to the Owner.

PART 3 EXECUTION

3.01 PREPARATION OF GROUND

A. Existing subgrade shall be examined to ensure that the rough grading is correct and that suitable subgrade materials exist prior to start of sodding work. Start of work shall constitute acceptance of the subgrade.

B. Existing subgrade shall be loosened or scarified to a minimum depth of 3 in. prior to spreading of topsoil. Subgrade shall be brought to true and uniform grade, and shall be cleared of stones greater than 1 in., sticks, and other extraneous material.

C. Soil in compacted areas shall be tilled to a depth of 12 in. to produce a loose friable soil.

3.02 SPREADING OF PLANTING SOIL

A. Subgrade shall be damp when planting soil is spread.

B. Areas where sod is to be planted shall have a subgrade 4" lower than the finish grade. A two inch layer of planting soil shall be added prior to laying of sod.

C. Planting soil in areas to receive lawns and grasses shall be fine graded with a drag or rake. Remove sticks, stones rubbish and extraneous matter. Grading shall round out all breaks in grade, smooth down all lumps and ridges, and fill in all holes and crevices. Grade shall be maintained until installation of sod.

3.03 WEED CONTROL

A. Apply post-emergent herbicide per manufacturer's rate and method of application to all areas to receive sod.

B. Apply pre-emergent herbicide before sodding and again as necessary throughout required maintenance period to prevent weed seed germination.

D. Verify that the herbicide and application technique will not damage sod prior to application, and replace, and/or repair damage to any sod injured by herbicide at no cost to the Owner.

3.04 APPLICATION OF FERTILIZER

A. Before applying fertilizer, the soil pH shall be brought to a minimum range of 6.0-7.0

B. The fertilizer shall be spread uniformly over the area to be sodded at the rate of 500 pounds per acre, by a spreading device capable of uniformly distributing the material at the specified rate. Immediately after spreading, the fertilizer shall be mixed with the soil to a depth of approximately 3 inches.

C. On steep slopes, where the use of a machine for spreading or mixing is not practical, the fertilizer shall be spread by hand and raked in and thoroughly mixed with the soil to a depth of approximately 2 inches.

3.05 SODDING

A. Weather Conditions

1. Schedule work for periods of favorable weather.
2. Sod placement on days, which in the judgment of the Engineer, are too hot, sunny, dry, or windy for optimal installation may be prohibited.

B. Begin sodding at the bottom of slopes.

C. Lay first row of sod in straight line.

D. Butt side and end joints. Ensure that joints are tight, thereby eliminating the need to patch to eliminate gaps.

E. Lateral joints shall be staggered.

F. Do not stretch or overlap rows.

G. In areas abutting concrete, asphalt or other applicable surfaces the top of the planting soil of the sod shall be a maximum of ¼" below the adjacent surface and the top of the cut grass shall not protrude over 2 inches above the adjacent property.

H. As sodding is completed in any one section, the entire area shall be rolled. Roll sod, except on pegged areas, with roller weighing no more than 150 lbs. per foot of roller width to eliminate air pockets. Following tamping, screened topsoil shall be used to fill all cracks and excess soil shall be worked into the sod with rakes or other suitable equipment. Sod shall not be smothered with too much top dressing of topsoil.

I. Watering

1. Immediately after top dressing thoroughly, water to a depth sufficient that the underside of the new sod strips and the soil immediately below the sod are thoroughly wet, or a minimum of 6 in.
2. Provide an adequate supply of water during transplanting of the sod.

3.06 MAINTENANCE

A. The Contractor shall maintain all grass guaranteed for the period of the guarantee. Such maintenance shall include filling, leveling, and repairing eroded areas, replanting areas where the establishment of the grass does not develop satisfactorily, and watering as required. In no case shall such maintenance be less the 8 weeks for watering and 12 weeks for remaining maintenance care.

B. Maintenance shall consist of protecting, watering, weeding, cutting, fertilizing, repairing of eroded areas, and re-sodding which in the opinion of the Landscape Architect is required to establish a uniform stand of grass.

C. Mowing

1. Whenever grass reaches a height of 3 in., it shall be cut back to 2 in. Clippings shall be removed.
2. After two mowings the Contractor shall top dress the sod with an application of fertilizer at the rate of one lb. of Nitrogen per 1000 square feet.

3.07 CLEANING

A. Immediately clean spills from paved and finish surface areas.

B. Remove debris and excess materials from project site.

C. Dispose of protective barricades and warning signs at the termination of lawn establishment.

END OF SECTION 02935

SECTION 03100

CONCRETE FORMWORK

PART 1 GENERAL

1.1 SECTION INCLUDES:

A. Formwork for cast-in-place concrete or site cast concrete, with shoring, bracing and anchorage.

B. Openings for other affected work.

C. Form accessories

D. Setting of embeds in concrete.

E. Stripping forms.

1.2 RELATED SECTIONS:

A. 03200 - Concrete Reinforcement

B. 03300 - Cast-in-Place Concrete

C. 033450 - Site Casted Concrete Panels

D. 04200 - Concrete Unit Masonry

1.3 REFERENCES

A. ASTM International:
1. D994 Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
2. E154 Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls or as Ground Cover.

B. Codes and Standards: Comply with the following codes, specifications, and standards, except where more stringent requirements are shown or specified (Current Edition U.O.N.):
1. ACI 117 Tolerances for Concrete Construction and Materials.
2. ACI 301 Specifications for Structural Concrete for Buildings.
3. ACI 318 Building Code Requirements for Reinforced Concrete.
4. ACI 347 Recommended Practice for Concrete Formwork.

1.4 QUALITY ASSURANCE

A. Qualifications:
1. Formwork Engineer: Professional engineer, with Florida license and experience in design of formwork and related items.
2. Formwork Contractor: Florida licensed contracting firm having 5 years successful experience in fabrication and erection of formwork systems of

similar scope and complexity as required for this project. Contractor shall have sufficient capacity to produce formwork without causing delay in work.

1.5 FORMWORK AND RESHORING DESIGN

A. Formwork:
1. Comply with ACI 301
2. Formwork engineer shall perform or oversee design, drawings, erection, and removal.
3. Design formwork, shores and reshores according to ACI 117 and ACI 347, including provisions for construction loads and placing equipment to be used on project.
4. Verify strength and stiffness of in-place building elements to resist required loads and restrict deformations to specified tolerances.
5. Earth cuts shall not be used as forms for vertical surfaces. Comply with OSHA's "Trench Safety Act".
6. Design and Installation of Formwork: Form ties that leave through holes in the concrete are not allowed.

B. Removal Strength:
1. Wall forms and column forms may be removed 12 hours after pouring.
2. Slabs supported by precast joists may have forms removed as follows, but not earlier than required by the pre-cast manufacturer or formwork engineer:
   (a) Joist spacing 4'-6" or less, 24 hrs.
   (b) Joist spacing between 4'-6" and 6'-8", 48 hrs.
   (c) Joist spacing between 6'-8" and 8'-8", 72 hrs.
3. Beams and other slabs shall not have forms removed until the concrete has achieved 75 percent of its design strength or as otherwise required by ACI 347. Beams shall be reshored immediately upon removal of forms.
4. In addition to the above, flat slab forms and stair slab forms shall not be removed for 5 days. Upon removal of forms, reshores shall be placed and remain in place until concrete is 14 days old or as otherwise required by the formwork engineer.
5. Where side forms of walls, beams, or columns are supported other formwork, the removal time for the latter shall govern.
6. Supporting forms and shores must not be removed from beams, floors, columns and walls until these structural units are strong enough to carry their own weight and any approved superimposed loads.
7. Strength of concrete shall be determined from testing of job-cured concrete cylinders. Cost of cylinder casting and testing of job-cured specimens cast for this use shall be borne by the contractor.

C. Reshoring:
1. Design reshoring to resist active loads.
2. Space shoring so no lower floor or member will be excessively loaded from design live loads or will induce tensile stress in concrete members where no reinforcing steel is provided.
3. Extend shores beyond minimums to ensure proper distribution of loads throughout structure.
4. Consider special loading requirements to support load of special elements where elements of similar size and capacity do not exist in supporting structure below.

1.6 FORMWORK SUBMITTALS

A. Product Data: Submit manufacturer's product data with application and installation instructions for proprietary materials and items.

B. Formwork:
   1. Submit shop drawings, signed and sealed by formwork engineer, for fabrication and erection of specific finished concrete surfaces as indicated. Show construction of forms as required. Shoring drawings are required for all elevated concrete work.
   2. A/E'S review is for general applications and features only. Design of formwork for structural stability and efficiency is Contractor's responsibility, and will not be reviewed.

C. Shoring/Reshoring:
   1. Submit shop drawings, signed and sealed by formwork engineer, for shoring/reshoring system showing:
      (a) Arrangement, bracing and sequencing of shores/reshores required.
      (b) Design load allowances (vertical and lateral) and thicknesses of all members supported.
      (c) Types of shoring/framing material to be used including catalog cuts of systems/components (if used).
      (d) Specific areas where shores/reshores do not align vertically.
      (e) Required installation procedures.
      (f) Removal criteria.

D. Foundations for Formwork and Shoring/Reshoring:
   1. Submit shop drawings, signed and sealed by formwork engineer, or include with formwork and shoring/reshoring shop drawings, showing:
      (a) Sub grade preparation required including compaction and moisture control.
      (b) Size and description of sill assemblies.

E. Formwork Removal:
   1. Authorization for Removal: Formwork engineer shall furnish a signed and sealed report establishing the criteria for removal of formwork, shoring, and reshoring. Deviation from established criteria is not allowed.

PART 2 PRODUCTS

2.1 FORM MATERIALS

A. Forms for Exposed Finish Concrete:
   1. Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal, or other acceptable panel-type materials. Provide continuous, straight, smooth, exposed surfaces. Earth forming for foundations is prohibited, except for monolithic footings.
   2. Furnish in largest practicable sizes to minimize number of joints and to comply with joint system shown on drawings.
   3. Provide form material with sufficient thickness to withstand pressure of newly placed concrete, restricting bow and deflection to specified tolerances.
   4. Use plywood complying with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood", Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.
   5. Where concrete is scheduled to have Smooth Rubbed Finish (Sm Rb-Fn), use plywood complying with U.S. Product Standard PS-1 "B-B (Medium

Density Overlaid Concrete Form", Class I, with each piece bearing legible inspection trademark.

B. Forms for Unexposed Finish Concrete: Form concrete surfaces to be concealed in finished structure with plywood, lumber, metal, or other material.

C. Forms for Textured Finish Concrete:
1. Form textured finish concrete surfaces with units of face design, arrangement, and configuration as shown on drawings or as required to match A/E'S control sample.
2. Provide form supports to ensure stability of textured form liners.

D. Cylindrical Columns and Supports:
1. Form round-section members with paper or fiber tubes, constructed of laminated plies using water-resistant adhesive with wax-impregnated exterior for weather and moisture protection.
2. Prefabricated fiberglass or steel forms may be used.
3. Provide units with sufficient wall thickness to resist loads imposed by wet concrete and restrict deformation to specified tolerances.

E. Form Ties: Ties that leave plastic tube lined holes through members are not allowed. Provide factory-fabricated adjustable-length, removable or snap-off metal form ties, designed to prevent form deflection and to prevent spalling concrete. Provide units that will leave no metal closer than 1 and 1.5 inches to exposed surface. Provide ties that will leave holes no larger than 1 inch diameter in concrete surface.

F. Form Coatings: Provide commercial formulation form-coating compounds with a maximum VOC of 350 mg/l that will not bond with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.

G. Forming Accessories: CRD-C572-74 polyvinyl chloride (PVC).
1. Waterstops: Flat dumbbell type at construction joints and center bulb type at building expansion joints.
2. Chamfers: 1/2 inch radius on outside corners of exposed-to-view concrete unless drawings show other size or shape.
3. Drips: 3/8 inch wide x 1/2 inch high drip groove placed 3/4 inch back from edge in cast-in-place exterior soffits.

H. Premolded Expansion Joint: ASTM D994, 1/2 inch thick.

I. Vapor Retarder:
1. Provide moisture retarder cover over prepared base material where indicated.
2. Use polyethylene sheet not less than 10 mils thick or other materials resistant to decay when tested according to ASTM E154.

PART 3 EXECUTION

3.1 FORMS

A. Erect, support, brace, and maintain formwork to support applied vertical and lateral loads until such loads can be supported by concrete structure. Construct formwork so

concrete members and structures are of correct size, shape, alignment, elevation, and position.

1. Formwork shall be coated with a form release which will not stain or damage the concrete. The form release shall be applied prior to the installation of any reinforcing steel.
2. Design formwork to be readily removable without impact, shock, or damage to cast-in-place concrete surfaces and adjacent materials. Formwork shall be designed to support pressure resulting from placement and consolidation of the concrete. Design of formwork is the responsibility of the Contractor.
3. Construct forms to sizes, shapes, lines, and dimensions shown to obtain accurate alignment, location, grades, and level and plumb work in finished structures.
4. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work.
5. Use selected materials to obtain required finishes.
6. Solidly butt joints and provide backup at joints to prevent leakage of cement paste.
7. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces.
8. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only.
9. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and for easy removal.
10. Provide temporary opening where interior area of formwork is inaccessible for clean out, for inspection before concrete placement, and for placement of concrete.
    (a) Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar.
    (b) Locate temporary openings on forms at inconspicuous locations.
11. Chamfer exposed corners and edges as shown on Drawings, using wood, metal, PVC, rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints. Provide corners and edges with 1/2 inch radius PVC accessories to produce uniform smooth lines and tight edge joints, unless otherwise indicated or accepted by A/E.
12. Form Ties:
    (a) Factory-fabricated, adjustable-length, removable or snapoff metal form ties, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal.
    (b) Unless otherwise indicated, provide ties so portion remaining within concrete after removal is at least 1-1/2 inch inside concrete.
    (c) Unless otherwise shown, provide form ties that will not leave holes larger than 1-inch diameter in concrete surface.
13. Provisions for Other Trades:
    (a) Provide openings in concrete formwork to accommodate work of other trades.
    (b) Determine size and location of opening, recesses, and chases from trades providing such items.
    (c) Accurately place and securely support items built into forms.
    (d) Accurately place and securely anchor embeds prior to the placing of concrete.
14. Cleaning and Tightening:
    (a) Thoroughly clean forms and adjacent surfaces to receive concrete.

(b) Remove chips, wood, sawdust, dirt, or other debris just before concrete is placed.

3.2 JOINTS

A. Construction Joints: Locate and install construction joints not shown on drawings to not impair strength and appearance of the structure, as acceptable to A/E.

B. Provide keyways at least 1-1/2 inch deep in construction joints in walls, slabs, and between walls and footings. Accepted bulkheads designed for this purpose may be used for slabs.

C. Place construction joints perpendicular to the main reinforcement. Continue reinforcement across construction joints.

D. Waterstops:
1. Provide waterstops in construction joints as indicated.
2. Install waterstops to form continuous diaphragm in each joint.
3. Make provisions to support and protect exposed waterstops during progress of work.
4. Fabricate field joints in waterstops according to manufacturer's printed instructions.
5. Isolation Joints in Slabs-on-Ground:
   (a) Construct isolation joints in slabs-on-ground at points of contact between slabs on ground and vertical surfaces, such as column pedestals, foundation walls, grade beams, and elsewhere as indicated.
   (b) Joint filler and sealant materials are specified in Division 7 sections of these specifications.
6. Contraction (Control) Joints in Slabs-on-Ground:
   (a) Construct contraction joints in slabs-on-ground to form panels of patterns as shown on drawings.
   (b) Use inserts 1/4 inch wide x 1/4 of slab depth, unless otherwise indicated.
   (c) Form contraction joints by inserting premolded hardboard or fiberboard strip into fresh concrete until top surface of strip is flush with slab surface. After concrete has cured, remove inserts and clean groove of loose debris.
   (d) Contraction joints may be formed by saw cuts (when permitted by the drawings) as soon after slab finishing as possible without dislodging aggregate or tearing or raveling the concrete. Depth of cut shall be 1/4 of slab depth.

3.3 RE-USE OF FORMS

A. Clean and repair surfaces of forms to be re-used in work. Split, frayed, delaminated, or otherwise damaged form facing materials are not acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.

B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to A/E.

END OF SECTION

SECTION 03200

CONCRETE REINFORCEMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Steel reinforcement for cast-in-place concrete, site casted concrete, and reinforced masonry.

1.2 RELATED SECTIONS:

A. 03100-Concrete Formwork.

B. 03300-Cast-in-Place Concrete.

C. 03450 - Site Casted Concrete Panels.

D. 04200-Concrete Unit Masonry.

1.3 REFERENCES

A. ASTM International:
1. A82 Specification for Steel Wire, Plain, for Concrete Reinforcement.
2. A184 Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
3. A185 Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
4. A496 Specification for Steel Wire, Deformed, for Concrete Reinforcement.
5. A497 Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.
6. A615/A97 Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
7. A706/A706M Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
8. A775 Specification for Epoxy-Coated Reinforcing Steel Bars.

B. Codes and Standards: Comply with the following codes, specifications, and standards, except where more stringent requirements are shown or specified:
1. ACI 117 Tolerances for Concrete Construction and Materials.
2. ACI 301 Specifications for Structural Concrete for Buildings.
3. ACI 315 Details and Detailing of Concrete Reinforcement.
4. ACI 318z ex Building Code requirements for Reinforced Concrete.
5. ACI 439 Mechanical Connection of Reinforcing Bars.
6. AWS Dl.4 Structural Welding Code Reinforcing Steel.
7. CRSI "Manual of Standard Practice".

8. CRSI "Placing Reinforcing Bars".
9. Wire Reinforcement Institute "Manual Standard Practice".

1.4 QUALITY ASSURANCE

A. Steel Contractor: Florida licensed contracting firm having 5 years successful experience in fabrication and erection of reinforcing steel of similar scope and complexity as required for this project. Contractor shall have sufficient capacity to install reinforcing steel without causing delay in work.

1.5 SUBMITTALS

A. General:
1. Submit shop drawings for fabrication, bending, and placement of concrete reinforcement.
(a) Comply with ACI 315 showing bar schedules, stirrup spacing, diagrams of bent bars, arrangement of concrete reinforcement and accessories.
(b) Include special reinforcement required at openings through concrete structures.

B. Shop drawings made from sepias (or other reproductive methods) of the structural drawings will not be accepted and shall be cause for resubmittal.
1. Selection of splices: Splices shall be full tension, unless noted otherwise.

C. Submittals as required to comply with Section 01900, Section 01910, and Section 01930.

D. Splices noted on the drawings to be compression splices shall be furnished by one of the following:
1. Compression lap splices according to ACI 315. Mechanical compression only connectors according to ACI 439, staggered 1/2 Class "B" lap length and maintaining not less than 1/4 the total tensile capacity of any column face.
2. Full penetration welds staggered not less than 18 diameters.

E. Splices shown on the drawings as either Class "A" or Class "B" may be one of the following:
1. Class "B" lap splices.
2. Class "A" (but not less than compression lap) lap splices staggered not less than one Class "B" lap length.
(a) Exception: This shall not be allowed when shown as class "B" in a location, which by design, has already accounted for other continuing bars or staggered splices.
3. Appropriate mechanical connectors according to ACI 439 staggered not less than 24 diameters.
4. Full penetration welds staggered not less than 24 diameters.

F. Unless otherwise noted in the drawings, reinforcing shall be spliced to develop the full strength of the bar in either tension or compression. Those splices shall be furnished by one of the following:
   1. Class "B" lap splices where only 1/2 of the total rebars are spliced at any one floor.
   2. Full penetration welds staggered not less than 36 diameters.
   3. Appropriate mechanical connectors according to ACI 439-3R staggered not less than 36 diameters.

G. Total steel at lap splices shall not exceed 8 percent for columns or shear wall cores containing the spliced bars.
   1. All bars may be lapped at one section for up to 4 percent steel.
   2. 1/2 of the bars may be lapped for up to 5.3 percent steel.
   3. 1/3 of the bars may be lapped for up to 6 percent steel.
   4. Above 6 percent steel, other splice choices shall be used.

H. Where staggered lap splices are used, provide a mixture of bar sizes as appropriate where vertical bar size changes on the drawings.

I. Where different size bars are lap spliced, the length of splice may be based on the smaller bar size. If there is a larger quantity of the smaller bar size, the splice length shall be based on the larger bar.

J. It shall be the responsibility of the reinforcing detailer to determine the concrete strength at the point of a lap splice, the bar position (top or other), bar spacing, confinement condition based on ties or stirrups or edge condition to select the proper lap length.

K. Increase laps for bundled bars according to ACI 318, with number based on total bars in-group including lapped bars.
   1. Detailing of Splices: Placing shop drawings shall specifically show splice lap lengths where they occur. Bar diameter lap tables and references to other charts are not acceptable.
   2. Staggered Laps Required: Provide staggered laps in any member as necessary to keep space between bars within splice zone at least 1 inch or 1 bar diameter clear.
   3. Detailing of Bar Placement: For any bar other than those placed at an edge condition, between edge condition or openings, or any other location where the bar cannot be shifted longitudinally, a dimension shall be shown from an identifiable building grid, wall, or edge to at least one end of the bar.
   4. Congested Areas of Placement: For any conditions resulting in bar spacing less than 2 diameters clear or where the placement of bars in one member requires critical templating to allow bar placement in an intersecting member, furnish details of sufficient scale to show clearances, spacing, and arrangements for properly placing those bars.
   5. Accessories: Show accessories, supports, chairs, bolsters, and spacers necessary to complete the installation. Where supports are beyond the scope of CRSI detailing standards and custom designed

supports are required, provide engineering calculations demonstrating the capacity of the system.

6. Flat Plates: Provide not less than 3 separate drawings of each plate separately showing bottom bars, top bars, and accessories.

L. Welding Submittals:

1. If welding of reinforcing bars is to be included as part of the work, submit the following:
   (a) A complete welding procedure specification according to AWS Dl.4.
   (b) A certified chemical analysis of the steel to be welded.
   (c) Carbon equivalence calculations according to AWS Dl.4.
   (d) Qualification papers for welders who will be employed on the project. Welders shall have passed a qualification test within a 12 month period before the work or furnish a statement from a testing agency acceptable to A/E that they have observed or tested that welder's work under similar requirements within the past 6 months.

M. Alternate Reinforcing Splicing:

1. Splices shown in the drawings shall be considered mandatory for base bid purposes.
2. Alternative methods of providing for splices are available within the constraints of this specification and ACI 318.
3. If alternative splices are desired, the shop drawing submitted shall clearly indicate the change and include authorization by any other subcontractors involved in the change.

PART 2 PRODUCTS

2.1 REINFORCING MATERIALS

A. Comply with Chapter 5 of ACI 301.

B. Reinforcing Steel:

1. Bars #3 through #11 shall be deformed bars according to ASTM A615 Grade 60 and according to the additional requirements of Paragraph 5.2.2.1 of ACI 301.
2. Bars #2 in size shall be plain round meeting A615/A-96a Grade 40.
3. Welded wire fabric shall be of plain wire.
4. Unless indicated otherwise the minimum concrete protective cover specified in ACI 301 is the specified cover for this project unless indicated otherwise.
   (a) Epoxy-Coated Reinforcing Bars: ASTM A775.
   (b) Form-Saving Splice Connectors: Flanged devices to allow insertion of threaded reinforcing bars into a previously formed face. Available products include, but are not limited to:
   (c) Form Saver by Lenton.
   (d) DB-SAE Splices System by Richmond.
   (e) Rebar Flange Coupler by Williams.

5. Mechanical Connectors and Splice Devices: Proprietary products suitable for the use intended and listed in ACI 439-3R-83.
6. Steel Wire: ASTM A82, plain, cold-drawn, steel.
7. Fabricated Deformed Steel Bar Mats: ASTM A184.
8. Welded Steel Wire Fabric: ASTM A185.
9. Deformed Steel Wire: ASTM A496.
10. Welded Deformed Steel Wire Fabric: ASTM A497.
11. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI Class C or Class A as required acceptable.

C. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs. Maximum spacing of supports is 3 feet in both directions.

D. For exposed-to-view concrete surfaces and with legs of supports in contact with forms, provide supports with legs, either plastic protected according to CRSI, Class 1 or stainless steel protected according to CRSI, Class 2.

E. Provide custom supports as required to support top layer of mats and other special conditions not provided for within CRSI standards.

PART 3 EXECUTION

3.1 PLACING REINFORCEMENT

A. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as specified.

B. Clean reinforcement of loose rust and mill scale, dirt, and other materials that reduce or destroy bond with concrete.

C. Accurately position, support, and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers as required.

D. When any reinforcing bar is placed projecting either horizontally or vertically from a given element to subsequently lap with other reinforcing bar, verify the detailed lap length will be achieved.
1. Report any deviation to the A/E for correction before placing concrete in the first element.
2. Bar projections resulting in laps shorter than the detailed laps shall be considered rejected, and corrective measures shall be taken at the direction of the A/E with no additional cost to the Owner.

E. Place reinforcement to obtain at least minimum coverages for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

F. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh plus 2 inches and wire splices. Offset end laps in adjacent widths to prevent continuous laps in either direction.

G. Provide the A/E with not less than 48 hours notice before starting any welding of reinforcing bars.
   1. Welding of reinforcing bars shall only be allowed under the direct supervision of the A/E.
   2. Welding of crossing reinforcing bars is not allowed.
   3. Any bars with unauthorized or unacceptable welds shall be replaced at no additional cost to the Owner.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Normal weight cast-in-place concrete, including production, formwork, reinforcement, mix design, delivery, placement procedures, and finishes.

B. The Base Specification for cast-in-place concrete is ACI 301. This specification Section is written to supplement the ACI Standards by designation or specifying individual project requirements for materials and performance.

1.2 RELATED SECTIONS

A. 02200-Earthwork: Sub grade and capillary break vapor barrier: placement of drainage.

B. 03100-Concrete Formwork.

C. 03200-Concrete Reinforcement.

D. 03410-Precast Concrete Joists and Beams.

E. 03450-Site Casted Concrete Panels.

F. 07121-Fluid Applied Waterproofing Substrate requirements: coordination.

G. 09310-Ceramic Tile.

H. 09330-Quarry Tile.

1.3 REFERENCES

A. American Concrete Institute (ACI).
1. ACI 117-Standard Tolerances for Concrete Construction and Materials.
2. ACI 301-Specifications for Structural Concrete.
3. ACI 302-Guide for Concrete Floor and Slab Construction.
4. ACI 304-Guide for Measuring, Mixing, Transporting and Placing Concrete.
5. ACI 305-Hot Weather Concreting.
6. ACI 306R-Cold Weather Concreting.
7. ACI 309-Guide for Consolidation of Concrete.
8. ACI 318-Building Code Requirements for Reinforced Concrete.
9. ACI 347-Recommended Practice for Concrete Formwork.

B. ASTM International:

1. A185 Standard Specification for Welded Wire Steel Fabric for Concrete Reinforcement.
2. A497 Standard Specification for Welded Deformed Steel Wire Fabric for Concrete Reinforcement.
3. A615 Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
4. C31-Standard Practice for Making and Curing Concrete Test Specimens in the Field.
5. C33-Standard Specification for Concrete Aggregates.
6. C39-Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
7. C94-Standard Specification for Ready-Mixed Concrete.
8. C143-Standard Test Method for Slump of Portland Cement Concrete.
9. C150-Standard Specification for Portland Cement.
10. C172-Standard Practice for Sampling Freshly Mixed Concrete.
11. C260-Standard Specification for Air-Entraining Admixtures for Concrete.
12. C309-Standard Specification for Liquid Membrane Forming Compounds for Curing Concrete.
13. C330-Standard Specification for Lightweight Aggregate for Structural Concrete.
14. C494-Standard Specification for Chemical Admixtures for Concrete.
15. C618-Standard Specification for Fly Ash and Raw or Claimed Natural Pozzolin for Use as a Mineral Admixture in Portland Cement Concrete.
16. C989-Standard Specification for Ground Granulated Blast-Furnace Slag for use in Concrete and Mortars.
17. C1116-Standard Specification for Fiber-Reinforced Concrete and Shotcrete.

C. ASCE 37-02 Design Loads On Structures During Construction.

1.4 SUBMITTALS

A. Mix Designs: Submit mix designs to Engineer for review 20 days before first placement. Do not proceed without Engineer's written approval.
1. Mix design shall include laboratory test results or production records of 30 consecutive tests as defined by ACI 301.
2. Indicate material content per cubic yard of each class of concrete furnished:
(a) Saturated surface-dried weights of fine and course aggregate.
(b) Type and name of admixtures.
(c) Wet unit weight of each concrete mix.

B. Certificates:
1. Manufacturer's certification that materials meet specification requirements.
2. Ready-mix delivery tickets, ASTM C94.

C. Product Data: Submit product data for all admixtures proposed for use.

D. Related Materials: Submit product data for all proposed release agents, curing compounds and evaporation reducer, and polypropylene fibers that demonstrate conformance to specification.

E. Submittals as required to comply with Section 01900, Section 01910, and Section 01930.

F. Shop Drawings: Indicate floor plan and precise locations of all control joints and construction joints in relation to building grid lines that are not shown on drawings. Submit drawings for reinforcement, for fabrication, bending, and placement of concrete reinforcement. Comply with ACI SP-66 “ACI Detailing Manual” showing bar schedules, stirrup spacing diagrams of bent bars, and arrangement of concrete reinforcement.

G. Records: Retain records of all concrete poured, including; exact mix proportions, slump, air content test, strength, date, time, location of the placement, weather conditions at the time of placement, and the source of concrete. Submit copy to Engineer.

1.5 QUALITY ASSURANCE

A. Reinforced concrete to comply with ACI 301 and ACI 318, and other stated requirements, codes and standards.

B. Only one source of cement and aggregates shall be used in one structure to insure uniform color and appearance.

C. Inspection and Tests: Notify Engineer and testing agency of concrete placement, a minimum of 24 hours before placement begins.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Hot weather placements: Follow all of the special procedures in Article “Placing Concrete” below and conform to ACI 305R.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

A. Cement: ASTM C150, Type I or Type II; other types as approved.

B. Supplemental Cement Materials
   1. Fly Ash.: ASTM C618, Type F. Not to exceed 20% by weight of total cementitious material
   2. Granulated Ground Blast-Furnace Slag: ASTM C989. Not to exceed 30% by weight of cementitious material.

C. Normal Weight Coarse; Aggregate; ASTM C33

D. Water: ACI 301. Clean and potable

E. Admixtures, General: All concrete shall contain a Type A or D admixture in the basic design with dosages high enough to reduce water by at least 7 percent from the same mix without the admixture. No admixture shall have added chloride in its manufacture. Add all admixtures at the concrete batch plant.

1. Air-Entraining agent: Shall conform to ASTM C 260. (if used)
   (a) MB AE 90 or MB-VR by Master Builders.
   (b) Darex by WR Grace & Co.
   (c) Air Mix by Euclid Chemical Co.
2. Water-Reducing Admixture: Shall conform to ASTM C 494 Type A (if used).
   (a) Pozzolith 200N or Pozzolith 322N by Master Builders.
   (b) WRDA 60 by WR Grace & Co.
   (c) Eucon WR 75 by Euclid Chemical Co.
3. Water-Reducing Retarding Admixture: Shall conform to ASTM C 494 Type D.
   (a) Pozzolith 961R or Pozzolith 200N by Master Builders.
   (b) WRDA 60 by WR Grace & Co.
   (c) Eucon WR by Euclid Chemical Co.
4. Mid-Range Water-Reducing Admixture: Shall conform to ASTM C 494 Type A or F.
   (a) Polyheed 997 by Master Builders.
   (b) Mira 70 by WR Grace & Co.
   (c) Eucon MR by Euclid Chemical Co.
5. High-Range Water-Reducing Admixture (Superplasticizer): Shall conform to ASTM C 494 type F.
   (a) Rheobuild or PS 1232 by Master Builders.
   (b) Adva Flow by WR Grace & Co.
   (c) Eucon 37 by Euclid Chemical Co.
6. Fibrous Concrete Rinforcement: Shall meet ASTM C-1116 Type III 4.1.3 and ASTM C-1116. Shall be 100 percent virgin polypropylene fibrillated fibers containing no reprocessed olefin materials and specifically manufactured for use as concrete reinforcement at a minimum of 0.1 percent by volume for the control of cracking due to plastic shrinkage and thermal expansion/contraction.

2.2 RELATED MATERIALS

A. Evaporation Reducer: Shall be specially formulated material to be sprayed on fresh concrete to prevent rapid drying during hot and windy weather, and reduce plastic shrinkage cracking. Sprayed over plastic concrete, the material produces a monomolecular film that holds the water in until the next finishing operation. Product shall contain a yellow fluorescent color tint to easily identify the areas covered.

1. Confirm by Master Builders.
2. Eucobar by Euclid Chemical Co.
3. Sikafilm by Sika Corp.

B. Liquid Membrane-Forming Curing Compound: Shall be a membrane-forming curing compound complying with ASTM C 309, Type I, except that minimum

solids content shall be 30% and moisture loss shall not exceed 0.040 gm/cm2 of surface in 72 hours at a coverage rate of 2 coats at 300 sq. ft per gallon.

1. Masterkure 200W by Master Builders.
2. Super Aqua-Cure VOX by Euclid Chemical Co.
3. Kure-N-Seal 30 by Sonneborn.

C. Epoxy Adhesives: Two component, 100% solids, 100% reactive compound suitable for use on dry or damp surfaces:

1. Concresive LPL by Master Builders.
2. EpoGrip by Sonneborn.
3. Hi-Mod Epoxy Adhesive by ThoRock.

D. Epoxy Joint Filler: Two components, 100% solids compound with minimum Shore D hardness of 60 and a maximum of 65.

1. Masterfill 300 I by Master Builders.
2. Epolith by Sonneborn.
3. Sikadur 51 by Sika Corp.

E. Preformed concrete joint filler.

1. Asphalt Saturated Filler, ASTM D1751.
2. Recycled Rubber, ASTM D1752.

F. Moisture-Retaining Cover: Shall be one of the following, complying with ASTM C171.

1. Waterproof paper.
2. Polyethylene film.
3. Polyethylene-coated burlap.

G. All coating/ sealant shall be compatible with each other and applied floor finishes or be completely removed prior to application of other coating or finish.

H. Bonding Agent: Shall conform to ASTM C881 Type 2, Grade 2 Class B and C.

1. Concresive 1414 by Master Builders.
2. Engineer Approved Alternative.

2.3 PROPORTIONING AND DESIGN OF MIXES

A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. If trial batch method used, use an independent testing facility acceptable to Architect for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing.

B. Design mixes to provide normal weight concrete with the following properties, as indicated on drawings and schedules:

Concrete Use	Compressive Strength	Maximum water/cementitous ratio

Slab-on-ground and Foundations	3000 psi	.60
Columns, Beams, and all other concrete	4000 psi	.54

C. Slump Limits: Maximum slump of all concrete at point of placement shall be 4 inches except as modified here:
   1. Maximum slump of all concrete containing mid-range water-reducing admixture shall be 7.5 inches.
   2. Maximum slump of all concrete containing high-range water-reducing admixture shall be 10 inches.

D. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by Engineer. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Engineer before using in work.

E. Use of aggregate smaller than #67 is prohibited in foundations, slabs, tilt up walls, and grade beams/pilecaps.

PART 3 EXECUTION

3.1 PREPARATION OF FORMED SURFACES

A. General: Coat surfaces of forms with non-residual low-VOC form release agent before reinforcement is placed. Do not allow excess form release agent to accumulate in forms or come into contact with in-place concrete surfaces against which concrete will be placed.

3.2 MIXING: CONCRETE

A. Ready-mixed Concrete: Mix and transport in accordance with ASTM C94.

B. Admixture: Dispense admixtures in mix using automatic dispenser or similar metering device at the batch plant with the type and quantity of admixture printed on the batch ticket.

C. Addition of water in excess of that prescribed in the approved mix design or that increases slump beyond specified values is not permitted.

3.3 PLACING CONCRETE

A. General: Comply with ACI 304.

B. Ensure compliance with requirements of ASCE 37-02.

C. Hot Weather Concreting: In accordance with the current edition of ACI 305.

1. Protect to prevent rapid drying of concrete surface. Start finishing and curing as soon as possible. Use continuous fog sprays or use the specified hot weather evaporation reducer after placement. Apply cure as soon as finishing is complete then protect from sun and wind for at least 24 hours.
2. Allowable Concrete Temperatures: Hot weather: Maximum 95 degrees F. Concrete exceeding this temperature shall be discarded.

D. Conveying:
1. General: Conform to ACI 301. Convey concrete from mixer to place of final deposit by methods preventing; separation or loss of materials.
2. Equipment: Use pump, crane bucket, wheelbarrow, or buggies to deliver concrete to placing location. Chuting permitted only by method to insure a practically continuous flow of concrete at delivery end to prevent material separation.

3.4 DEPOSITING

A. Conform to ACI 301. Deposit concrete in or close to its final position. Avoid segregation due to rehandling or flowing. Deposit at rate that concrete is always plastic and flows readily into spaces between reinforcement. Deposit in one continuous operation until panel or section is complete, top surface generally level.

B. Wall Tops, Horizontal Offsets, Other unformed surfaces: Strike smooth after placing concrete float to continued uniform texture reasonably consistent with adjacent formed surfaces. Tool edges and corners to be exposed in the finished work to approximate 1/4 = radius, unless otherwise detailed.

3.5 CONSOLIDATION OF WALLS, COLUMNS, BEAMS AND SLABS OVER EIGHT-INCHES THICK

A. All concrete shall be thoroughly consolidated by means of mechanical vibrators. Vibrators shall be in accordance with ACI 309.

B. Use internal mechanical vibrators with 7000 rpm minimum frequency operated in nearly vertical position, vibration points uniformity spaced, close enough to assure complete consolidation, and at no time over twice the radius over which vibration is visibly effective. Vibration should continue until:
1. Frequency returns to normal.
2. Surface appears liquefied, flattened, and glistening.
3. Trapped air ceases to rise.
4. Coarse aggregate has blended into surface, but has not disappeared.

C. Penetrate vibrator head into upper portion of underlying plastic layer. Do not over-vibrate so as to cause segregation.

D. Vibrate around reinforcement, embedded items, and into corners and angles of forms by spading and rodding to exclude rock-pockets, air bubbles and honeycomb. Never have the vibrator more than 3 feet from the point of discharge into the form.

E. This mid-range slump concrete will require only 1/2 of the vibration time of 3 inch slump concrete, while high-range slump will require 1/3 of the vibration time of 3 inch slump concrete.

3.6 CONSOLIDATION OF SLABS LESS THAN EIGHT- INCHES THICK

A. Use vibrating screed.

B. Use of a “jitterbug” is not allowed unless concrete slump is less than 2 inches.

3.7 BONDING CONCRETE

A. Apply bonding agent to existing hardened concrete where noted to be bonded to new concrete. Be sure bonding agent is still tacky at the time of placement of new concrete. Prepare surface and install per manufacturer’s instructions.

3.8 JOINTS

A. Construction Joints:
1. Locate where indicated on Drawings.
2. Make joints perpendicular to principal reinforcement.
3. Unless indicated otherwise, provide longitudinal keys 1 and 1.5 inches minimum depth in walls.
4. Where concrete is to be exposed in finished construction, install rustication strips in formwork to form straight joint line.

B. Expansion Joints:
1. Unless indicated otherwise, place expansion joints where exterior slabs abut concrete walls, the building perimeter, and other fixed objects abutting or within the slab area.
2. Provide non-extruding filler where sealant is indicated. Allow 1/2 inch for application of sealant.
3. Provide asphalt impregnated filler where sealant is not to be used.
4. Do not extend reinforcement through joint, except as shown on structural drawings.
5. Sealants are specified in Section 07920.

C. Contraction Joints:
1. Make joints straight perpendicular or parallel to building lines and slab edges, as appropriate.
2. Contraction joints shall be saw cut, unless indicated otherwise. Cut as soon as possible after concrete placement without dislodgment or damage to the slab surface, using test cuts as soon as the concrete will not be damaged by traffic.
3. Contraction joints shall penetrate the slab a minimum 1/4 the thickness of the slab and shall be 3/16 inches in width minimum.
4. Align joints with column lines when ever possible. Joints shall form squares where possible or rectangular panels with the long side less than 1-1/2 times the length of the short side. Provide circular or diamond shaped joint lines around columns. Locate contraction joints

at reentrant corners. Coordinate with placement of joints in tile surface.

5. If joint pattern is not shown on Drawings, or joint plan is not submitted for approval to Engineer, maximum distance between joints shall be 20 feet on center.
6. Fill interior joints as indicated on Drawings with specified joint filler at least 90 days after concrete placement.

3.9 FINISHING OF FORMED SURFACES

A. Finish surfaces within 96 hours after removal of forms, allowing minimum of 24 hours for curing. After removal of forms and immediately following any required repair and patching finish formed surfaces with one or more of the following finish operations

1. Form Tie Holes: Do not fill form tie holes, except as required for application of waterproof membrane and/or interior finishing.
2. As-cast Finish: Completely remove all surface fins by hand or power grinding; with stone to approved smoothness. Clean with light wire brushing.

3.10 FINISHING OF FLOOR SLABS

A. General:

1. Finish floor slabs in accordance with ACI 301.
2. Screed all slabs, for whatever finish, to true levels or slopes work surfaces only to the degree required to produce the desired finish. Do no finishing in areas where water has accumulated; drain and re-screed, do not use cement and sand sprinkling to absorb moisture. Carefully finish all joints and edges with proper tools.
3. Consolidate placed concrete preferably with power driven floats of impact type use wood floats for surfaces inaccessible to power floats
4. In areas where drains are indicated, without depressed slab to accommodate subsequent thick bed setting system or leveling course, slope slabs evenly to drains, 1/8 inch per foot in the area within 8 feet of the drain, unless otherwise indicated.
5. Steel trowel finish only those slab surfaces scheduled to remain exposed in the finished work, and slab surfaces to receive resilient flooring, carpeting, ceramic or quarry tile or other final finish. Grind smooth, surface defects that would telegraph through applied floor covering.
6. Apply trowel and fine broom finish to slab surfaces to be covered by thinset terrazzo, or ceramic or quarry tile that is to be installed with thinset mortar.
7. Provide medium broom finish to concrete stair treads, loading docks, and pedestrian areas subject to foot traffic to provide a nonslip finish.
8. Slabs with excessive shrinkage cracks, curling, and slabs not properly sloped to drains, shall be removed and replaced with complying work, at no additional cost to Owner.

B. Tolerance: Provide floor tolerances as follows, when measured in accordance with ACI 301 and ACI 117, including those floors to receive subsequent finishes.
   1. Interior Slabs in equipment areas: Class B 1/4 inch in 10 feet.
   2. Interior Areas Indicated For Slopes And Pitches To Drain: Class B 1/4 inch in 10 feet.
   3. Exterior Areas Indicated For Slopes And Pitches To Drain: Class B 1/4 inch in 10 feet.
   4. Dried slabs shall not show curling at the corners of more than 1/8 inch when measured by a 2 foot straight edge placed in any direction.

3.11 CURING

A. General:
   1. Protect all freshly placed concrete from premature drying. Maintain curing procedures used for three days, at temperatures above 70 degrees F. If mean daily temperature drops below 70 degrees F. during this period, extend curing period appropriately to 5 days.
   2. Field application of curing compound shall be 2 coats, one as soon as finishing is complete and the second the next morning in accordance with recommendations of the product manufacturer, but not at a rate in excess of 300 sq. ft per gallon.
   3. Protect all concrete during curing period from all damaging; mechanical disturbances, load stresses, heavy shock and excessive vibration.
   4. Protect finish surfaces from all damage.
   5. Leave curing compound on slab for a minimum of 7 days.
   6. If curing compound later requires removal within 3 weeks of application, strip following the procedures recommended by manufacturer, for all slab areas that require coatings or tile.

3.12 PATCHING AND REPAIRS

A. General: Defective concrete and honeycombed areas as determined by Engineer shall be repaired as specified in Section 03700.

B. Upon removal of forms, remove plugs and break off metal ties. Where form ties are to be filled promptly fill holes upon stripping as follows:
   1. Moisten holes with water, brush on a coat 1/16 inch of neat cement slurry mixed to consistency of paste. Plughole with a 1 to 1.5 mixture of cement and concrete sand, mixed to a slightly damp to the touch consistency. Hammer the grout into the hole until dense, and an excess of paste appears on the surface in the form. Trowel smooth with heavy pressure, and avoid burnishing.

3.13 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. General: The Owner shall employ a testing laboratory to perform tests and submit test reports. Testing lab shall furnish all equipment for taking and testing concrete samples. Sampling and testing of concrete shall be performed by ACI certified Concrete Field Technicians Grade 1.

B. Sampling Fresh Concrete: Shall conform to ASTM C 172 and ASTM C 94 except as modified here.

1. Slump: ASTM C 143. One test at point of discharge for each class of concrete during the days placement, and one every additional 50 yards of each class of concrete. Additional tests should be taken if consistency of concrete changes.
2. Concrete and Ambient Temperature: Performed each time concrete compressive strength cylinders are cast per ASTM C-1064.
3. Compressive Test Specimens: ASTM C 31. One set of 5 cylinders for each compressive strength test taken at same frequency as slump test. Do not store cylinders in the field over 24 hours until picked up and then placed into laboratory curing conditions.
4. Compressive Strength Tests: ASTM C 39. Test one specimen at 3 days, test one specimen at 7 days, 2 cylinders at 28 days and hold one specimen for f56 days if the average of the 2 28 day cylinders strength is less than required compressive strength.
5. Test results will be reported in writing to Architect, Engineer, Ready-Mix Producer, and Contractor within 24 hours after tests are completed. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in the structure, design strength at 28 days, compressive strength, type of break, ambient and concrete temperature.
6. Additional tests: The testing lab will make additional tests of in-place concrete when test results indicate specified compressive strength and other characteristics have not been attained. Engineer will direct location and type of testing to be conducted. Costs of testing to be paid by contractor. Strength evaluations of structure and testing of in place concrete shall be per ACI 318.

END OF SECTION

SECTION 03312

CONCRETE TESTING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide labor, materials, necessary equipment, services, and related work to complete the concrete testing work including, but not necessarily limited to, the following:

1. Testing and evaluation of concrete ingredients.
2. Sampling and testing of concrete.
3. Testing of grout.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. C31/C-96 Practice for Making and Curing Concrete Test Specimens in the Field.
2. C39-96 Test Method for Compressive Strength of Cylindrical Concrete Specimens.
3. C42-94 Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
4. C94-96 Specification for Ready-Mixed Concrete.
5. C143-90a Test Method for Slump of Hydraulic Cement Concrete.
6. C173-94a Test Method for Air Content of freshly Mixed Concrete by the Volumetric Method.
7. C231-97 Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
8. C494-92 Specification for Chemical Admixtures for Concrete.

1.03 QUALITY ASSURANCE

A. Comply with provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:

1. ACI 301-89 Specifications for Structural Concrete for Buildings.
2. ACI 318-02 Building Code Requirements for Reinforced Concrete.
3. ACI 347-88 Recommended Practice for Concrete Formwork.

B. Testing Laboratory Qualifications:

1. Testing laboratory shall comply with state and local requirements.
2. Compression testing machines shall comply with ASTM C39.

PART 2 PRODUCTS NOT USED

PART 3 EXECUTION

3.01 SAMPLING FRESH CONCRETE

A. Comply with ASTM C172, except for slump to comply with ASTM C94.
B. Slump: ASTM C143, at each sample for strength tests, at each load for concrete of specified strength of 6,000 psi and greater, and at intervals not exceeding 10 minutes for concrete containing ASTM C494, Type F admixture. Perform visual slump evaluation of each load and perform test when questionable.

C. Air Content: One for each set of compressive strength test specimens and at every load where concrete is subject to hydrostatic pressure, according to the following.

1. ASTM C173 Volumetric method for lightweight or normal weight concrete
2. ASTM C231 Pressure for normal weight concrete.

D. Concrete Temperature:

1. Test hourly when air temperature is 40 degrees F. and below.
2. Test hourly when air temperature is 80 degrees F. and above.
3. Each time a set of compression test specimens is made.

E. Compression Test Specimens: ASTM C31;

1. Number of Cylinders per Set:

a. One set of 3 standard cylinders for each compressive strength test.

2. Frequency of Sampling:

a. One set for each 50 cubic yards or fraction thereof of each concrete class placed in any one day or for each 5,000 square feet of slab surface area placed.
b. When frequency of testing will provide less than 5 strength tests for a given class of concrete, take samples from at least 5 randomly selected batches or from each batch if fewer than 5 are used.

3. Point of Sampling:

a. Samples may be taken at the discharge of the truck except when concrete is placed by conveyor or pumping, take samples at point of final placement of concrete within the structure at intervals not exceeding every 150 cubic yards placed.
b. Samples taken at point of final placement may be in place of samples at intervals required above, or samples may be taken at point of final placement, at option of testing agency.

4. Handling:

a. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.

3.02 COMPRESSIVE STRENGTH TESTS

A. Comply with ASTM C39.

B. Time of tests:

1. 1 specimen at 7 days.
2. 1 specimens tested at specified age and 1 reserve.

3.03 REPORTS

A. A. Reports of compressive strength test shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for tests.

3.04 ACCEPTANCE

A. When strength of field-cured cylinders is less than 85 percent of companion laboratory cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.

B. Strength level of concrete will be considered satisfactory if averages of sets of 3 consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive strength by more than 500 psi.

3.05 ADDITIONAL TESTS

A. The testing service will make additional test of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by A/E.

1. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42 or by other methods as directed.
2. Contractor shall pay for such tests conducted and any other additional testing as may be required, when unacceptable concrete is verified.

END OF SECTION

SECTION 04200

UNIT MASONRY

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:
1. 03300-Cast-In-Place Concrete.
2. 08100-Steel Doors and Frames.
3. 09200-Metal Studs, Lath, Suspension Ceiling, Plaster, and Stucco.
4. Furnishing of other items to be built-in under respective sections.

1.2 REFERENCES

A. ASTM International (ASTM):
1. A82 Specification for Steel Wire, Plain, for Concrete Reinforcement.
2. A153 Specifications for zinc coating (hot-dip) on iron and steel hardware
3. C55 Specification for Concrete Brick.
4. C90 Specification for Load bearing Concrete Masonry Units.
5. C91 Specification for Masonry Cement.
6. C129 Specification for Non-Load bearing Concrete Masonry Units.
7. C144 Specification for Aggregate for Masonry Mortar.
8. C150 Specification for Portland Cement.
9. C270 Specification for Mortar for Unit Masonry.
10. C331 Specification for Lightweight Aggregates for Concrete Masonry Units.

B. Florida Building Code.

C. American Concrete Institute (ACI):
1. ACI 530/530.1-Building Code Requirements and Specifications for Masonry Structures.
2. D. ASCE-37-02-Design loads on structures during construction.

1.3 SUBMITTALS

A. Submit properly identified product data on masonry units and each type of metal anchor and accessory, before starting work, which shall certify conformance to these specifications.
1. Submittal is for information only. Neither receipt of list nor acceptance of mockup constitutes approval of deviations from Contract Documents unless such deviations are specifically brought to the attention of the Architect and approved in writing.

B. Samples for initial selection of the following:

1. Unit Masonry samples in small-scale form showing the full range of colors and textures available for each different exposed masonry unit required
2. Colored-masonry mortar samples showing the full range of colors available.
3. Samples for verification of the following:
   (a) Full-size units for each different exposed masonry unit required showing the full range of exposed colors, textures, and dimensions to be expected in the complete construction.
   (b) Include size-variation data for Type FBS Brick, verifying that actual range of sizes for brick falls within ASTM C216 dimension tolerances.

C. Colored-masonry mortar samples for each color required showing the full range of colors expected in the finished construction. Make samples using the same sand and mortar ingredients to be used on the project. Label samples to indicate type and amount of colorant used.

D. Weep holes/vents in color to match mortar color.

E. Submittals as required to comply with Section 01900, Section 01910, and Section 01930.

F. Accessories embedded in the masonry.

1.4 QUALITY ASSURANCE

1. Refer to ACI 530/530.1 and FBC for inspection requirements. Note that for all masonry bearing walls, a ‘special inspector’ is required.
2. Certifications: Provide certification from concrete unit masonry manufacturer stating the materials supplied meet specifications.
   (a) Provide a certification for fire rating for each masonry unit type submittal.
   (b) Submit compressive strength and absorption tests demonstrating compliance with specifications.
   (c) Test reports shall be no older than one year and be representative of the batch characteristics of the proposed masonry unit(s).
3. Mason Certification:
   (a) Perform under the direct supervision of a "Certified Structural Masonry Contractor".
   (b) The supervisor of the masonry portion of the project: "Certified Structural Masonry Contractor and a Certified Structural Mason" as recognized by the Florida Concrete & Products Association (FC&PA).
   (c) The Masonry Supervisor: Responsible to assure that the work is accomplished under provisions of the contract documents.
   (d) The Masonry Contractor: Submit credentials from the FC&PA to the Architect for review and approval prior to bidding.
   (e) All Masonry Work: Under the direct, onsite supervision of a certified structural mason.

4. Mock-Ups: Erect, at a minimum or as otherwise directed by A/E for size or quantity, a 6 foot long by 4 foot high by full thickness sample wall panel to represent completed exterior and interior masonry work for each type of masonry for qualities of appearance, materials, and construction. Retain sample wall in an undisturbed condition during construction for standard judging for completed masonry work.
5. Testing Agency Qualifications: Conform to ASTM C10 83
6. Pre-construction testing: Perform the following pre-construction testing to establish compliance of proposed materials and construction with specified requirements:
   (a) Prism Test: For each type of wall construction indicated, test masonry prisms per ASTM E447, Method B.
   (b) Evaluate Mortar composition and properties per ASTM C780.
   (c) Test grout compressive strength per ASTM C109.
   (d) Provide additional testing as required in section 3.6.
7. Fire-Resistant Ratings: Provide materials and construction identical to those of assemblies with fire resistance ratings determined per ASTM E119.
8. Single-source Responsibility for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from 1 source and by a single manufacturer for each different product required.
9. Single-Source Responsibility for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from 1 manufacture for each cementitious component and from 1 source or producer for each aggregate.
10. Preinstallation Conference: Conduct conference at project site to comply with requirements of Section 01310, “Project Management and Coordination”.
11. Delivery, Storage, And Handling
    (a) Store masonry units on elevated platforms, under cover, and in a dry location to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, and other causes.
    (b) Store cementitious materials on elevated platforms, under cover, and in a dry location.
    (c) Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
    (d) Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.
12. Project Conditions:
    (a) Protection of Masonry: During erection, cover tops of walls, projections, and sills with waterproof sheeting at end of each day’s work. Cover partially completed masonry when construction is not in progress.
        (1) Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
        (2) Where 1 wythe of multi-wythe masonry walls is completed in advance of the wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.

(b) Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

(c) Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

(1) Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on ground and over wall surface.

(2) Protect sills, ledges, and projections from mortar droppings.

(3) Protect surfaces of window and doorframes, as well as similar products with painted and integral finishes, from mortar droppings.

(4) Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt on completed masonry.

1.5 PROJECT CONDITIONS

1. Environmental Conditions

(a) Temperature: 40 degrees F. minimum and rising.

(b) Weather: No application during precipitation.

2. Special Requirements

(a) Comply with the following requirements:

(1) Cover masonry with a weather-resistant membrane for 48 hours after construction.

(2) Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 degrees Fahrenheit and above.

PART 2 PRODUCTS

2.1 LOAD BEARING UNIT MASONRY

A. Weight: Normal.

B. Size: 8 inches x 16 inches x thickness indicated,

1. Two cell flush end type.

2. Two cell stretcher type one end (to be used adjacent to concrete construction)

C. Texture: Medium.

D. Grade: ASTM C90, Type II.

E. Shapes: Appropriate to suit conditions.
   (a) Provide special shapes for lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions including partition top closures.
   (b) Provide bullnose units for outside corners, unless otherwise indicated.

2.2 NON-LOAD BEARING CONCRETE UNIT MASONRY

A. Weight: Normal.

B. Size: 8 inches x 16 inches x thickness indicated
   1. 2 cell flush end type.
   2. 2 cell stretcher type one end (to be used adjacent to concrete construction)

C. Texture: Medium.

D. Grade: ASTM C129, Type II.

E. Shapes: Appropriate to suit conditions.
   (a) Provide special shapes for lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions including partition top closures.
   (b) Provide bullnose units for outside corners, unless otherwise indicated.

2.3 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C150, Type I, domestic.

B. Masonry Cement: ASTM C91.
   1. For pigmented mortars, use premixed, colored mortar cements of formulation required to produce color indicated, or if not indicated, as selected from manufacturer's standard formulations.
   2. Pigments: Do not exceed 5 percent of mortar cement by weight for mineral oxides nor 1 percent for carbon black.

C. Hydrated Lime: ASTM C207, Type S.

D. Portland Cement-Lime Mix: Packaged blend of Portland cement complying with ASTM C150, Type I or Type III, and hydrated lime complying with ASTM C207.
   1. For pigmented mortars, use premixed, colored mortar cements of formulation required to produce color indicated, or if not indicated, as selected from manufacturer's standard formulations. Pigments: do not exceed 10 percent of mortar cement by weight for mineral oxides nor 5 percent for carbon black.

E. Aggregate for Grout: ASTM C404.

F. Mortar Pigments Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortars.

G. Products: Subject to compliance with requirements, provide one of the following:
   1. Colored Masonry Cement:
      (a) Brixment-in Color; as manufactured by Essrock Materials, Inc.
      (b) Centurion Colorbond; as manufactured by Lafarge Corporation.
      (c) Lehigh Custom Color Masonry Cement; as manufactured by Lehigh Portland Cement Company.
      (d) Flamingo Color Masonry Cement; as manufactured by Riverton Corporation.
   2. Colored Portland Cement-Lime Mix:
      (a) Color Mortar Blend; as manufactured by Glen-Gery Corporation.
      (b) Centurion Colorbond; as manufactured by Lafarge Corporation.
      (c) Lehigh Custom Color Masonry Cement; as manufactured by Lehigh Portland Cement Company.
      (d) Riverton Portland Cement Lime Custom Color; as manufactured by Riverton Corporation.
   3. Mortar Pigments:
      (a) True Tone Mortar Colors; as manufactured by Davis Colors.
      (b) Centurion Colorbond; as manufactured by Lafarge Corporation.
      (c) SGS Mortar Colors; as manufactured by Solomon Grind-Chem Services, Inc.

H. Sand: ASTM C144.

I. Water: Potable.

2.4 MORTAR AND GROUT MIXES:

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
   1. Do not use calcium chloride in mortar or grout.

B. Mortar for Unit Masonry: ASTM C270, Type S, 1800 psi use, and Type M-2500 psi. Mix accurately proportioned by volume.

C. Grout for Unit Masonry: Comply with ASTM C476.
   1. Use grout of consistency indicated or, if not otherwise indicate, of consistency (fine or coarse) at time of placement that will completely fill spaces intended to receive grout.
   2. Use fine grout in grout spaces less than 2 inches in horizontal dimension, unless otherwise indicated.

3. Use coarse grout in grout spaces 2 inches or more in least horizontal dimension, unless otherwise indicated.
4. Slump for grout shall be between 8 inch and 11 inch.
5. See also requirements in Section 03300.

D. Epoxy Pointing Mortar: Mix epoxy pointing mortar to comply with mortar manufacturer's directions.

2.5 REINFORCEMENT, ANCHORS, TIES, AND ACCESSORIES

A. Horizontal Joint Reinforcement: Continuous 9 gage truss (see below) design, deformed, galvanized steel.
1. Acceptable manufacturers:
(a) A.A. Wire Products.
(b) Dur-O-Wal.
(c) Hohmann and Barnard, Inc.
2. Galvanized to meet ASTM A-153, Class B-2.
3. Provide ladder type for reinforced walls, truss type for non-reinforced walls.
4. Provide prefabricated corners and tees for use at wall intersections.
5. Widths to suit thickness of block to within 1 inch of each face.

B. Buck Anchors: 16 gage corrugated galvanized steel, 1-1/4 inch wide, 8 inch long leg, with 2 inch upturned end, punched for fastenings, complete with No.10 galvanized machine screws and metal expansion anchors for securement to concrete.

C. Dovetail Slots: 22 gage galvanized with filler, 1 inch wide x 1 inch deep.

D. Dovetail Anchors: 16 gage corrugated galvanized steel, 1 inch wide x 5-1/2 inch long, sized to fit dovetail slots.

E. Embedded Flashing Materials:
1. Concealed Through-Wall Flashing: Manufacturers full sheet of copper, 7 ounces per square foot, laminated between and bonded to two 2 layers of asphalt impregnated fiberglass fabric.
2. Adhesive Backed Membrane Flashing: Manufacturer's standard composite flashing product consisting of pliable and highly adhesive rubberized asphalt compound, 32 mils thick, bonded completely and integral to a high-density, cross laminated polyethylene film, 8 mils thick to produce an overall thickness of 40 mils.
(a) Primer: Flashing manufacturer's standard product or product recommended by flashing manufacturer for bonding flashing sheets to masonry and concrete.
3. Solder and Sealants for Sheet-Metal Flashings: As specified in Division 7 Section "Flashing and Sheet Metal".
4. Products: Subject to compliance with requirements, provide one of the following:
(a) Concealed Through-Wall Flashing:

(1) FCO Copper-Fabric Flashing: As manufactured by AFCO Products, Inc., Sommerville, Mass. 617-623-7700.
(2) H & B C-Fab Flashing: As manufactured by Hohmann & Barnard, Inc., Hauppauge, N.Y. 516-234-0600.
(3) Approved equivalent alternative.

F. Miscellaneous Masonry Accessories:
1. Compressible Filler: Premolded filler strips complying with ASTM D1056, Type Class A, Grade 1; compressible up to 35 percent; of width and thickness indicated; formulated from the following material:
(a) Neoprene.
(b) Urethane.
(c) Polyvinyl chloride.
2. Preformed Control-Joint Gaskets: Material as indicated below, designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
(a) Styrene-Butadiene Rubber Compound: ASTM D2000, Designation M2AA-805.
(b) Weep Holes: Provide the following:
(1) Vinyl Weep Hole/Vent: One-piece, offset, T-shaped units formed to fit in a vertical mortar joint by injection molding of flexible polyvinyl chloride and consisting of a louvered vertical leg, flexible wings to seal against ends of masonry units, and top flap; in color approved by Architect to match that of mortar.
3. Cavity Drainage Material: Two inch thick, reticulated, nonabsorbent mesh, made from polyethylene strands and shaped to maintain drainage at weep holes without being clogged by mortar droppings.
(a) Product: Subject to compliance with requirements, provide “Mortar Net” by Mortar Net USA, Ltd.
4. Approved equivalent alternative.

2.6 MASONRY CLEANERS:

A. Proprietary Acidic Cleaner: Manufacturer’s standard-strength, general-purpose cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry surfaces of type indicated below without discoloring or damaging masonry surfaces; expressly approved for intended use by manufacturer of masonry units being cleaned.
1. For masonry not subject to metallic oxidation stains, use formulation consisting of a concentrated blend of surface-acting acids chelating, and wetting agents.
2. For dark-colored masonry not subject to metallic oxidation stains, use formulation consisting of a liquid blend of surface-acting and special inhibitors.
3. For masonry subject to metallic oxidation stains, use formulation consisting of a liquid blend of organic and inorganic acids and special inhibitor.

B. Products: Subject to compliance with requirements, provide one of the following:
   1. 202 New Masonry Detergent; Diedrich Technologies, Inc.
   2. 200 Lime Solv; Diedrich Technologies, Inc.
   3. 202V Vana-Stop; Diedrich Technologies, Inc.
   4. Sure Klean No. 600 Detergent; ProSoCo, Inc.
   5. Sure Klean No. 101 Lime Solvent; ProSoCo., Inc.
   6. Sure Klean Vana Trol; ProSoCo, Inc.

PART 3 EXECUTION

3.1 PREPARATION

A. Examination:
   1. Verify that the surfaces, substrates and conditions are satisfactory to receive unit masonry, and are free from deviations affecting quality of the work.
   2. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affection performance of unit masonry. Do not proceed with installation until unsatisfactory conditions have been corrected.
      (a) For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of unit masonry.
      (b) Examine rough-in and built-in construction to verify actual locations of piping connections prior to Installation.

3.2 LOCATION OF MASONRY SYSTEMS (UON on drawings)

A. Load Bearing Units: For partitions and walls 8 inches or greater.

B. Load Bearing Lightweight Units: For partitions and walls as indicated.

C. Non-Load Bearing Units: For partitions 4 or 6 inches.

D. Concrete Brick: Filling-in to suit conditions.

E. Corners and Special Shapes: As required to suit conditions, including corners, returns, offsets, and to maintain bond.

3.3 LOCATION OF REINFORCEMENT, ANCHORS, TIES, AND ACCESSORIES

A. Horizontal Joint Reinforcement: Every second block course and at first joint above and below openings, for all masonry, interior or exterior.

B. Buck Anchors: Every second block course for masonry walls and partitions abutting precast concrete and wherever dovetail anchors cannot be incorporated. Secure upturned ends to concrete with specified screws and anchors.

C. Dovetail Anchors: Every second block course for masonry walls and partitions abutting cast-in-place concrete with continuous dovetail anchor slots.

3.4 ERECTION

A. General:
1. Ensure scaffolds and loadings conform to requirements of ASCE 37-02.
2. Thickness: Build cavity and composite walls and other masonry construction to the full thickness shown. Build single-wythe walls to the actual thickness of the masonry units, using units of thickness indicated.
3. Build chases and recesses to accommodate items specified in this and other Sections of the Specifications.
4. Leave openings for equipment to be installed before completion of masonry. After installing equipment, complete masonry to match construction immediately adjacent to the opening.
5. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining construction. Use full-size units without cutting, where possible. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
6. Mix units for exposed unit masonry from several pallets or cubes as they are placed to produce uniform blend of colors and textures.

B. Laying Units:
1. Lay masonry plumb, true to line, with level and accurately spaced courses.
2. Keep bond plumb throughout.
3. Lay corners and reveals plumb and true.
4. Avoid over plumbing of corners and jambs to fit stretcher units after they are set in position.
5. Where adjustment must be made after mortar has started to harden, remove mortar and replace with fresh mortar.
6. Use concrete brick to course out walls concealed in the finished work.
7. Vertical cells to be grouted shall be aligned to provide unobstructed openings for grout.
8. Stopping and Resuming Work: In each course, rack back one-half (1/2) unit length for one-half (1/2) running bond or one-third (1/3) unit length for one-third (1/3) running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar prior to laying fresh masonry.

C. Tolerances:
1. Conform to tolerances listed in ACI530.1, Part 3.

D. Bond:
1. Provide common bond, with vertical joints centered over masonry unit below, except where other bonds are indicated.

2. Lap alternate masonry courses at corners and intersections.

E. Joint Treatment:
1. Block Exposed to View: Tooled concave joints mortar thoroughly compacted and pressed against edges of units and float finish joints.
2. Concealed Block: Joints struck flush.
3. Joint Thickness: 3/8 inch.

F. Jointing Methods:
1. Where block cores are indicated to be filled with grout, lay in full mortar beds and full mortar end joints.
2. Lay all other concrete block with full beds of mortar on vertical and horizontal face shells.
3. Furrowing of mortar not allowed.
4. Shove vertical joints tight.
5. Finish tooled joints to uniformly straight and true lines and surfaces, smooth and free of tool marks.
6. Uniformly rake joints between masonry and doorframes to 3/8 inch depth to receive caulking or sealant.
7. Rake joints around flush electrical outlets in wet locations to receive caulking or sealant.
8. Remove masonry protrusions extending 1/2 inch or more into cells or cavities to be filled.

G. Mortar Filled Units:
1. First cell of blocks abutting doorjambs and window frames.
2. Cells of blocks at free ends of partitions and walls.
3. Where necessary for embedment of anchors, and where otherwise shown.
4. Voids around ducts, pipes, and other items passing through masonry work.
5. Hollow metal door frames and elevator hoistway door frames in masonry walls and partitions:
   (a) Grout solid with mortar as masonry is laid.
   (b) Include tops of door frames.
   (c) Load Bearing Masonry Walls:
      (1) Erect masonry before reinforced concrete building frame.
      (2) Close masonry top course cores under poured concrete beams with paper stuffing or metal caps.
      (3) Do not use flush end type units against columns or poured concrete walls.

H. Non-Load Bearing Masonry Wall and Partition Anchorage:
1. Erect masonry after steel and concrete frames are in place, and after concrete floors and roof decks are in place.
2. After forms are stripped, remove slot fillers.
3. At edges of non-bearing interior masonry walls and partitions abutting concrete columns and poured concrete walls, provide corrugated dovetail type anchors.

4. Grout dovetail slots and space between end of masonry units and concrete solid.
5. Point up all joints solid and flush on both sides of partitions.

I. Partition Heights:
1. Partitions to be continuous from floor to underside of floor or roof construction above. UON drawings.
2. Full height partitions and walls to be wedged tight with tile or brick set in mortar.
3. Use brick or solid units for top masonry course. UON drawings.
4. Point up all joints solid and flush on both sides of walls and partitions.
5. Where suspended ceilings on both sides of partitions are indicated, the partitions other than those shown to be continuous may be terminated approximately four inches above the ceiling level, where noted on drawings.

J. Concrete Grout Fill for Masonry Cores:
1. Coordinate masonry work to allow placing of grout as indicated and as specified in this section.
2. Fill top courses of masonry walls with grout before placing or use concrete brick for top courses to assure solid masonry.

K. Pipe Chase Walls and Partitions: Erect after pipes are in place, tested, and accepted.

L. Slots, Chases, Recesses and Openings: Provide as required for work of other trades.

M. Setting of Items Furnished Under Other Sections: Set anchors, bolts, sleeves, access panels, doorframes, and other items occurring in masonry as the work proceeds.

N. Securing Hollow Metal Door Frames: Set in hollow metal frames on floor, floor clips secured and frames braced in proper position. Grout anchors into masonry joints as walls are erected.

O. Lintels: Set reinforced precast concrete or coordinate installation of cast-in-place concrete lintels as indicated.
1. Precast concrete lintels to be set in full mortar beds with 8 inches minimum bearing each end.
2. Cast-in-place lintels shall be used at openings, which have cast-in-place columns at either or both ends.
3. Lintels shall be appropriately sized for the opening and shall have openings cast into the unit each end to allow for the passage of vertical reinforcing.

P. Flashing, Weep Holes, And Vents:
1. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to the downward flow of water in the wall, and where indicated.

2. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Place through-wall flashing on sloping bed of mortar and cover with mortar. Seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer before covering with mortar.
3. Install flashing as follows:
   (a) At composite masonry walls, including cavity walls, extend flashing from exterior face of outer wythe of masonry, through the outer wythe, turned up a minimum of 4 inches, and to the surface of the waterproofing membrane applied to the outer face of the inner wythe.
   (b) At lintels and shelf angles, extend flashing a minimum of 4 inches into masonry at each end. At heads and sills, extend flashing 4 inches at ends and turn up not less than 2 inches to form a pan.
   (c) Interlock end joints of sheet-metal flashing by overlapping ribs not less than 4 inches, and seal lap with elastomeric sealant complying with requirements of Section 07920-Joint Sealants for application indicated.
   (d) Extend sheet-metal flashing 1/2 inch beyond face of masonry at exterior and turn down to form a drip.
4. Install weep holes in the head joints in exterior wythes of the first course of masonry immediately above embedded flashing and as follows:
   (a) Form weep holes with product specified.
   (b) Space weep holes 24 inches on center.
   (c) Place cavity drainage material immediately above flashing in cavities.

Q. Installation of Horizontal Wall Reinforcement:
1. In masonry areas indicated to have concrete filled cores, provide reinforcement in every horizontal joint.
2. At other areas, provide reinforcing in every second block course joint and at first joint above and below openings for exterior and interior masonry.
3. Provide prefabricated corners and tees at all wall intersections.
4. Extend reinforcement 6 inches into concrete tie columns and concrete encasement of steel columns poured after block is in place.
5. Unless walls have cast-in-place concrete corner tie columns, make wall and partition joint reinforcing continuous around corners and at intersections according to manufacturer's published directions.
6. Lap splices in joint reinforcement no less than 6 inches. Reinforcement shall not be continuous through expansion or control joints.

R. Covers: At work stoppage, provide waterproof covers secured over exposed wall tops for weather protection.

S. Pointing: Point holes in masonry. Cut out and point up defective joints.

3.5 MASONRY WASTE DISPOSAL:

1. Recycling: Undamaged, excess masonry materials are Contractor's property and removed from the Project site for his use.
2. Disposal as Fill Material: Dispose of clean masonry waste, including broken masonry units, waste mortar, and excess or soil-contaminated sand, by crushing and mixing with fill material as fill is placed.
   (a) Crush masonry waste to less than 4 inches in greatest dimension.
   (b) Mix masonry waste with at least 2 parts specified fill material for each part masonry waste. Fill material is specified in Section 02300-Earthwork.
   (c) Do not dispose of masonry waste as fill within 18 inches of finished grade.
3. Excess Masonry Waste: Remove excess, clean masonry waste that cannot be used as fill, as described above, and other masonry waste and legally dispose of off Owner's property.

3.6 FIELD QUALITY CONTROL

A. The Owner will employ and pay a qualified independent testing agency to perform the following testing for field quality control. Retesting of materials failing to meet specified requirements shall be done at Contractor's expense.

B. Testing Frequency: Tests and Evaluations listed in this Article will be performed during construction for each 5000 square feet of wall area or portion thereof.

C. Mortar composition and properties will be evaluated per ASTM C780.

D. Prism-Test Method: For each type of wall construction indicated, masonry prisms will be tested per ASTM E447, Method B. and as follows:
   1. Test prior to construction.
   2. Test for every 5,000 sq/ft of wall area or portion thereof.

E. Evaluation of Quality-Control Tests: In the absence of other indications of non-compliance with requirements, masonry will be considered satisfactory if results from construction quality-control tests comply with minimum requirements indicated.

END OF SECTION

SECTION 04230

REINFORCED UNIT MASONRY

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:
1. 03100-Concrete Formwork.
2. 03200-Concrete Reinforcement.
3. 03300-Cast-in-Place Concrete.
4. 04200-Unit Masonry.

1.2 REFERENCES

A. Comply with Reference requirements of Sections 03300 and 04200.

1.3 QUALITY ASSURANCE

A. Comply with provisions of applicable codes, specifications, and standards, except where more stringent requirements are shown or specified, as referred to in Sections 03300 and 04200.

B. Certifications: Comply with applicable certification requirements of Sections 03300 and 04200.

C. Mock-Ups: Comply with applicable mockup requirements of Sections 03300 and 04200.

1.4 SUBMITTALS

A. Comply with applicable submittal requirements of Sections 03300 and 04200.

B. Submittals as required to comply with Section 01900, Section 01910, and Section 01930.

PART 2 PRODUCTS

2.1 MATERIALS

A. Formwork: Comply with applicable requirements of Section 03100 Concrete Formwork.

B. Reinforcement: Comply with applicable requirements of Section 03200 Concrete Reinforcement.

C. Grout: Comply with applicable portions of Sections 03300 and 04200.

D. Masonry Materials and Accessories: Comply with applicable requirements of Section 04200 Concrete Unit Masonry.

PART 3 EXECUTION

3.1 FORMWORK

A. General: Refer to Section 04200 for general installation requirements of unit masonry.

B. Temporary Formwork: Provide formwork and shores as required for temporary support of reinforced masonry elements. Design, erect, support, brace and maintain formwork.

C. Construct formwork to conform to shape, line, and dimensions shown. Make sufficiently tight to prevent leakage of mortar grout, or concrete. Brace, tie, and support as required to maintain portion and shape during construction and curing of reinforced masonry.

D. Do not remove forms and shores until reinforced masonry member has hardened sufficiently to carry it's own weight and all other reasonable temporary loads that may be placed on it during construction.

3.2 PLACING REINFORCEMENT

A. General: Clean reinforcement of loose rust, mill scale, dirt, or other materials capable of reducing bond to mortar or grout. Do not use reinforcement bars with kinks or bends not shown on drawings or final shop drawings, or bars with reduced cross section due to excessive rusting or other causes.

B. Position reinforcement accurately at the spacing shown. Support vertical bars are shown in close proximity. Provide a clear distance between bars of not less than the nominal bar diameter or 1 inch whichever is greater.
   1. For columns, piers, and pilasters, provide a clear distance between vertical bars as shown, but not less than 1-1/2 times the nominal bar diameter or 1-1/2 inch, whichever is greater. Provide lateral ties as shown.

C. Splice reinforcement bars where shown and according to applicable provisions of Section 03200, Concrete Reinforcement. Do not splice at other points unless acceptable to the A/E. Provide lapped splices, unless otherwise shown. In splicing vertical bars or attaching to dowels, lap ends, place in contact and wire tie.

D. Embed metal ties in mortar joints as work progresses, with a minimum mortar cover of 5/8 inch on exterior face of walls and 1/2 inch at other locations.

E. Embed prefabricated horizontal joint reinforcing as the work progresses, with a minimum cover of 5/8 inch on exterior face of walls and 1/2 inch at other locations. Lap units not less than 6 inches at ends. Use prefabricated "L" and "T" units to provide continuity at corners and intersections. Cut and bend units as recommended

by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

F. Anchoring:
1. Anchor reinforced masonry work to supporting structure as indicated.
2. At intersections of reinforced masonry walls with non-reinforced masonry, provide anchorage as shown.

3.3 INSTALLATION OF REINFORCED CONCRETE UNIT MASONRY

A. General:
1. Do not wet concrete masonry units (CMU).
2. Lay CMU units with full-face shell mortar beds.
3. Fill vertical head joints (end joints between units) solidly with mortar from face of unit to a distance behind face equal to not less than the thickness of longitudinal face shells.
4. Solidly bed cross-webs of starting courses in mortar.
5. Maintain head and bed joint widths shown, or if not shown, provide 3/8 inch joints.
6. Where solid CMU units are shown, lay with full mortar head and bed joints.

B. Walls:
1. Pattern Bond: Lay CMU wall units in 1/2 running bond with vertical joints in each course centered on units in courses above and below, unless otherwise indicated.
2. Bond and interlock each course at corners and intersections. Use special-shaped units where shown, and as required for corners, jambs, sash, control joints, lintels, bond beams, and other special conditions.
3. Maintain vertical continuity of core or cell cavities, to be reinforced and grouted, to provide minimum clear dimensions indicated and to provide minimum clearance and grout coverage for vertical reinforcement bars. Keep cavities free of mortar. Solidly bed webs in mortar where adjacent to reinforced cores or cells.
4. Where horizontal reinforced beams (bond beams) are shown, use special units or modify regular units to allow for placement of continuous horizontal reinforcement bars. Place small mesh expanded metal lath or wire screening in mortar joints under bond beam courses over cores or cells of non-reinforced vertical cells, or provide units with solid bottoms.

C. Columns, Piers, and Pilasters:
1. Use CMU units of the size, shape, and number of vertical core spaces shown. If not shown, use units providing minimum clearances and grout coverage for number and size of vertical reinforcement bars shown.
2. Provide pattern bond shown, or if not shown, alternate head joints in vertical alignment.
3. Where bonded pilaster construction is shown, lay wall and pilaster units together to maximum pour height specified.
4. Grouting, General:
(a) Use "Fine Grout" only where allowed by Section 04200.

(b) Use "Coarse Grout" for typical reinforced masonry construction. Use high-slump where height of any lift exceeds 4 feet.

(c) Grouting Technique: At the Contractor's option, use either low lift or high-lift grouting techniques subject to the requirements as specified.

5. Low-Lift Grouting:

(a) Provide minimum clear dimension of 2 inches and clear area of 8 square inches in vertical cores to be grouted.

(b) Place vertical reinforcement before laying of CMU. Extend above elevation of maximum pour height as required to allow for splicing. Support in position at vertical intervals not exceeding 160 bar diameters.

(c) Lay CMU to maximum pour height. Do not exceed 4 feet height, or if bond beam occurs below 4 feet height stop pour at course below bond beam.

(d) Pour grout-using container with spout or by chute or by pumping. Vibrate grout during placing. Place grout continuously. Do not interrupt pouring of grout for more than one hour. Terminate grout pours 1-1/2 inch below top course of pour.

(e) Bond Beams: Stop grout in vertical cells 1-1/2 inch below bond beam course. Place horizontal reinforcing in bond beams. Lap at corners and intersections as shown. Place grout in bond beam course before filling vertical cores above bond beam.

(f) High-Lift Grouting:

(1) Do not use high-lift grouting technique for grouting of CMU unless minimum cavity dimension is 3 inches and 10 square inches, respectively.

(2) Provide clean-out holes in first course at all vertical cells to be filled with grout.

(a) Use units with one face shell removed and provide temporary supports for units above, or use header units with concrete brick supports, or cut openings in one face shell.

(3) Construct masonry to full height of maximum grout pour specified, before placing grout.

(4) Limit grout lifts to a maximum height of 4 feet and grout pour to a maximum height of 12 feet, for single wythe hollow concrete masonry walls, unless otherwise indicated.

(5) Place vertical reinforcement before grouting. Place before or after laying masonry units, as required by job conditions. Tie vertical reinforcement to dowels at base of masonry where shown and if reinforcement is placed first, thread CMU over or around reinforcement. Support vertical reinforcement at intervals not exceeding 192 bar diameters nor 10 feet.

(a) Where reinforcement is prefabricated into cage units before placing, fabricate units with vertical reinforcement bars and lateral ties of the size and spacing shown.

(6) Place horizontal beam reinforcement as the masonry units are laid.

(7) Embed lateral tie reinforcement in mortar joints where shown. Place as masonry units are laid, at the vertical spacing shown.

(8) Preparation of Grout Spaces: Before grouting, inspect and clean grout spaces. Remove dust, dirt, mortar droppings, loose pieces of masonry, and other foreign materials from grout spaces. Clean reinforcing and adjust to proper position. Clean top surface of structural members supporting masonry to ensure bond. After final cleaning and inspection, close clean-out holes and brace closures to resist grout pressures.

(9) Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist displacement of masonry units and breaking of mortar bond. Install shores and bracing, if required, before starting grouting operations.

(10) Place grout by pumping into grout spaces unless alternate methods are acceptable to the A/E.

(11) Limit grout pours to sections, which can be completed in one working day with not more than one-hour interruption of pouring operation.

(a) Place grout in lifts, which do not exceed 4 feet.

(b) Allow not less than 30 minutes, nor more than one hour between lifts of a given pour.

(c) Vibrate each grout lift during pouring operation.

(d) Place grout in lintels or beams over openings in one continuous pour.

(12) Where bond beam occurs more than one course below top of pour, fill bond beam course to within 1 inch of vertically reinforced cavities, during construction of masonry.

(13) When more than one pour is required to complete a given section of masonry, extend reinforcement beyond masonry as required for splicing. Pour grout to within 1-1/2 inch of top course of first pour. After grouted masonry is cured, lay masonry units and place reinforcement for second pour section before grouting. Repeat sequence if more pours are required.

END OF SECTION

SECTION 06100

CARPENTRY

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Carpentry work including grounds, nailers, blocking, miscellaneous framing, plywood backing panels, plywood sheathing, preservative treatment, and necessary accessories indicated or specified in this section.

B. Related Sections:

1. 01910 – Special Environmental Requirements
2. 06300 - Wood Treatment.
3. 07210 - Building Insulation.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. A153-95 Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
2. D226-95 Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.

B. All products must be manufactured of wood approved by Forest Stewardship Council (FSC) guidelines. See www.fscus.org for more information.

C. USGBC LEED Reference Guide for Green Building Design and Construction 2009 edition including January 2013 Addenda and Interpretations.

1.03 QUALITY ASSURANCE

A. Factory mark each piece of lumber and plywood to identify type, grade, agency providing inspection service, producing mill, and other qualities as specified.

1.04 DELIVERY AND STORAGE

A. Keep materials dry during delivery and storage.

1. Protect against weather and contact with damp or wet surfaces.
2. Stack lumber and plywood and provide air circulation within stacks.

1.05 SITE CONDITIONS

A. Powder driven fasteners are not allowed.

1.06 SUBMITTALS

A. Submit manufacturer's literature.

B. Documentation as per Section 01910 – Special Environmental Requirements proving all wood components used are Forest Stewardship Council (FSC) approved wood, including Chain of Custody (COC) certification if required. All wood (including plywood and/or veneer) must be labeled "FSC Pure" or "FSC Mixed".

C. Documentation as per Section 01910 – Special Environmental Requirements proving all composite wood components used on the project contain no urea-formaldehyde resins.

PART 2 PRODUCTS

2.01 MATERIALS

A. All wood materials specified under this section shall be Forest Stewardship Council (FSC) approved wood. All wood (including plywood and/or veneer) must be labeled "FSC Pure" or "FSC Mixed". GC shall comply with all FSC regulations regarding manufacture of wood based products and provide evidence of FSC COC for all products used.

B. All composite wood products specified under this section shall contain no urea-formaldehyde resins. Laminating adhesives used to fabricate on-site and/or any shop applied composite wood assemblies shall not contain urea-formaldehyde resins.

C. Exterior Plywood:

1. Exterior plywood is not permitted.

D. Interior Plywood (Concealed): Where plywood will be concealed by other work, provide exterior type plywood C-D plugged grade, unless otherwise specified.

E. Interior Plywood (Painted Finish): Same as concealed, except with hardwood plywood or medium density overlay, Grade MDO EXT-101; smooth surface with no grooves.

F. Interior Plywood (Transparent Finish):

1. Exterior type plywood, Grade A veneers on exposed surfaces, Grade B veneers on semi-exposed surfaces, and Grade D or better veneers on concealed surfaces.

a. Birch - (Natural) (Select) (Rotary Cut) (Red) (White).
b. Oak - (Rotary Cut) (Plain Sliced) (Red) (White).

G. Lumber:

1. Standard:

a. Comply with American Softwood Lumber Standards PS-20 by U.S. Department of Commerce.
b. Nominal sizes are shown or specified, except as shown by actual

dimensions.

c. Provide actual sizes complying with minimum size requirements for PS-20 for moisture content specified for each use.

2. Moisture Content: Seasoned lumber with 19 percent maximum moisture content at time of dressing and complying with dry size requirements of PS-20, unless otherwise specified.

H. Framing Lumber:

1. Lumber is not permitted for framing.

I. Boards:

1. Boards complying with dry size requirements of PS-20 where lumber less than 2 inches in nominal thickness and 2 inches or more in nominal width is shown or specified.
2. Moisture Content - Exposed Work: Moisture content of 19 percent maximum, SDRY Southern Pine No.2 per SPIB for paint finish.
3. Moisture Content - Concealed Work: Moisture content of 19 percent maximum, Southern Pine (SPIB) No.2 boards.

J. Miscellaneous Materials:

1. Fasteners and Anchorages:

a. Provide size, type, material, and finish and as recommended by applicable standards, complying with applicable Federal Specifications for nails, staples, screws, bolts, nuts, washers, and anchoring devices.
b. Provide metal hangers and framing anchors of size and type recommended by the manufacturer for each use including recommended nails.
c. Where rough carpentry Work is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners and anchorages with hot-dip zinc, ASTM A153.

2. Building Paper: ASTM D226, Type I, asphalt saturated felt, non-perforated, 15 lb. type.

PART 3 EXECUTION

3.01 PREPARATION

A. Protect installed carpentry work from damage by work of other trades until accepted by the Owner.

1. Review proposed protection methods with A/E for acceptance.

B. Examine substrates, adjoining construction, and conditions where work is to be installed.

C. Do not proceed with work where unsatisfactory conditions exist.

D. Where rough carpentry is fitted to other work, obtain measurements of other work and verify dimensions shown on shop drawing details.

E. Apply heavy brush coat of same chemical treatment material to surfaces exposed by sawing, cutting, or drilling.

3.02 INSTALLATION

A. Materials: Use only sound, thoroughly seasoned materials of longest practical lengths and sizes to minimize jointing, free from warp that cannot be easily corrected by anchoring and attachment.

B. Installation:

1. Closely fit and accurately set members to required lines and levels, and rigidly secure in place.
2. Attachment and Anchorage:

   a. Nail size and nail spacing shall be sufficient to develop adequate strength for connection without splitting the member.
   b. Countersink nailheads on exposed carpentry work and fill holes.
   c. Anchors and Attachments: Hot dip galvanized finish, except where otherwise shown.
   d. Use common wire nails, except as otherwise shown or specified.
   e. Use finishing nails for finish work.
   f. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish material(s).
   g. Make tight connections between members.
   h. Install fasteners without splitting wood, pre-drill as necessary.

3. Wood Grounds, Nailers, Blocking, and Sleepers:

   a. Provide as shown and as required for screeding or attachment of other work.
   b. Form to shapes as shown and cut as required for true line and level of work to be attached.
   c. Set true to line and level, plumb, with intersections true to required angle.
   d. Coordinate location with other work involved.
   e. Provide wood blocking to strengthen and supplement horizontal metal stud framing members between studs required for recessed or surface mounted items including, but not limited to, cabinets, finish hardware, magnetic door holding devices, chalkboards.
   f. Cut blocking to fit between framing members and rigidly attach thereto.
   g. Secure blocking and nailers to building structure as indicated and as specified.
   h. Provide wood grounds for attachment of finish trim and other work to plaster.
   i. Grounds shall be dressed, preservative treated. Use key-beveled lumber

not less than 2 inch nominal width and of thickness required to bring face of ground to exact thickness of finish material involved.

j. Remove temporary grounds when not longer required.

END OF SECTION

SECTION 06300

WOOD TREATMENT

PART 1 GENERAL

1.01 SUMMARY

A. Related Sections:

1. 01910 – Special Environmental Requirements
2. 06100 - Carpentry.
3. 06400 - Architectural Woodwork.

1.02 SUBMITTALS

A. Wood Treatment Data:

1. Submit chemical treatment manufacturer's instructions for handling, storing, installation, and finishing of treated material.
2. Preservative Treatment: For each type specified, including certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained and conformance with applicable standards.
3. Water-Borne Treatment: Include statement that moisture content of treated materials was reduced to levels indicated before shipment to project site.
4. Fire-Retardant Treatment: Include certification by treating plant that treatment material complies with specified standard and other requirements.

B. Documentation as per Section 01910 – Special Environmental Requirements proving all wood components used are Forest Stewardship Council (FSC) approved wood, including Chain of Custody (COC) certification if required. All wood (including plywood and/or veneer) must be labeled “FSC Pure” or “FSC Mixed”.

C. Documentation as per Section 01910 – Special Environmental Requirements proving all composite wood components used on the project contain no urea-formaldehyde resins.

PART 2 PRODUCTS

2.01 MATERIALS

A. All wood materials specified under this section shall be Forest Stewardship Council (FSC) approved wood. All wood (including plywood and/or veneer) must be labeled “FSC Pure” or “FSC Mixed”. GC shall comply with all FSC regulations regarding manufacture of wood based products and provide evidence of FSC COC for all products used.

B. All composite wood products specified under this section shall contain no urea-formaldehyde resins. Laminating adhesives used to fabricate on-site and/or any shop applied composite wood assemblies shall not contain urea-formaldehyde resins.

C. Preservative Treatment:

1. Where lumber or plywood is specified to be treated, comply with applicable requirements of AWPA Standards C2, Lumber, and C9, Plywood and of AWPB standards listed.
2. Mark each treated item with AWPB Quality Mark Requirements.
3. Pressure treat aboveground items with water-borne preservatives to comply with AWPB LP2.
4. After treatment, kiln-dry lumber and plywood to a maximum moisture content, respectively, of 19 percent and 15 percent.
5. Treat indicated items and the following:

    a. Wood cants, nailers, curbs, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
    b. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
    c. Wood Framing Members: Maximum 18 inches above grade.

6. Pressure treat the following with water-borne preservatives for ground contact use complying with AWPB LP22:

    a. Wood members in contact with ground.
    b. Wood members in contact with fresh water.

7. Pressure treat softwood lumber, timber, and plywood for wood foundation systems with water-borne preservatives for ground contact to comply with AWPB FDN.
8. Complete fabrication of treated items before treatment, where possible.
9. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.

D. Fire-Retardant Treatment:

1. Where fire-retardant treated wood (FRTW) is specified, pressure impregnate lumber and plywood with fire-retardant chemicals shall comply with Military Specification MIL-L-19140E for Lumber and Plywood, Fire-Retardant Treated. Comply with AWPA C20 and C27, respectively, for treatment type indicated.
2. Identify FRTW lumber with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection or other testing and inspecting agency acceptable to authorities having jurisdiction.
3. Interior: Use where FRTW is indicated for interior applications.
4. Exterior: Use where FRTW is indicated for exterior, exposed applications.
5. Inspect each piece of treated lumber or plywood after drying, discard damaged or defective pieces.

PART 3 EXECUTION

3.01 APPLICATION

A. Place treated lumber and plywood as detailed.

END OF SECTION

SECTION 07190

VAPOR/RADON BARRIER

PART 1 GENERAL

1.01 SUMMARY

A. Related Sections:

1. 02201 - Earthwork for Buildings.
2. 03300 - Cast-In-Place Concrete.

1.02 SUBMITTALS

A. Submit properly identified manufacturer's literature before starting work.

1.03 QUALITY ASSURANCE

A. Comply with the following regulatory requirements issued by the Florida Department of Health - Bureau of Environmental Toxicology Radon and Indoor Air:

1. Florida Standard for Radon-Resistant New Commercial Building Construction.
2. EPA Handbook for Design and Installation of a Home Radon Reduction System - Sub-Slab Depressurization for Low Permeability Fill Material.

PART 2 PRODUCTS

2.01 MATERIALS

A. Vapor/Radon Barrier:

1. Interior Slabs: 10 mil minimum polyethylene film.
2. Exterior Slabs: 6 mil polyethylene film.

B. Tape: As recommended by vapor/radon barrier manufacturer, except at vertical penetrations, use reinforced duct tape.

PART 3 EXECUTION

3.01 INSTALLATION

A. Lay vapor/radon barrier over entire area to receive interior slab work, lap edges at least 12 inches and seal with tape.

1. Lay vapor/barrier with seams perpendicular to and lapped in direction of concrete pour.
2. Turn edges up to top of slab.
3. Where expansion joints are indicated at adjacent vertical surfaces, extend

vapor/radon barrier beyond expansion joint filler and turn up to top of slab.

4. Do not allow screed supports or other items to penetrate vapor/radon barrier.

B. Extend vapor/radon barrier over surfaces of areas to be protected from vapor or transmission from conditioned space to unconditioned space after placement of insulation.

1. Seal all joints by lapping 2 inches minimum and tape all joints.
2. Repair any punctures or tears before placement of finished surface material.

C. Seal perimeters, penetrations, and joints and tape to prevent vapor moisture and radon gas penetration.

3.02 FIELD QUALITY CONTROL

A. Inspection: Upon completion of the installation of the vapor/radon barrier, contact A/E for approval.

3.03 PROTECTION

A. Protect vapor/radon barrier from damage until permanent covering is in place.

1. Repair punctures and tears in vapor and radon barrier using patches of the material overlapping the puncture or tear a minimum of 12 inches. Seal with tape.

END OF SECTION

SECTION 07210

BUILDING INSULATION

PART 1 GENERAL

1.01 SUMMARY

A. Related Sections:

1. 05400 - Light Gage Metal Framing.
2. 06100 - Carpentry.
3. 09200 - Metal Studs, Lath, Suspension Ceilings, Plaster, and Stucco.
4. 09250 - Gypsum Wallboard.
5. Division 7 - Thermal and Moisture Protection.

1.02 REFERENCES AND CODES

A. Florida Building Code (FBC).

B. American Society for Testing and Materials (ASTM):

1. C272-91(96) Test Method for Water Absorption of Core Materials for Structural Sandwich Constructions.
2. C739-91 Specification for Cellulose Fiber (Wood Base) Loose Fill Thermal Insulation.
3. C1149-90 Specification for Self-Supported Spray Applied Cellulosic Thermal/Acoustical Insulation.
4. D1622-93 Test Method for Apparent Density of Rigid Cellular Plastics.
5. E84-96a Test Method for Surface Burning Characteristics of Building Materials.
6. E96-95 Test Methods for Water Vapor Transmission of Materials.
7. E662-95 Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
8. E736-92 Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members.
9. E759-92(96) Test Method for Effect of Deflection on Sprayed Fire-Resistive Material Applied to Structural Members.
10. E859-93 Test Method for Air Erosion of Sprayed Fire Resistive Materials (SFRMs) Applied to Structural Members.

1.03 SUBMITTALS

A. Submit properly identified manufacturer's product data including installation instructions before starting work.

B. Submit Southern Building Code Congress International (SBCCI) Public Safety Testing and Evaluation Services reports including trade name, application, and thermal protection requirements of insulation used.

1.04 QUALITY ASSURANCE

A. ASTM E84 Flame Spread: 25 or less.

B. ASTM E662 Smoke Development: 450 or less.

C. Sprayed-Applied Cellulose Insulation:

1. Use factory trained applicators.
2. The product shall not be reactive or prone to chemical degradation that reduces the required fire resistance over time.

D. Materials used shall contain no formaldehyde.

PART 2 PRODUCTS

A. Acoustical Blanket Insulation (for use at interior partitions as indicated on wall types):

1. Manufacturers:

a. CertainTeed: NoiseReducer Sound Attenuation Batts
b. Johns Manville: Sound Control Batts
c. Guardian: Fiberglass batt insulation

2. Physical Data:

a. Thickness as required to achieve STC ratings as required by drawings.
b. For use between metal studs.
c. Fiberglass blankets; per manufacturer x lengths as long as practicable.

B. Sprayed-Applied Cellulose Insulation (Limited to completely encapsulated locations where blanket and/or board insulation cannot be used. A/E approval required on a case by case basis before use):

1. Manufacturers:

a. K-13 by International Cellulose Corp.
b. Sunguard Two by Suncoast Industries.
c. UltraTherm by CertainTeed.
d. Thermocon by Thermocon, Inc.

2. Physical Data:

a. "R" Value: 9.3 per inch minimum at 75 degrees Fahrenheit mean.
b. ASTM E736 Bond Strength: Greater than 5 times its weight.
c. ASTM C1149 Smoldering Combustion: Less than 15 percent.
d. ASTM C1149 Fungi Resistance: No growth.

e. ASTM C1149 Corrosion: Non-corrosive.
f. ASTM C1149 Moisture Vapor Absorption: Less than 15 percent.
g. ASTM C1149 Odor: No objectionable odor.
h. Substrate Deflection: ASTM E759.
i. Air Erosion: ASTM E859.

C. Polyisocyanurate Wall Insulation (for use at exterior walls installed behind drywall finish only):

1. Manufacturers:

a. Tuff-R by Dow.
b. AP Foil-Faced Polysio foam sheathing by Johns Manville.
c. A/E approved equal.

2. Physical Data:

a. "R" value: 6.5 per inch minimum at 75 degrees Fahrenheit mean.
b. ASTM D1622 Board Density: 2 pcf.
c. ASTM D1621 Compressive Strength: 25 psi, minimum.
d. ASTM C209 Water Absorption: 0.3 percent by volume maximum.
e. ASTM E96 Moisture Vapor Transmission: 0.03 perm maximum.

D. Polyisocyanurate Wall Insulation (for use at exterior walls installed behind drywall finish OR at unfinished spaces):

1. Manufacturers:

a. Thermax by Dow.
b. A/E approved equal.

2. Physical Data:

a. "R" value: 6.5 per inch minimum at 75 degrees Fahrenheit mean.
b. ASTM D1622 Board Density: 2 pcf.
c. ASTM D1621 Compressive Strength: 25 psi, minimum.
d. ASTM C209 Water Absorption: 0.3 percent by volume maximum.
e. ASTM E96 Moisture Vapor Transmission: 0.03 perm maximum.

PART 3 EXECUTION

3.01 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.02 INSTALLATION

A. Install the accepted insulation according to the manufacturer's printed instructions for the specific product.

END OF SECTION

SECTION 07900

JOINT SEALERS

PART 1 GENERAL

1.01 SUMMARY

A. System Description: Joint sealers, fillers, and other related materials compatible with one another, with joint substrate, and other adjacent materials including finishes.

1.02 SUBMITTALS

A. Shop Drawings: Detail proper joint sealer and backing for the following joints:

1. Vertical and horizontal surfaces at interior and exterior locations.
2. Traffic areas at interior and exterior locations.

B. Documentation as per Section 01910 – Special Environmental Requirements and manufacturer's information showing compliance with low-VOC limits specified herein for all joint sealers used on the building interior.

1.03 QUALITY ASSURANCE

A. Provide single source responsibility for each type of joint materials.

1.04 WARRANTY

A. Manufacturer shall provide warranties covering joint sealers for 10 years from date of Substantial Completion.

B. Contractor shall furnish the Owner a 2-year written warranty covering quality of construction from applicator.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Joint Sealers: All joint sealants specified in this section used on the building's interior shall comply with VOC levels as required to comply with USGBC LEED Reference Guide for Green Building Design and Construction 2009 edition (including January 2013 addenda and interpretations) requirements to comply with IEQ Credit 4.1 Low-emitting materials – Adhesives and Sealants.

1. DuPont Surfaces
2. Henkel Corporation
3. Bostick Construction Products Division.
4. Pecora Inc.
5. Sika Chemical Corp.
6. Sonneborn Building Products.
7. Thiokol/Speciality Chemical Division.

8. Thoro Systems Products.
9. Tremco Manufacturing Co.
10. W.R. Meadows.
11. A/E accepted equivalent

PART 3 NOT USED

END OF SECTION

SECTION 08110

STEEL DOORS AND FRAMES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Steel doors and frames including necessary accessories.

B. Section Does Not Include: Use of aluminum doors.

C. Related Sections:

1. 04220 - Concrete Unit Masonry.
2. 04530 - Masonry Patchwork.
3. 06100 - Carpentry.
4. 07900 - Joint Sealers.
5. 08710 - Finish Hardware.
6. 09200 - Metal Studs, Lath, Suspension Ceiling, Plaster, and Stucco.
7. 09900 - Painting.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. A366-96 Specification for Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality.
2. A653/A-96 Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
3. A924/A-96a Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
4. C270-96a Specification for Mortar for Unit Masonry.

B. Factory Mutual (FM), latest edition.

C. National Builders Hardware Association - "Recommended Locations for Builders", latest edition.

D. Steel Door Institute (SDI), latest editions.

1. SDI 100 Standard Steel Doors and Frames, latest edition.
2. SDI 105 Recommended Erection Instructions for Steel Frames.
3. SDI 107 Hardware on Steel Doors (reinforcement application).

E. Underwriters Laboratories (UL), latest edition.

F. UL 1784 Air Leakage Test of Door Assemblies.

G. National Fire Protection Association (NFPA)

1. NFPA 80 Standard for Fire Doors and Windows.
2. NFPA 101 Life Safety Code.
3. NFPA 105 Smoke and Draft Control Assemblies.

H. Florida Building Code (FBC).

I. Americans with Disabilities Act and Accessibility Guidelines (ADA).

J. American National Standards Institute (ANSI):

1.	A250.4-1994	Test Procedure and acceptance criteria for physical endurance, steel doors and frames.
2.	A224.1-1980	Test Procedure and acceptance criteria for prime painted steel surfaces for steel doors and frames.
3.	All7.1	Accessible and Usable Buildings and Facilities.

K. Warnock Hersey International (WHI), Division of Inchcape Testing Services.

1.03 SUBMITTALS

A. Exterior Door Certification: FBC product approval single listing with specified door, door frame, and hardware, demonstrating compliance with FBC missile impact criteria.

1. Comply with calculations, signed and sealed by a Florida registered professional engineer, establishing wind velocity pressure values for the specific project according to American Society of Civil Engineers (ASCE) 7 current version.

B. Submit properly identified product data including manufacturer's specifications and installation instructions before starting work, and any information necessary to indicate compliance to these specifications.

C. Shop Drawings:

1. Indicate manufacturer's model number, door and frame elevations and sections, materials, gauges and finishes, fabrication and erection details, locations of finish hardware by dimension and locations/details of all openings and louvers. Do not proceed with any fabrication until all details are approved.
2. Provide shop drawings for louver kits and light kits.

D. Upon request, submit non-returnable samples necessary to be evaluated for construction compliance.

E. Label Construction Certification: For door assemblies required to be fire-rated and exceeding sizes of tested assemblies, submit manufacturer's certification for each door and frame assembly constructed to conform to design, materials, and construction equivalent to requirements for labeled construction.

F. Submittals required as per Section 01910 and Section 01930.

1.04 QUALITY ASSURANCE

A. Fire-Rated Door Assemblies: Where fire-rated door assemblies are indicated or required, provide fire-rated door and frame assemblies complying with NFPA 80 and have been tested, listed, and labeled according to UBC-43-2 and ISO-3008 by a nationally recognized independent testing and inspection agency.

B. Provide doors and frames complying with SDI 100 and as specified.

C. Owner reserves the right to cut open, at no cost to the Owner, a random door to verify construction and reinforcements for compliance with Owner's previously accepted manufacturer's shop drawings. Non-Compliance will be grounds for removal and replacement of installed door at no expense to the Owner.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver steel doors and frames cartoned or crated to provide protection during transit and job storage. Provide additional sealed plastic wrapping for factory finished doors.

B. Inspect steel doors and frames upon delivery for damage. Minor damage may be repaired if refinished items are equal in all respects to new work and acceptable to A/E. Remove and replace damaged items as directed.

C. Store doors and frames at building site under cover. Place units on minimum 4 inch high wood blocking. Avoid use of non-vented plastic or canvas shelters that could create a humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide 1/4" spaces between stacked doors to promote air circulation.

D. Deliver all doors and frames to the jobsite in a timely manner to not delay progress of other trades.

1.06 WARRANTY

A. Hollow metal doors and frames shall be supplied with a l year warranty against defects in materials and construction.

B. Warranty shall begin on date of substantial completion of the project.

1.07 DEFINITIONS

A. Areas subject to wet mopping include kitchens, toilets, locker/showers, custodial, and other similar spaces with hard or resilient flooring.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Steel Doors and Frames:

1. Model "Imperial" by Ceco Corporation, Door Division, Carol Stream, IL.

2. Model S-8080F Flush by Next Door Company, Miami, FL.
3. Model F16 by Fleming-Baron Door Products, Woodbridge, Ontario.
4. Model “Series Flush” by Quality Engineered Products Co., Inc., Tampa, FL.
5. Model DL-416 by Republic Doors and Frames, McKenzie, TN.
6. A/E approved equivalent.

2.02 DOORFRAMES

A. Fabricate exterior frames and interior frames to profiles indicated of 16 gage hot-dip zinc-iron alloy coated sheet steel, A366, with A60 coating designation according to ASTM A924 and ASTM A653 0.50 oz. zinc per sq.ft. total both sides. Steel shall be of commercial quality, stretcher leveled flatness.

B. Frames: Fully welded with mitered or butted head and jamb members with integral stops and with combination buck and trim as shown.

1. Corners shall have continuous flush and smooth welds without dishing.
2. Sanitary or hospital type stops shall have 6 inch high cutoffs with 45 degree caps.

C. Hardware Reinforcements and Preparations:

1. Frames shall be mortised, reinforced, and drilled/ tapped for mortised hardware according to approved finish hardware schedule and templates by hardware supplier.

   a. Drilling and tapping for surface applied hardware shall be done in the field.
   b. Locate finish hardware according to "Recommended Locations for Builder's Hardware" published by National Builders Hardware Association or as otherwise directed by A/E.

2. Butt (Hinge) Reinforcing:

   a. Steel plate 3/16" thick by 1-1/4" minimum to 1-1/2" maximum by 10 inches long, offset as required to have faces of butts flush with doorframe edge and secured by not less than 6 spot welds.

3. Strike Reinforcement: Offset clips of 12 gage steel, 1-1/4" x 4-7/8" long.
4. Closer Shoe Reinforcing for Parallel Arm:

   a. 12 gage steel plates (minimum 20" long x 1-3/4" wide) at bottom of door stop located next to door rabbet on hinge.
   b. Provide styrofoam or treated wood over plates to allow closer foot screws to seat without interference from grout fill.

D. Silencer (Mute) Provisions: Punch frames to receive silencers on strike jamb scheduled in Section 08710.

E. Center Hardware Mullions, Removable: Grout filled and fabricated with only one thickness of metal occurring at point of silencer punch-outs, 2" x 3", 11 gage hardware mullion by exit device manufacturer.

F. Grout:

1. Grout Guards:

a. Provide 26 gage sheet metal covers welded to the back of frames at hinges, lock, bolts, tapped reinforcements at hardware and silencer locations.
b. At Silencer locations, furnish suitable removable plugs in holes to keep grout free.

2. Coatings:

a. Provide full coverage at frame interior before grouting with corrosion inhibiting bituminous coating.

3. Grout At Frames:

a. Grout fill doorframes at metal stud walls.
b. Grout fill-in-place doorframes at masonry and concrete walls after installation.
c. Grout shall be a mortar mix complying with ASTM C270, Type S-1800 psi minimum.

G. Frames at precast construction shall be cast-in-place.

H. Jamb Anchors: Provide according to frame manufacturer's recommendations for attachment to masonry walls, concrete columns, and metal stud system as shown on drawings to allow grout fill.

I. Floor Anchors: Provide 14 gage galvanized sheet steel angle shaped anchors for each jamb extending to the floor, punched for not less than two 1/4" diameter bolts.

J. Spreaders: Provide frames with temporary steel spreader bars tack welded to jambs to maintain full rigidity and proper alignment during installation.

K. Security Switch and/or Other Electrical item Preparation: Refer to the Electrical Drawings for locations requiring preparation. Door manufacturer shall coordinate required preparation during shop drawings.

L. All exterior frames shall be have current FBC Product approval.

2.03 HOLLOW METAL DOORS

A. Fabricate exterior and interior doors to profiles indicated of 16 gage hot-dip zinc-iron alloy coated sheet steel, A366, with A60 coating designation according to ASTM A924 and ASTM A653 0.50 oz. zinc per sq. ft. total both sides. Steel shall be of commercial quality, stretcher leveled flatness.

B. Types: Flush, seamless hollow construction with louvers or vision cutouts as shown or specified.

C. Sizes and Thickness: Sizes shall be as indicated and with 1-3/4" thickness unless otherwise specified or shown.

1. Provide undercuts where indicated for ventilation. Do not exceed 3/4" undercut for fire labeled doors.
2. Provide 3/8" undercut at doors for exterior openings with ADA threshold.

D. Door Perimeters:

1. Stile Edges: Bevel for single acting doors shall be 1/8" in 2 inches.
2. Reinforcing: As required by manufacturer.
3. Top and Bottom Channels.

a. Not less than 16 gage A60 zinc coated steel channels-flush or inverted.
b. Welded to the face sheets.
c. Exterior door tops shall have flush surface.

E. Doors:

1. Classification: SDI Grade III - Model 2, 16 gage, seamless, and steel stiffened with required reinforcement and as shown on Drawings.
2. Doors shall have minimum 20 gage, continuous one piece, vertical steel stiffeners spaced not to exceed 6 inches apart and welded at 6 inches on center to face skin.
3. Lock Rail shall be one piece, full height minimum 16 gage channel.
4. Hinge Rail Reinforcement Manufacturer’s Option:

a. One piece, full height, 12 gage channel formed, and tapped for hinges.
b. One piece, full height, minimum 16 gage channel formed and with minimum 3/16" thick steel by minimum 8" long at each hinge.

5. Cylindrical Lock Reinforcement: Minimum 16 gage standard hardware lock box.
6. Exit Device Reinforcement: Minimum 14 gage channel or box minimum 16" long by 3-1/2" wide.
7. All spaces between stiffeners shall be insulated with fiberglass or mineral insulation.
8. Door closer reinforcement shall be minimum 12 gage channel or box, welded to top channel. Bottom of reinforcement shall be a minimum of 5-3/4" from top of door, by width of door.
9. Astragals: Flat security type or "Z" as indicated in drawings or specifications.
10. All doors shall comply with ANSI A250.4-1994 Level "A" criteria and be tested to 1,000,000 operating cycles and 23 twist tests.

a. Certification of Level "A" doors shall be submitted with approval drawings by the distributor.
b. Do not bid or supply any type or gage of door not having been tested and passed this criteria.

F. Core material.

1. Stiffeners: Provide vertical members spaced not more than 6 inches o.c. with shape standard to manufacturer.
2. Core Fill: Provide fiberglass or mineral standard to manufacturer.

G. Hardware Reinforcements and Preparation:

1. Hardware Reinforcement: Comply With manufacturer's drawings.
2. Hardware preparation.

    a. Drill for hardware according to accepted finish hardware schedule and templates furnished by hardware supplier.
    b. Drilling and tapping for surface applied hardware shall be done in the field.
    c. Locate finish hardware according to recommended locations for hardware as shown on drawings.
    d. Through bolts for exit devices and locksets shall be by manufacturer.
    e. Lock reinforcement shall be located as height required for standard and disabled users as shown on drawings and as specified.

H. Security Switch and/or Other Electrical item Preparation: Refer to the Electrical Drawings for locations requiring preparation. Door manufacturer shall coordinate required preparation during shop drawings.

I. Exterior Door Louvers:

1. Zee profile weather resistant type equal to thickness of door, with center rail and of sizes indicated.
2. Fabricate frames and louvers of 18 gage bonderized electro zinc coated sheet steel.
3. Weld or secure frame and louvers into doors without use of screws or through bolts visible from the secured side.
4. Provide security grille as specified on inside of louvers.
5. At louver opening cutout, provide minimum of 20 gage zinc coated steel channel closure welded at opening perimeter.

J. Interior Door Louvers:

1. Inverted "Y" profile sightproof type equal to thickness of door, of sizes indicated.
2. Fabricate frames and louvers of 18 gage bonderized electro zinc coated sheet steel.
3. Weld frame and louvers into doors without use of screws or through bolts visible from the secured side.
4. Provide security grille as specified on inside of louvers.
5. At louver opening cutout, provide minimum of 20 gage zinc coated steel channel closure welded at opening perimeter.

K. Fire Door Louvers: Provide UL or FM labeled assemblies of sizes indicated, subject to

the following:

1. Louver maximum size limited to 24 inches height and width.
2. Louver minimum size limited to 6 inches high and 12 inches wide.
3. Secure double louver frames to doors with sex bolts through door at 12 inches o.c. maximum.
4. Provide security grille as specified on inside of louvers.

L. Insect Screens for Exterior Door Louvers:

1. 18 x 16 mesh aluminum screen on rewireable extruded aluminum frame.
2. Mount screen on interior of exterior doors with zinc plated sheet metal screws at 12 inches o.c.

M. Rat Screens for Exterior Door Louvers:

1. 1/4" mesh hot dipped galvanized steel hardware cloth secured in 16 gage bonderized hot dipped zinc coated steel "U" frames.
2. Mount screens on interior of exterior doors with zinc plated sheet metal screws at 12 inches o.c.

N. Interior Lightproof Door Louvers:

1. Interlocking channel lightproof type, equal to thickness of door, of sizes indicated.
2. Fabricate frames and louvers of 18 gage bonderized electro zinc coated sheet steel.
3. Weld or secure frame and louvers into doors without use of screws or through bolts visible from the secured side.

O. Slip-on Spats: 20 ga., #4 satin finish.

P. Light Opening in Doors:

1. Provide light openings of sizes indicated.
2. At light opening cut outs, provide 16 gage zinc coated steel channel closures welded into opening perimeter.

Q. Glass light frames in doors fabricated of not less than l8 gage galvanized steel with attachment screws allowed only on the non-secure side, not visible when viewing door lite frame face.

R. All exterior doors shall have current FBC NOA.

2.04 FINISHING AND SHOP PAINT

A. After Fabrication: Grind exposed weld marks smooth and flush, clean and degrease surfaces, apply metallic filler, sand smooth, and apply shop coat of manufacturer's standard rust-inhibitive metal primer baked on.

B. Prime Coat: Thoroughly cover all surfaces to provide uniform dry film thickness of not

less than 1.0 mil without runs, smears, or bare spots.

C. Primer Coat: Use manufacturer's standard rust inhibiting primer complying with ANSI A-224.1-1990.

PART 3 EXECUTION

3.01 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.02 INSTALLATION

A. Frames:

1. Install plumb, level, and true to line, secured in openings.
2. Install frames according to accepted shop drawings, manufacturer's printed instructions.
3. Grout fill doorframes at metal stud walls and grout fill-in-place all other doorframes after installation. Frames at precast construction shall be cast-in-place.
4. Install fire-rated frames according to NFPA 80.
5. Install stainless steel slip-on spats at food service doorframes.
6. Install exterior frames as per FBC NOA.

B. Doors:

1. Install in openings plumb, level, and true to line.
2. Apply hardware and adjust to achieve smooth and quiet operation.
3. Install insect/rat screens on interior of exterior door louvers.
4. Place fire-rated doors with clearances as specified in NFPA 80.
5. Install exterior doors as per FBC NOA.

3.03 ADJUST AND CLEAN

A. Prime Coat Touch-Up: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.

B. Protection Removal: Immediately before final inspection, remove protective plastic wrappings from prefinished doors.

C. Fill all dents, holes, etc. with metal filler and sand smooth flush with adjacent surfaces-paint to match.

D. Final Adjustments: Check and readjust operating finish hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition. Provide final adjustment as follows:

1. Door Contact With Silencers: Doors shall strike a minimum of two silencers

without binding lock or latch bolts in the strike plate.

2. Head, Strike, and Hinge Jamb Margin: 1/8".
3. Meeting Edge Clearance, Pairs of Doors: ± 1/16".
4. Bolts and Screws: Leave tight and firmly seated.
5. Soundseal gasketing.
6. Vermin Protection:

    a. Drop Seal: Full contact with no gaps.
    b. Brush weatherstripping.

END OF SECTION

SECTION 08710

FINISH HARDWARE

PART 1 GENERAL

1.01 SUMMARY

A. Provide finish hardware including necessary accessories.

B. Related Sections:

1. 06100 - Carpentry.
2. 08110 - Steel Doors and Frames.
3. 08210 - Wood Doors.
4. 16721 - Fire Alarm and Detection System.
5. 13851 - Card Access Control System.
6. Division 16 - Electrical.

1.02 SUBMITTALS

A. Exterior Door Certification: FBC product approval single listing with specified door, door frame, and hardware, demonstrating compliance with Florida Building Code missile impact criteria.

1. Comply with calculations, signed and sealed by a Florida registered professional engineer, establishing wind velocity pressure values for the specific project according to American Society of Civil Engineers (ASCE) 7 (most current version)

B. Hardware Schedules:

1. Submit plans, specifications, and tentative hardware schedule to A/E and Owner for approval.
2. Hardware schedules with A/E and Owner review comments shall be resubmitted with corrections and responses to comments.
3. Approval of Hardware Schedule shall not relieve the Contractor of the cost and responsibility to furnish all necessary and required hardware for this project.
4. Identify manufacturer of each item with type, numbers, and finish symbols.
5. Indicate door numbers at individual hardware set numbers.
6. Indicate doors with card readers and other security devices
7. Include a separate index, listing all doors in the project sorted numerically and with appropriate hardware set number next to each door number with building numbers.

C. Catalog Cuts: Submit 2 sets of catalog cuts for each piece of hardware furnished.

D. Templates: Furnish suitable templates, with approved Hardware Schedule, to respective trades and suppliers as required to insure accurate setting, reinforcing, and fitting of finish hardware specified.

E. Bitting:

1. Before ordering the cylinders and locksets, the Hardware Supplier, through the A/E, shall request Keying Schedule and Bitting List from Owner.

   a. Keying information, including Keying Schedules, door index, and Bitting Lists, shall never be in the possession of the Contractor.

F. Keying:

1. Lock cylinders shall be keyed and registered by the factory for all Master Key (MK) and Construction Master Key (CMK) systems to maintain security and identification. Keying information, including Keying Schedules and Bitting Lists, shall never be in the possession of the Contractor.

   a. Provide Great Grand Master Keys (GGMK), Grand Master Keys (GMK), Master Keys, Section Master Keys (SMK) and Change Keys (CK) according to the keying schedule provided by Owner.
   b. Provide individual lock cylinder keying according to M-DCPS Central Lock Department furnished keying schedule.
   c. Construction Master Keying:

      1) Cylinders shall be Construction Master Keyed (CMK).
      2) Identify quantity of Construction Master Keys (CMK) furnished for project on Hardware Schedule.
      3) The project shall remain on Construction Master Keys (CMK) system until accepted by the Owner. Following acceptance, the Contractor shall "knock-out" CMK system and install final keying.

   d. Master Keys, Change Keys, and CMK Plug Extractors:

      1) Supply all cylinder locks with a minimum of 5 cut change keys (CK).
      2) Furnish each keyed alike (KA) lock group with a maximum of 12 cut keys, furnish all remaining required keys uncut.
      3) Furnish 10 CMK Plug Extractors.
      4) Furnish 5 each Master Keys (MK).
      5) Provide keys and plug extractors in enveloped sets and identify with keyset numbers and factory file or folio number.

         a) Do not pack keys with locksets.

      6) The permanent keys shall at no time be in the possession of the Contractor or his representatives. If this security measure is violated and rekeying is required, then the cost of rekeying this entire project shall be the sole responsibility of the Contractor.

      7) Key Bows: Standard and unembossed.

   e. Miscellaneous Keys:

1) Mark and tag keys to electric panels, access panels, built-in cabinets, and any other miscellaneous keys with description and room number or location.
2) Turn all keys over to Owner representative upon acceptance of project and obtain a receipt.

1.03 QUALITY ASSURANCE

A. Florida Building Code (FBC).

B. Americans with Disabilities Act and Accessibility Guidelines (ADA).

C. National Fire Protection Association:

1. NFPA 80 - Standard for Fire Doors and Windows.
2. NFPA 101 - Life Safety Code.

D. State and local fire safety codes.

1.04 DELIVERY, STORAGE, AND HANDLING:

A. Properly package and mark hardware according to the Hardware Schedule, complete with necessary screws, special tools, instructions, and installation templates.

B. Keys: Do not package keys with the individual hardware sets.

C. Store hardware in a secured area.

PART 2 PRODUCTS

2.01 MANUFACTURERS – As noted in this Specification Section. At exterior doors requiring FBC NOA, manufacturers and items noted in this Specification Section shall be used if possible and still comply with NOA. If exact items as noted in this specification section are not permitted by the NOA, then an approved item by the same manufacturer shall be selected.

2.02 COMPONENTS

A. Substitutions will not be considered for any of the following listed manufacturers of hinges, locksets, door closers, or exit devices.

1. Lock Cylinders: Six pin with interchangeable (IC) cylinders. Cylinders shall be Schlage “C” or “E” keyways.

2. Locksets: Locksets shall be furnished and assembled with cylinder and labeled with door tag number and key symbol from hardware supplier, as specified and meeting ADA, FBC NOA, and fire rating requirements. Locksets shall be as per hardware schedule noted in this Specification Section.

a. Schlage ND Series Rhodes - Heavy-duty lever handle locksets (Vandlgard) x 26D x thru-bolts. Thru-bolts required for wood and steel doors, regardless of manufacturer's recommendations.
b. Marks 195 Survivor Series: Heavy-duty lever handle locksets (American Design) x 26D.
c. A/E accepted equivalent

3. Hinges: By Hager, McKinney, or A/E accepted equivalent.

a. Interior hollow metal doors:

1) Hager BB1168 x ss pin 4-1/2 x 4-1/2 USP.

b. Interior wood doors:

1) Hager BB1279 4-1/2 x 4-1/2 USP.

c. Exterior doors (must comply with FBC NOA):

1) Hager AB933 4-1/2 x 4-1/2 US32D.
2) Accepted equivalent with stainless steel oil-impregnated bearings and stainless steel hinge pins.

4. Exit Devices:

a. Comply with ADA requirements and shall be by the same manufacturer.

b. Precision 1100 Series or A/E accepted equivalent.

1) Non-labeled: Pairs of doors shall have outside door pull on RHR door only. Provide "exit only" device on LHR door.
2) Labeled: Interior labeled doors requiring exit devices, shall have outside lever trim on RHR door. Provide "exit only" device on LHR door.

c. Exterior Non-Labeled Openings:

1) Entry Doors:

a) Precision 1103 x US32D x SNB x less trim x cylinder x door pull x SNB.

2) Exit Only Doors:

a) Precision 1101 x less trim x less cylinder x US32D x SNB.

3) Card Access Doors:

a) SS1103 x US32D less trim xSNB with Hager H4G door pull and cylinder.

d. Interior and Exterior Labeled Openings:

1) Entry Doors:

a) Precision FL1108-V39-L x cylinder.

2) Exit Only Doors:

a) Precision FL1101 less trim and less cylinder.

e. Special Labeled Exterior Entry Doors.

1) Card Access Doors with Restricted Access and Exterior Doors: Precision SS FL-1103 x US32D x less trim x SNB with Hager H4G door pull and cylinder.
2) Card Access Doors with Continuous Access and Interior Doors: Precision SS FL-1108 x 39LA.
3) Mount manufacturer's cylinders to the door and not through the body of the exit device.

5. Vertical Rod Exit Devices: Vertical Rod Exit Devices are not acceptable.

6. Door Pulls: Cast aluminum, Hager H4G with deadbolt or A/E approved equivalent.

7. Bore-In Deadbolt Locks:

1) Marks 13OS/26D (or A/E approved equivalent) for labeled doors.
2) Marks 13OK/26D (or A/E approved equivalent) for non-labeled doors.

8. Surface Mounted Head/Foot Bolts.

a. Use at labeled and non-labeled doors on telephone closets, mechanical rooms, electrical rooms, flammable storage, and interior storage rooms at the LHR door of a pair of doors without a center mullion. Comply with NFPA-80 2.8-2.5.

b. Left Hand Reverse (LHR) leaf.

1) Exterior Labeled: Hager 275D (UL) (or A/E approved equivalent).

c. Right Hand Reverse (RHR) leaf.

1) Exterior Labeled: Exit device x door pull and cylinder.
2) Exterior Non Labeled: Deadbolt x door pull and cylinder.
3) Interior: Storage function cylindrical lever lock, knurled outside.

9. Removable Hardware Mullion:

   a. For exterior pair of doors except at non-occupied spaces.

      1) Labeled openings: Precision FL822 (or A/E approved equivalent).
      2) Non-labeled openings: Precision 822 (or A/E approved equivalent).

10. Weather Stripping, Thresholds, Door Bottoms, and Astragals.

   a. Accepted Manufacturers: Baldwin, Brookline, Cipco, Corbin, Glynn Johnson, Hager, Ives, National Guard Products, Quality, Pemko, Reese, Russwin, Trimco, Rockwood, or Zero.
   b. Stop applied sound seals or weather stripping shall not exceed more than 5/16" thickness.
   c. Provide rain drips for all exterior doors not having overhead roof protection.
   d. Provide door weatherstripping for head and jamb legs at building perimeter doors to air-conditioned spaces, exterior entrance and exit doors, and exterior electric rooms.
   e. Soundseals and automatic door bottoms shall be used at interior doors of mechanical rooms. Use bumper type thresholds for exterior doors and saddle type thresholds for interior doors.
   f. Thresholds:

      1) Panic Type Thresholds (For exterior and sound control use):

         a) Hager 520SAS: 5" wide x 1/2" high. (Or A/E approved equivalent)

      2) Saddle Type Thresholds (Only for interior use at change of floor finishes and sound control use):

         a) Hager 418SA: 3" wide x 1/4" high. (Or A/E approved equivalent)
         b) Hager 413SA: 5" wide x 1/4" high. (Or A/E approved equivalent)

      3) Marble Thresholds: For toilet rooms, wet mop areas adjacent to other spaces and sink or mop receptor equipped custodial closets.
      4) Thresholds shall comply with ADA requirements.

   g. Door Bottoms.

      1) Automatic Door Bottoms: Hager 747S or A/E approved equivalent.

   h. Weatherstrip/Soundseals:

      1) Rigid Weatherstrip: Hager 891SAS or A/E approved equivalent.

2) Press on Weatherstrip: Hager 736 or A/E approved equivalent.
3) Brush Weatherstrip: Hager 801S or A/E approved equivalent.
4) Soundproofing: Hager 862SXN or SDN or A/E approved equivalent.
5) Silencers: Hager 307D or A/E approved equivalent.
6) Overhead Rain Drip: Hager 810S or A/E approved equivalent.

i. Astragals:

1) Hager 837SAV or A/E approved equivalent.
2) Use only at a pair of doors with head and foot bolts.

11. Auxiliary Hardware: Push Plates, Kick Plates, Doorstops and Holds, and Doorstops.

a. Accepted Manufacturers: Architectural Builders Hardware (ABH), Baldwin, Brookline, Cipco, Corbin, Glynn Johnson, Hager, Ives, National Guard Products, Quality, Pemko, Reese, Rockwood, Russwin, Trimco, or Zero.
b. Push-Plates: Hager 60S PK (or A/E approved equivalent), hard black plastic with beveled edges.

1) Provide push plates at non-labeled doors with exit devices or deadbolts, and at toilet room doors without locksets.
2) Omit push plates at doors with lever handle cylindrical locksets.
3) Provide 2 push plates and 2 kick plates on double acting doors.
4) Do not use push-plates on fire labeled doors.
5) 16 inches x 16 inches x 1/8", hard black plastic.

a) 4 inches x 16 inches x 1/8" on doors with vision panels.

6) Clear plastic, push-plates are not acceptable.

c. Kick Plates: Hager 214SBL or A/E approved equivalent.

1) Provide at all hollow metal and wood doors except individual offices.
2) 16 inches x 1/8" thick x less 2 inches the width of door, hard black plastic with beveled edges. At louvered doors, provide 16 inch height maximum or to bottom of louver.
3) Clear plastic kick plates are not acceptable.
4) Kick plates for labeled doors shall be UL labeled.

d. Doorstops and Holds:

1) Wall mounted doorstop and holds: Hager 254W x US26D or A/E approved equivalent.

a) At custodial, electrical, and mechanical non labeled spaces and exterior non-labeled access to corridors.

2) Floor mounted door holders: Hager 258F x US26D or A/E approved equivalent.

a) At non-labeled doors only if doorstop and holds cannot be used and cush-n-stop closers at labeled doors.

3) Door holds at labeled doors with closers shall be magnetic hold open devices connected to the fire alarm system.

e. Doorstops:

1) Wall mounted doorstops: At non-labeled wood doors to administrative individual offices, conference rooms, storage rooms, and work rooms and at all labeled doors. Install on solid concrete or masonry walls or at drywall or plaster applications with adequate backing reinforcement.

a) Convex type for doors not having push button locksets: Hager 230W or A/E approved equivalent.
b) Concave type for doors having office function or push-button locksets, locate on button side of door: Hager 234W or A/E approved equivalent.

2) Floor mounted doorstops: At labeled doors only if wall mounted stops cannot be used.
3) Provide doorstops or other door control devices at doors if stop and holds are not specified.

12. Fasteners:

a. Hollow Metal Doors: Accepted machine.
b. Kick Plates: O.H. Phillips recess Type A SMS.
c. Thresholds: Hager FHSL 25-1/4 x 1/4-20 x 2" cadmium plated expansion screw in one unit or accepted equivalent.
d. Brush Weatherstripping: As recommended by manufacturer.
e. Finish: Match finish of surfaces to which they are applied.

13. Door Closers:

a. For all hollow metal doors, wood doors, and storefront doors on project unless otherwise noted.
b. Pairs of doors shall both require closers.
c. Do not provide a closer on a leaf with head and foot bolts.
d. LCN Series 4111-N AVB x EDA x TB, parallel arm only.
e. 4111-N DEL x AVB x AL x EDA x TB (Special delay action closer, do not provide at doors opening 180 degrees or greater).
f. 4111-N Spring Cush AVB x AL x EDA x TB.
g. 4116-N AVB x AL x EDA x TB (oversize doors only, verify with manufacturer).
h. 4111-N Cush-n-stop x AVB x EDA x TB. Provide where 180 degree swing is obstructed or where a wall stop is not practical.

14. Overhead Stop and Hold:

    a. 3324-US26D, surface mounted, by ABH.

15. Electromagnetic Holder/Release:

    a. Hold open devices specified for fire rated doors shall be electromagnetic type. Holder shall be wired to fire alarm system and shall release in the event of fire. Coordinate with Section 16721 - Fire Alarm and Detection System.
    b. 900 Series by Firemark or 2210-US28 Mag Holder Recessed Wall Mount by ABH or A/E approved equivalent.

16. Electromagnetic Lock: Locknetics or accepted equivalent.

    a. Labeled and non-labeled doors:

        1) Locknetics Series 390 x MBS x L1 x ATD x FSE x US28. Minimum holding force shall be 1500 pounds.
        2) Signal Switch (SS): Internally mounted switch to monitor the use of the touch bar.
        3) Exit Device, labeled: SS FL1108 x 39LA
        4) Exit Device, non-labeled: SS 1103 x door pull.
        5) Hinge: AB850 x 4.5" x4/5" x US32D x ETW-4.
        6) Motion Detector: ScanII B.

17. Key Cabinet:

        1) Tel-kee AWC 250.

18. Sliding Glass Door Locks for display cabinets etc. using only 1/4" thick, solid sliding safety glazing glass doors: By Wonder Lock or A/E approved equivalent.

19. See Division 13851 for additional information regarding required card access components to be furnished by Contractor.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not proceed with the work of this section until conditions detrimental to the proper installation and protection of hardware have been performed.

3.02 INSTALLATION

A. Door hardware locations shall be as follows:

    1. Pushplates: 1 inch above pushpad and 1 inch from exit device head.
    2. Pushplates with a Vision Panel: 1 inch above exit device between vision panel and edge of door.

3. Exit Device: 40-5/16" from door bottom or 34 inches as required for children's accessibility.
4. Lever Lockset: 38 inches from door bottom or 34 inches as required for children's accessibility.
5. Deadbolt: 48 inches from door bottom.
6. Kickplate: 1 inch from door bottom or 1/2" from top of surface mounted automatic door bottom.

B. Finish Hardware:

1. Lockset and cylinders: Permanent restricted cylinders shall be installed with lockset.
2. Do not install finish hardware until operations causing dampness have been completed.

C. Door Closers:

1. Install with closer manufacturer's thru bolts and adjust for proper operation.
2. Location: Locate closer on door as if door were to swing 180 degrees, regardless of the actual swing of the door. When using Cush-n-stop, mount for maximum opening swing. Verify 90, 100, or 110 degree template mounting.
3. Do not allow closer to act as a stop.
4. Closer Foot: Install with 5 screws for wood jambs or 5 stove bolts for metal jambs. Provide an accepted spacer (if required by the width of stop) for fifth fastener.

    a. Use of screw type fasteners are not allowed for metal frames.

D. Exit Devices: Install with thru bolts.

E. Door Pulls: Top hole of door pull shall be 2 inches above bottom of exit device casing at casing centerline.

F. Stop and Hold, Wall Mounted: Install at top outside corner of door, with thru bolts or grommet nuts.

1. Install wall portion according to manufacturer's recommendations and based on field conditions to withstand 100 lbs. shear pressure.

G. Stop and Hold, Floor Mounted: Install at bottom outside corner of door, with thru bolts or grommet nuts.

1. Install floor portion according to manufacturer's recommendations, after finish floor covering has been installed. Secure to subfloor using full size spacer if necessary to keep bottom flush with finish flooring, i.e. carpet.

H. Surface Bolts (Head and Foot): Install with thru bolts or grommet nuts.

I. Thresholds at Exterior Doors Exposed to Weather:

1. Set in full bed of sealant.

2. If threshold is saddle type, then door bottom shall seat against threshold. Threshold shall not exceed 1/4" in height.

J. Brush Weatherstripping: Install according to manufacturer's recommendations and after final finish has been applied to door and frame.

K. Push Plate:

1. 1 inch above push pad and 1 inch from exit device head
2. With vision panel, 1inch above exit device head between vision panel and edge of door.

L. Sliding Door Top Rail and wheels:

1. Top Line Grant 1210 by Grant Door Hardware/Hettich America (or A/E approved equivalent. Top rail shall have heavy aluminum I-beam track Item 1201 with two wheel carrier Item 1210 with precision ball-bearing wheels. Provide two sets wheels with adjustable pendant and top plate for each door.

M. Sliding Door Bottom Rail:

1. Top Line Grant 1210 by Grant Door Hardware/Hettich America (or A/E approved equivalent. Bottom rail shall be Floor Guide 7015. Provide two sets per door.

N. Sliding Door Bumper Stop:

1. Top Line Grant 1210 by Grant Door Hardware/Hettich America (or A/E approved equivalent. Bumper stop shall be aluminum Bumper Stop 1212. Provide one set per door.

3.03 FIELD QUALITY CONTROL

A. At final acceptance, hardware shall be clean and free from disfigurement, paint, and other foreign matter.

3.04 HARDWARE SCHEDULE

A. The Contractor’s hardware schedule and related shop drawings shall be sent to Owner for review as specified for submittals.

B. Do not include single doors and pairs of doors within the same hardware set.

C. Incorporate in the Door Schedule, located in the Drawings, corresponding with the Hardware Set numbers as shown in the project Finish Hardware section.

D. List every door required for each Hardware Set.

E. Hardware Sets: All hardware shall be as specified in this section. Item number for lockset basis of design is Schlage ND Series as specified in this section.

Hardware Set No. 1:
Single door exterior (as per Product Approval for specific door).
1 ea Lockset ND Series
1 ea cylinder
1 ea deadbolt
1 ea kickplate
3 pr hinges
3 ea silencers
1 ea doorstop
1 ea closers
1 ea threshold
1 ea weatherstripping kit

END OF SECTION

SECTION 09200

METAL STUDS, METAL LATH,
SUSPENSION CEILINGS, PLASTER, AND STUCCO

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Steel studs.
2. Metal furring and lath.
3. Ceiling suspension system.
4. Portland cement plaster and stucco.

B. Related Sections:

1. 04220 - Concrete Unit Masonry.
2. 06100 - Carpentry.
3. 09900 - Painting.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):

1.	A641-92	Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
2.	A653/A-96	Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
3.	A924/A-96a	Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
4.	C150-96	Specification for Portland Cement.
5.	C645-96a	Specification for Nonstructural Steel Framing Members.
6.	C754-96	Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
7.	C841-90	Specification for Installation of Interior Lathing and Furring.
8.	C897-96	Specification for Aggregate for Job-Mixed Portland Cement-Based Plasters.
9.	C926-95a	Specification for Application of Portland Cement-Based Plaster.
10.	C932-80(90)	Specification for Surface-Applied Bonding Agents for Exterior Plastering.
11.	C1007-96a	Specification for the Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories.
12.	E119-95a	Test Methods for Fire Tests of Building Construction and Materials.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's product data for cementitious materials, lath, metal support components, studs, furring, and accessories.

B. Material Certificates:

1. Submit producer's certificate for each kind of plaster aggregate indicated materials comply with requirements.

C. Shop Drawings:

1. For all ceiling and/or wall systems forming part of the building envelope, (including ALL exterior soffits and vertical faces, whether or not these form part of the building envelope) provide shop drawings and design calculations signed and sealed by a Florida Registered Professional Engineer for metal support systems indicating load calculations, sizing of members, and anchorages for review. Shop drawings and calculations shall include support members, lath, and stucco work as required. Shop drawings and calculations shall demonstrate compliance with Florida Building Code and ASCE-7 most current version.

D. Submittals as required by Section 01900, Section 01910, and Section 01930.

1.04 QUALITY ASSURANCE

A. Design Criteria:

1. Fire-Resistance Ratings:

a. Where plaster systems with fire-resistance ratings are indicated, provide materials and installations identical with applicable assemblies tested per ASTM E119 by fire testing laboratories acceptable to authorities having jurisdiction and as per appropriate UL rated assembly.

2. Coordinate layout and installation of suspension system components for suspended ceilings with other work supported by or penetrating through ceiling.
3. Clear bonding agents are not allowed.
4. Metal corner beads are not allowed. Use plastic trim accessories.
5. Prefabricated metal or plastic stucco reveals are not allowed. Strike final stucco coat to achieve score patterns. Slope bottom edge of horizontal score lines to dispel water.

B. Mockups:

1. Before installation of stucco work, fabricate mockup panels for each type of finish and application required using materials, including lath and support system, indicated for final work.
2. Build panels 4 feet x 4 feet x full thickness in location indicated, or if not otherwise indicated, as directed by A/E.
3. Demonstrate proposed range of color, texture, and installation to be expected

in completed work.

4. Obtain A/E and Owner acceptance of panel's visual quality before start of work.
5. Retain panel during construction as standard for judging completed work.

C. Comply with the applicable requirements of governing codes and authorities and applicable portions of the following:

1. ANSI A42.3-1971.
2. Metal Lath and Steel Framing Association Specifications, latest edition.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Supports:

1. Dale Industries.
2. Dietrich.
3. Gold Bond Building Products Division.
4. Unimast Incorporated

B. Expanded Metal Lath:

1. Dale Industries.
2. Gold Bond Building Products Div.
3. South Lath Inc.
4. Unimast Incorporated

C. Accessories:

1. Dietrich.
2. Fry Reglet Corp.
3. Gold Bond Building Products Div.
4. Plastic Components Inc.
5. South Lath Inc.
6. United States Gypsum Co.
7. Vinyl Corp., Miami, FL.

D. Portland Cement Plaster/Stucco:

1. Florida Super Stucco by Lafarge Florida.
2. Lonestar Products.
3. Rinker Materials Corp.
4. Southdown, Inc.
5. United States Gypsum Co.

2.02 MATERIALS

A. Metal Supports - Suspended and Furred Ceilings or Soffits. All exterior metal supports shall be specified and designed by Florida Registered Professional Engineer to resist all wind and gravity loads as specified in this Specification Section. All metal

supports for exterior envelope system shall comply with NOA as specified:

1. Portland Cement Plaster/Stucco Installation: ASTM C926.
2. Wire for Hangers and Ties: ASTM A641, 16 gage galvanized steel.
3. Rod Hangers: Mild steel, zinc, or cadmium coated.
4. Flat Hangers: Mild steel, zinc, or cadmium coated or protected with rust inhibitive paint.
5. Channels:

    a. Cold-rolled steel, minimum 0.0598" thickness of uncoated base metal, allowable bending stress of 18,000 psi. Protect with rust inhibitive paint or galvanizing complying with ASTM A924 for G60 coating designation.
    b. Carrying Channels: 1-1/2" deep x 7/16" wide flanges, 475 lbs. per 1,000 feet painted, 508 lbs. per 1,000 feet galvanized.
    c. Furring Channels: 3/4" deep x 7/16" wide flanges, 300 lbs. per 1,000 feet painted, 316 lbs. per 1,000 feet galvanized.
    d. Provide galvanized channels for exterior installations.

6. Hanger Anchorage Devices:

    a. Screws, cast-in-place concrete inserts, or other devices appropriate for anchorage to the form of structural framing indicated and whose suitability for use intended has been proven through standard construction practices or certified test data.
    b. Size devices to develop full strength of hanger minimum 3 times calculated hanger loading, except size direct pullout concrete inserts for 5 x calculated hanger loading.

B. Steel Studs and Runners/Tracks: All exterior steel studs and/or runners/tracks shall be specified and designed by Florida Registered Professional Engineer to resist all wind and gravity loads as specified in this Specification Section. All metal supports for exterior envelope system shall comply with NOA as specified:

1. Non-Load (Axial) Bearing Studs and Runners:

    a. ASTM C645 and complying with following requirements for minimum thickness of uncoated base metal and other characteristics:
    b. Stud Thickness: 0.0179", unless otherwise indicated.
    c. Stud Depth: As indicated on the drawings.

2. Load Bearing (Transverse and Axial) Studs and Runners:

    a. ASTM C955 and complying with following requirements for quality, grade, finish of steel sheet, design thickness of uncoated base metal, and other dimensional characteristics:
    b. Metal Quality: Zinc-coated steel sheet complying with ASTM A653, Coating Designation G60.
    c. Grade A - 33,000 psi Yield Point: Maximum 0.0359" design thicknesses.
    d. Grade D - 50,000 PSI Yield Point: Minimum 0.0598" design thicknesses.
    e. Stud Thickness: 0.0359", unless otherwise indicated.
    f. Stud Flange Width: 1-3/8".

g. Stud Lip Depth: 1/4".
h. Stud Depth: 3-1/2" minimum unless otherwise indicated.

C. Vertical Metal Furring:

1. Channel Furring and Braces. All metal supports for exterior envelope system shall comply with NOA as specified:

a. Cold-rolled steel, minimum 0.0598" thickness of uncoated base metal.
b. Allowable Bending Stress: 18,000 psi.
c. Protected with rust inhibitive paint finish or galvanizing.
d. 3/4" deep x 7/16" wide flanges.
e. 300 lbs. per 1,000 feet with painted finish.
f. 316 lbs. per 1,000 feet with galvanized finish.

2. Z-Furring Member. All metal supports for exterior envelope system shall comply with NOA as specified:

a. Manufacturer's standard screw-type zee-shaped furring members formed from zinc-coated steel sheet.
b. Minimum 0.0179" uncoated base metal thickness, complying with ASTM A924, Coating G60.
c. Design for mechanical attachment of insulation boards or blankets to monolithic concrete and masonry walls.

3. Furring Brackets. All metal supports for exterior envelope system shall comply with NOA as specified: Serrated-arm type, minimum 0.0329" thickness of base (uncoated) metal, adjustable from 1/4" to 2-1/4" wall clearance for channel furring.

D. Metal Lath:

1. Diamond Mesh Lath (at non exterior envelope areas):

a. Flat: 3.4 lbs. per sq.yd.
b. Self-Furring: 3.4 lbs. per sq.yd.
c. Paper Backing: Provide asphalt-impregnated paper factory-bonded to back and complying with Fed. Spec UU-B-790, Type I, Grade D vapor permeable, Style 2.
d. Lath Attachment Devices:

1) Devices of material and type required by referenced standards and recommended by lath manufacturer for secure attachment of lath to framing members and of lath to lath.
2) Provide resilient clips for attachment of gypsum lath to steel at locations indicated.

2. Welded Wire Fabric Lath (at non exterior envelope areas):

a. Weather Protected Exterior Horizontal Surfaces (Soffits, Ceilings, and Other Decorative Elements): Pyro K-Lath, Gun Lath, or accepted

equivalent.

b. Back of Ceramic Tile (Interior Usage Only): Aqua Lath or accepted equivalent.

c. Fire Resistance and Waterproofing (Interior Usage Only): Pyro K-Lath or accepted equivalent.

3. Galvanized Expanded Metal Lath (at all exterior envelope areas):

a. As per NOA specified.

E. Accessories for Portland Cement Stucco:

1. Comply with material provisions of ASTM C926; coordinate depth of accessories with thickness and number of coats required.
2. Plastic Trim Accessories: Corner beads, casing beads, control joints, and expansion joints with perforated flanges and fabricated from high impact polyvinyl chloride.

F. Portland Cement Plaster Materials:

1. Base Coat Cements: Portland Cement, ASTM C150, Type I or III.
2. Finish Coat Cement: Portland Cement, ASTM C150, Type I, white.
3. Factory-Prepared Finish Coat:

a. Manufacturer's standard product requiring addition of water only. White in color unless otherwise indicated.

b. Product: Oriental Exterior Stucco by United States Gypsum Co.

4. Sand Aggregate - Base Coats: ASTM C897.
5. Aggregate - Finish Coats: ASTM C897, manufactured or natural sand, white in color.
6. Fiber - Base Coat:

a. Alkaline-resistant glass fibers, 1/2" long, free of contaminates, manufactured for use in Portland cement plaster.

b. Product: Dur-O-Fiber AR Glass by Dur-O-Wal, Inc.

G. Miscellaneous Materials:

1. Water for Mixing and Finishing Plaster: potable, free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.
2. Bonding Agent - Portland cement: ASTM C932.

2.03 MIXES

A. Portland Cement Plaster/Stucco Mixes and Compositions - Base Coats (At CMU walls. System must be compatible with STO/NOA specified system):

1. Comply with ASTM C926 for Portland cement plaster base and finish coat mixes as applicable bases, materials, and other requirements indicated.

2. Base Coat:

a. Proportion materials for respective base coats in parts by volume for cementitious materials and in parts by volume per sum of cementitious materials for aggregates to comply with the following requirements for each method of application and plaster base indicated.
b. Adjust mix proportions below within limits specified to attain workability.

3. Base Coats for Three-Coat Work Over Metal Lath:

a. Contractor's Option 1:

1) Scratch Coat: 1 part Portland cement, 2-1/2 to 4 parts sand.
2) Brown Coat: 1 part Portland cement, 3 to 5 parts sand.

b. Contractor's Option 2:

1) Scratch Coat: 1 part Portland cement, 1 to 2 parts masonry cement, 2-1/2 to 4 parts sand.
2) Brown Coat: 1 part Portland cement, 1 to 2 parts masonry cement, 3 to 5 parts sand.

c. Contractor's Option 3:

1) Scratch Coat: 1 part masonry cement, 2-1/2 to 4 parts sand.
2) Brown Coat: 1 part Portland cement, 1 parts masonry cement, 3 to 5 parts sand.

4. Two-Coat Work Over Concrete Unit Masonry:

a. Contractor's Option 1:

1) Base Coat: 1 part Portland cement, 3 to 4 parts sand.

b. Contractor's Option 2:

1) Base Coat: 1 part masonry cement, 3 to 4 parts sand.

5. Fiber Content:

a. Add fiber to mixes above to comply with fiber manufacturer's directions, maximum 2 lbs. per cu. feet of cementitious materials.
b. Reduce aggregate quantities accordingly to maintain workability.

B. Portland Cement Plaster/Stucco Mixes and Compositions - Finish Coats (At CMU walls. System must be compatible with STO/NOA specified system):

1. Job-Mixed:

a. Contractor's Option 1:

1) 1 part Portland cement, 2-1/4 to 3 parts sand.

b. Contractor's Option 2:

1) 1 part Portland cement, 1 part masonry cement, 2-1/4 to 3 parts sand.

c. Contractor's Option 3:

1) 1 part masonry cement, 1-1/2 parts sand.

2. Factory-Prepared Portland Cement Plaster/Stucco Finish Coats:

a. Add water only.
b. Comply with finish coat manufacturer's directions.

C. Mixing: Mechanically mix cementitious and aggregate materials for plasters to comply with applicable referenced application standard and with recommendations of plaster manufacturer.

PART 3 EXECUTION

3.01 INSTALLATION

A. Lath and Furring:

1. Portland Cement Plaster/Stucco Lath and Furring Installation Standard: Install lath and furring materials indicated for Portland cement plaster to comply with ASTM C926.
2. Install supplementary framing, blocking, and bracing at terminations in work and for support of fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, and similar work to comply with details indicated or, if not otherwise indicated, to comply with applicable published recommendations of gypsum plaster manufacturer or, if not available, of Gypsum Construction Handbook, latest edition, published by United States Gypsum Co.
3. Isolation:

a. Where lath and metal support system abuts building structure horizontally, and where partition/wall work abuts overhead structure, isolate work from structural movement sufficiently to prevent transfer of loading into work from building structure.
b. Install slip or cushion type joints to absorb deflection but maintain lateral support.
c. Frame both sides of control and expansion joints independently.
d. Do not bridge joints with furring and lath or accessories.

B. Ceiling Suspension Systems:

1. Preparation and Coordination:

a. Coordinate installation of ceiling suspension system with installation of

overhead structural systems to ensure inserts and other structural anchorage provisions have been installed to receive ceiling hangers to allow development of their full strength and at spacings required to support ceiling.

b. Furnish concrete inserts and other devices indicated, to other trades for installations before time needed for coordination with other work.

c. Powder activated fasteners are not allowed.

2. Hanger: Attach hangers to structure above ceiling to comply with Metal Lath/Steel Framing Association (ML/SFA) Specifications for Metal Lath and Furring and with referenced standards.

3. Ceiling Suspension System:

a. Install components of sizes and spacings indicated but not in smaller sizes or greater spacings than required by referenced lath and furring installation standards. Comply with shop drawing design information as per this Specification Section.

b. Wire Hangers: Space maximum 48 inches o.c. parallel with, and maximum 36 inches perpendicular to, direction of carrying channels, unless otherwise indicated, and within 6 inches of carrying channel ends. Comply with shop drawing design information as per this Specification Section.

c. Carrying Channels: Space carrying channels maximum 36 inches o.c. with 48 inches o.c. hanger spacing. Comply with shop drawing design information as per this Specification Section.

d. Furring Channels to Receive Metal Lath: Space furring channels maximum 16 inches o.c. for 3.4 lb. diamond mesh lath or 24 inches o.c. for 3.4 flat rib lath. Comply with shop drawing design information as per this Specification Section.

C. Steel Stud Wall/Partition Support System:

1. Install components for steel stud wall/partition support systems to comply with directions of steel stud manufacturer for application indicated.

2. Non-Load (axial) Bearing Stud Systems: Comply with ASTM C754.

3. Loadbearing (axial and transverse) Stud Systems: Comply with ASTM C1007 and as indicated.

4. Steel Stud Systems to Receive Metal Lath: Comply with requirements of ML/SFA Specifications for Metal Lath and Furring applicable to each installation condition and type of metal system indicated.

5. Extend partition support systems to finish ceiling and attach to ceiling suspension members, unless otherwise indicated.

D. Vertical Metal Furring:

1. Metal Furring to Receive Metal Lath: Comply with requirements of ML/SFA Specification for Metal Lath and Furring applicable to each installation condition indicated.

E. Metal Lath:

1. Install expanded metal lath for following applications where plaster base coats are required.
2. Provide appropriate type, configuration, and weight of metal lath selected from materials indicated which comply with referenced lath installation standards.
3. Suspended and Furred Ceilings: Minimum weight of diamond mesh lath, 3.4 lbs. per sq.yd.
4. Exterior Sheathed Wall Surfaces: Minimum weight of self-furring diamond mesh lath, 3.4 lbs. per sq.yd.

F. Plastering Accessories:

1. Comply with referenced lath and furring installation standards for provision and location of plaster accessories of type indicated.
2. Miter or cope accessories at corners and install with tight joints and in alignment.
3. Attach accessories securely to plaster bases to hold accessories in place and alignment during plastering.
4. Accessories - Portland Cement Plaster:

    a. Corner Reinforcement: Install at external corners.
    b. Corner Bead: Install at external corners.
    c. Casing Beads: Install at termination of plaster work unless otherwise indicated.
    d. Control Joints: Install where an expansion or control joint occurs in surface of construction directly behind plaster membrane, where distance between control joints in plastered surface exceeds 10 feet in either direction, where area within Portland cement panels exceed 100 square feet, where Portland cement plaster panel sizes or dimensions change.

G. Plaster Application:

1. Two-coat plaster over gypsum lath.
2. Prepare monolithic surfaces for bonded base coats and used bonding compound or agent to comply with requirements of referenced plaster application standards for conditioning of monolithic surfaces.
3. Tolerances: Maximum 1/8" in 10'- 0" from a true plane in finished plaster surfaces, as measured by 10'- 0" straightedge placed at any location on surface.
4. Sequence plaster application with installation and protection of other work, so neither will be damaged by installation of other.
5. Plaster flush with metal frames and other built-in metal items or accessories that act as plaster ground, unless otherwise indicated.
6. Where plaster is not terminated at metal by casing beads, cut base coat free from metal before plaster sets and groove finish coat at junctures with metal.
7. Total thickness of plaster application shall be 5/8” applied as directed in this Specification Section.

H. Portland Cement Plaster/Stucco Application:

1. Portland Cement Plaster Application Standard: Apply Portland cement plaster

materials, compositions, and mixes to comply with ASTM C926.

2. Number of Coats: Apply Portland cement plaster, of composition indicated.
3. Finish Coat: Floated finish unless otherwise indicated; match A/E's sample for texture and color.
4. Moist cure Portland cement plaster base and finish coats to comply with ASTM C926, including recommendations for time between coats and curing in ASTM C926 Annex A2 - Design Considerations.
5. Total thickness of cement plaster/stucco application shall be 5/8” applied as directed in this Specification Section.
6. Install Stucco system on metal framed exterior walls as per NOA.

3.02 ADJUSTING, CLEANING, AND PROTECTION

A. Cutting and Patching:

1. Cut, patch, point-up, and repair plaster as necessary to accommodate other work and to restore cracks, dents, and imperfections.
2. Repair or replace work to eliminate blisters, buckles, excessive crazing and check cracking, dryouts, efflorescence, sweat-out and similar defect, and where bond to substrate has failed.
3. Sand smooth-troweled finishes lightly to remove trowel marks and arises.

B. Cleaning:

1. Remove temporary protection and enclosure of other work.
2. Promptly remove plaster from door frames, windows, and other surfaces that are not to be plastered.
3. Repair floors, walls, and other surfaces stained, marred, or otherwise damaged during plastering work.
4. When plastering is completed, remove unused materials, containers, and equipment, and clean floors of plaster debris.

C. Protection: Provide final protection and maintain conditions, in manner suitable to Installer, that ensures plaster work being without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 09250

GYPSUM WALLBOARD & TILE BACKER BOARDS

PART 1 GENERAL

1.01 SUMMARY

A. Related Sections:

1. 09200 - Metal Studs, Lath, Suspension Ceiling, Plaster, and Stucco.
2. 09310 - Ceramic Tile.

1.02 REFERENCES

A. American Society for Testing and Standards (ASTM):

1. C11-97 Terminology Relating to Gypsum and Related Building Materials and Systems.
2. C36-95b Specification for Gypsum Wallboard.

1.03 SUBMITTALS

A. Before starting work, provide manufacturer product data and cut sheets for each product to be used on the project.

B. Submittals as required by Section 01900, Section 01910, and Section 01930.

1.04 QUALITY ASSURANCE

A. Finish work shall be subject to inspection using a lighting level of not less than 50 foot candles at the surface of the gypsum board. Surfaces judged to be unsuitable for finishing, even if finish has been applied, shall be rejected.

B. The A/E will direct repair or replacement of rejected work.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver in original unopened packages. Provide protection from damage and exposure to the elements.

B. Prevent damage to edges and surfaces. Do not bend or damage metal corner beads and trim.

1.06 PROJECT CONDITIONS

A. Environmental Requirements: Proceed with installation of gypsum board materials only after building is weather tight.

1. Maintain temperature in areas receiving gypsum board materials between 55 degrees and 90 degrees F. during and after installation and provide adequate

ventilation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Gypsum Wallboard:

1. Gold Bond by National Gypsum.
2. Georgia Pacific.
3. United States Gypsum Company (USG).

B. Accessories shall be by gypsum wallboard manufacturer.

2.02 MATERIALS

A. Gypsum Wallboard:

1. Fire Rated Gypsum Board: USG SA 927, 5/8" thick x 48 inches wide x longest stock length, Type "X", with tapered edges or accepted equivalent. Where gypsum board systems with fire-resistance ratings are indicated, provide materials and installations identical with applicable assemblies tested per ASTM E119 by fire testing laboratories acceptable to authorities having jurisdiction and as per appropriate UL rated assembly.
2. Gypsum Board: ASTM C36, tapered edge, 5/8" thick x 48 inches wide x longest stock length.

B. Fasteners: Type S Bugle Head by USG or accepted equivalent, with lengths as specified by manufacturer.

C. Joint Treatment: Reinforcing tape, taping, or embedding and topping materials as recommended and manufactured by gypsum wallboard manufacturer.

D. Accessories:

1. Use internal and external corner beads, casing beads, and control joints, to provide a finished job with true, straight edges against adjoining work.
2. Provide expansion joints as required for conditions and according to manufacturer’s recommendations.

E. Tile Backer Boards:

1. Aggregated Portland cement board with vinyl-coated, woven glass fiber embedded on both surfaces. Where tile backer board systems with fire-resistance ratings are indicated, provide materials and installations identical with applicable assemblies tested per ASTM E119 by fire testing laboratories acceptable to authorities having jurisdiction and as per appropriate UL rated assembly.
2. Joint Reinforcement, Fasteners, Adhesives, and Grout: According to manufacturer's recommendation.

PART 3 EXECUTION

3.01 INSTALLATION

A. Place panels with long dimension parallel to the framing members and abutting edges occurring over stud flanges.

1. Fit ends and edges closely (maximum 1/16" between boards), but not forced together.
2. Stagger end joints in successive courses. Place end or edge joints on opposite sides of framing in different locations to avoid creating joints of panels ending on the same stud.
3. Panel edge above floor shall be 1/2" clear.
4. At fire rated assemblies, install all components as directed by UL listed assembly.

B. Panel Attachment:

1. Drive fasteners in field of panel first, working toward ends and edges.
2. Hold panel in firm contact with framing while driving fasteners.
3. Install perimeter fasteners at 3/8" from ends or edges and spaced a maximum of 8 inches on center.
4. Attach gypsum panels in field of panel with fasteners spaced a maximum of 12 inches on center.
5. At fire rated assemblies, install all components as directed by UL listed assembly.

C. Accessories: Apply accessories according to manufacturer's instructions. Sand after application of final joint treatment coat and leave surface smooth and ready for work by other trades.

1. Treat metal accessories with not less than 2 coats of joint compound in the same manner as joints. Feather joint compound out from 8 to 10 inches on both sides of corners.
2. Apply metal trim at intersections where gypsum board abuts other materials, unless detailed otherwise, and at all other locations indicated. Neatly fit and secure corner beads over external corners.
3. Install expansion joints as detailed.
4. Install control joints as detailed.
5. At fire rated assemblies, install all components as directed by UL listed assembly.

D. Joint Treatment Application:

1. Taping and Embedding:

a. Apply taping or embedding compound in a thin, uniform layer to joints and angles.
b. Immediately apply reinforcing tape centered over joint or angle and firmly

seat into compound. Sufficient compound (approximately 1/64" to 1/32") shall remain under tape to provide proper bond.

c. Immediately follow with a thin skim coat to embed tape but not to function as a second coat.
d. Fold and embed tape properly at interior angles to provide a true angle.
e. Tape or embedding coat shall be thoroughly dry before application of second coat.
f. At fire rated assemblies, install all components as directed by UL listed assembly.

2. Second Coat Embedding:

a. Apply a second coat of joint compound over embedding coat, filling panel taper flush with surface.
b. Cover tape and feather out at least 2 inches on each side beyond first coat.
c. On joints with no taper, cover tape and feather out at least 4 inches on either side of tape.
d. Allow second coat to dry thoroughly before application of finish coat.
e. At fire rated assemblies, install all components as directed by UL listed assembly.

3. Topping:

a. Spread a finish coat evenly over and extend at least 2 inches on each side beyond second coat on joints and feather to a smooth uniform finish.
b. Over tapered edges, do not allow finished joint to protrude beyond plane of surface.
c. Apply finish coat to cover tape and taping compound at taped angles and provide a true angle.
d. Where necessary, sand between coats and following final application of compound to provide a smooth surface ready for painting.
e. At fire rated assemblies, install all components as directed by UL listed assembly.

E. Finishing Fasteners:

1. Apply a taping or all-purpose type compound to fastener depressions as the first coat.
2. Follow with minimum of 2 additional coats of topping compound, leaving depressions level with plane of surface.
3. At fire rated assemblies, install all components as directed by UL listed assembly.

END OF SECTION

SECTION 09310

CERAMIC AND PORCELAIN TILE

PART 1 GENERAL

1.01 SUMMARY

A. Related Sections:

1. 03300 - Cast-In-Place Concrete.
2. 07900 - Joint Sealers.
3. 09200 - Metal Studs, Lath, Suspension Ceiling, Plaster, and Stucco.
4. 09250 - Gypsum Wallboard.
5. 09330 - Quarry Tile
6. 10800 - Toilet Room Accessories.
7. 15421 - Drains, Floor Sinks, and Cleanouts.
8. 15440 - Plumbing Fixtures, Trim, and Supports.

1.02 REFERENCES

A. American National Standards Institute (ANSI) latest edition:

1. A108.1 Installation of Glazed Wall Tile, Ceramic Mosaic Tile, Quarry and Paver Tile with Portland Cement Mortar.
2. A108.5-85 Ceramic Tile Installed with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.
3. A108.10-85 Installation of Grout in Tilework.
4. A118.1-85 Dry-Set Portland Cement Mortar.
5. A118.6-85 Ceramic Tile Grouts.
6. A137.1-80 Specifications for Ceramic Tile.

B. Tile Council of America, Inc. (TCA): Handbook For Ceramic Tile Installation, latest edition.

1.03 SUBMITTALS

A. Product Data: Submit material specifications, printed installation and mixing instructions, and maintenance recommendations for ceramic tile and accessories.

B. Samples: Submit the following:

1. Panels: 12 inches square, of each type, color, and pattern of tile required.
2. Tile manufacturer's full color and pattern range for each type of tile required.
3. Grout manufacturer's full color range samples.
4. Each type of trim shape and special shape required, if requested.

C. Submittals as required by Section 01900, Section 01910, and Section 01930.

D. Manufacturer’s information showing compliance with FloorScore standards as defined in USGBC LEED Reference Guide for Green Building Design and Construction 2009

edition for all porcelain tile flooring.

E. Manufacturer's information showing compliance with tile setting adhesives and grout as defined in USGBC LEED Reference Guide for Green Building Design and Construction 2009 and elsewhere in these specifications.

1.04 QUALITY ASSURANCE

A. Tile shall conform to requirements of TCA 137.1, Standard Grade.

1.05 MAINTENANCE

A. Maintenance Materials: At the job site, provide 2 unopened boxes of each color and type of tile installed.

1.06 WARRANTY

A. Provide written warranty to correct conditions due to faulty installation or replace defective materials after project completion, including any loss of adhesion to the substrate to the satisfaction of the Owner for a period of 5 years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Ceramic Tile:

1. American Olean Tile Company.
2. Dal-Tile.
3. Florida Tile Industries.
4. Interceramic.
5. Lone Star.
6. Mannington Ceramic Tile Company.
7. US Ceramic Tile Company.

B. Porcelain Mosaic Floor Tile:

1. American Olean Tile Company.
2. Dal-Tile.
3. Florida Tile Industries.
4. Interceramic.
5. Lone Star.
6. Mannington Ceramic Tile Company.
7. US Ceramic Tile Company.

2.02 MATERIALS

A. Slip-Resistant Mosaic Porcelain Floor Tile: 2 inches x 2 inches x 1/4" thick, unglazed, plain face, cushioned edges, having a minimum of 0.5 wet coefficient of friction, attained without use of abrasive impregnation.

B. Glazed Wall Tile: Nominal 4" x 4" x 5/16" thick, matte or crystalline face, cushioned edges.

C. Color and Pattern:

1. CM shall assume 20% Group IV (most expensive) color tiles. Additional 10% shall be assumed to be Group III color tiles, with balance of tiles (70%) Group I and II. Accent pattern shall be as per Color Board.
2. Colors and patterns shall be judged equivalent, as determined by the A/E, to those pre-selected or above specified patterns and colors.
3. Any pre-selected colors and patterns shown on the drawings or in the specifications shall govern.
4. Where colors or patterns are not shown, tile equivalent in cost to standard solid colors shall be bid upon, assuming not more than 10 colors.
5. A/E's range of color selection shall not be limited to colors stocked locally but by entire color line of specific manufacturer as determined by samples in A/E's office.

D. Trim and Special Shapes: Provide the following trim units and special shapes of same material and finish as ceramic wall tile:

1. Base: Cove base units, width and height to match wall tile.
2. External Corners: Bullnose shapes with round out base and top trim special shapes.
3. Internal Corners: Field-butted square with square in-corner base and top trim special shapes.

E. Marble Thresholds: 2-1/4" wide, 3/4" thick, White Georgia or Madre Cream Alabama marble with exposed edges beveled and honed finish on exposed surfaces.

F. Setting Materials: Dry-Set pre-sanded mortar according to ANSI A118.1-1985 and by manufacturer licensed by the Tile Council of America.

G. Mortar Additive: Laticrete 3701 latex additive or accepted equivalent.

H. Grout: Certified by the tile manufacturer as suitable for type of tile and application.

1. Dry-Set Grout: A mixture of Portland cement and additives furnished by a firm licensed to manufacture products, and tested and approved by the Tile Council of America. Colors as selected by A/E.
2. Commercial Latex-Portland Cement Grout: A mixture of Portland cement and mortar additive conforming to ANSI A118.6.

   a. Color: Natural mortar color.

I. Tile Cleaner: Biscayne Chemical Laboratories, Inc.,"Blue Boy" or accepted equivalent.

J. All porcelain tile setting adhesives and grout shall comply with VOC requirements as defined in the USGBC LEED Reference Guide for Green Building Design and Construction 2009 and elsewhere in these specifications.

K. All porcelain tile on the project shall comply with FloorScore standards as defined in USGBC LEED Reference Guide for Green Building Design and Construction 2009 edition.

PART 3 EXECUTION

3.01 INSTALLATION

A. Tile Setting Requirements:

1. Examine surfaces for foreign matter, unevenness, flatness, plumb planes, and damage. Make repairs if necessary to substrate to be in the proper condition to receive tile. Verify waterproofing at shower receptors will not affect tile installation adversely.
2. Construct sloped mortar beds using mortar consisting of 1 part Portland cement, 4 parts damp sand by volume, and gauged with mortar additive according to ANSI A108.5.
3. Secure tile firmly in place with uniform joints well filled and lines straight and true.

    a. Bring finished surfaces to true and flat planes, plumb on walls.
    b. Completed work shall be free of cracked or broken tiles.

4. Form intersections and returns perfectly and perform cutting and drilling of tile neatly without marring tile face.

    a. Carefully grind and joint cut edges of tile against any trim, finish, and built-in fixtures.
    b. Fit tile close around plumbing pipes, fixtures and fittings so usual plates, collars, or coverings will overlap tile.

5. Where borders, lines, patterns, panels, or other effects are a part of the work, properly space tiles and accurately reproduce required designs.
6. Where acoustic tile ceilings occur, install ceramic wall tile to a line 2 to 4 inches above plane of exposed surface of ceiling.
7. Layout tile work on floors or walls so, wherever possible, no tiles less than half full size will occur unless indicated.
8. Movement Joints:

    a. Provide control, isolation, expansion, and contraction joints according to movement joint designs and install according the TCA Handbook for Ceramic Tile Installation.
    b. Locate movement joints:

        1) At 24 to 36 feet in each direction.
        2) At tile abutting perimeter walls, dissimilar floors, pipes, and columns.
        3) Over cold joints and saw-cuts in the slab.

    c. Extend joints through the setting bed to the concrete substrate equal in width to the tile grout joints.

d. Provide approved solid neoprene filler and approved polysulfide caulking.

9. Where tile abuts restraining surfaces, cut tile to match contour of that surface.
10. At shower receptors continue slip-resistant ceramic mosaic floor tile up and over curbs to meet floor tile in adjoining areas using special shapes where necessary.
11. At floor drains, slope floor tile from high points at walls around perimeter of rooms down to floor drains.

B. Setting Ceramic Tile With Dry-Set Mortar:

1. Concrete Substrate:

a. Set ceramic tile according to applicable requirements of ANSI A108.5.
b. Set tile with dry-set mortar, 3/32" to 1/8" thick.
c. Provide latex mortar additive in setting mortar per manufacturer's directions.

C. Grouting: Comply with ANSI A108.10.

1. Ceramic mosaic floor tile: Use commercial latex Portland cement grout.
2. Glazed ceramic wall tile: Use dry-set grout.
3. Force grout into joints to fill solid.

a. Remove and re-grout discolored joints. Fill voids in joint grout.

D. Thresholds: Set marble thresholds where indicated or at dissimilar floor finishes with the same material used for setting ceramic mosaic floor tile.

E. Tolerances: Finished installation shall be trued to a tolerance of ±1/8" in a 10 foot radius and +1/16" within any given running foot.

3.02 CLEANING

A. Apply tile cleaner according to cleaner manufacturer's printed instructions.

B. Leave finished installation clean and free of cracked, chipped, broken, and unbonded or otherwise defective tile.

END OF SECTION

SECTION 09673

EPOXY RESIN FLOORING

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

A. Coordinate epoxy resin flooring and base with work before and after. See especially:
   1. Specified concrete finish and curing of concrete at floor slabs and decks 03300
   2. Vapor retarder beneath concrete slab-on-grade 07262

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. F710-04 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
   2. F1869-04 Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
   3. F2170-02 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs, Using In Situ Probes.

B. Voices of Safety International (VOSI):
   1. V41.22 Test Method for Slip-Resistant Footwear, as Measured Using a Drag Type Friction Tester.

1.3 QUALITY ASSURANCE

A. Installer: Certify that installer is approved by flooring producer.

B. Pre-Installation Meeting and Test:
   1. Contractor, A/E, Owner representative, testing agency, producer and installer shall meet at least 28 days before start of installation.
   2. Schedule slab moisture test for no more that 7 days after meeting.

1.4 SUBMITTALS Follow 01330

A. Early Submittal: Submit text of Contractor and installer's Special Warranty at least 10 weeks before epoxy resin flooring and base installation is to begin. Obtain approval of text by A/E and Owner before making other submittals.

B. Product Data.
   1. Test values for each quality specified in PART 2.
   2. Static Coefficient of friction (SCoF) test values on unwaxed epoxy resin flooring surfaces ranging from fine to coarse texture.
   3. Method of ensuring proper support and adhesion of base to soft substrates such as gypsum board.
   4. Method of providing UV-resistance at exterior applications.
   5. Producer's standard color chart.
   6. Installation instructions.

C. Samples: Provides two 4x4 in. samples, applied to thin concrete backing, in each color and texture selected by A/E.

D. Mockup after installation has started in each area of considerable substrate roughness to determine whether underlayment coat can be omitted after assessment by A/E and Owner. A/E will direct where slab roughness requires mockup. See 2.1 A.1. following.
   1. Contractor has the option of constructing all epoxy-quartx flooring in 4 coats, without mockup to determine if and where underlayment may be omitted.

E. Test Report: Moisture content of concrete floor substrate at time of installation.

1.5 SPECIAL WARRANTY — Follow 01910

A. By Installer: In addition to the warranty and correction of work requirements of the General Conditions, provide a written and signed Special Warranty from the flooring installer (or Subcontractor), endorsed by Contractor, to correct (repair or replace) defects in the epoxy resin flooring work as follows:
   1. Correct until date of Substantial Completion of the Work and for 5 years after.
   2. Agreeing to repair or replace flooring that shows significant loss of flooring aggregate; cracking, brittleness, crumbling, change of color, excessive indentation under normal foot and cart traffic and equipment loading, loss of adhesion of flooring to concrete, or of base to concrete and block wall surfaces.
   3. Exclusions: Minor loss of sheen at wear surfaces; cracks imparted solely by substrate cracking or movement; loss of adhesion that is demonstrably from substrate moisture; damage from abuse or lack of proper maintenance.

PART 2 PRODUCTS — Follow 01600

2.1 EPOXY RESIN FLOORING

A. Description. 4 coat assembly, containing 100% solids epoxy and silica/quartz aggregate.
   1. Underlayment: Install an epoxy underlayment (usually silica-filled) where concrete slab is so rough as to telegraph pits, ridges or other unevenness to finished surface of flooring, or if concrete texture is not optimal for adhesion of basecoat.
      a. Mockup on actual floor in the work: Underlayment may be omitted with approval of A/E after 100 ft^2 or more of floor area has been installed as a mockup in the selected color and texture. Mockup shall be in 4 coats.
      b. Mockup assessment: When cured, the adhesion, smoothness and appearance of the resulting surface shall be assessed by the A/E and decision made as whether to continue with the underlayment or primer, or both, for the rest of the installation.
   2. Primer: Epoxy primer as recommended by producer to enhance adhesion, or as needed following A/E's assessment of mockup.
   3. Basecoat: Quartz, white or colored, in epoxy matrix, placed with epoxy resin in 1 or more passes.
      a. Colors of aggregate and resin: As selected by the A/E from the basecoat producer's stock color selection.
      b. Aggregate size: Fine; only coarse enough to develop specified SCoF.
   4. Sealer coat: Epoxy (for interior work) or UV-resistant resin (for exterior work).
      a. Color: Clear, or match basecoat, as needed to match approved sample.
   5. Overall thickness of epoxy resin flooring assembly: As specified in PART 3.
   6. Texture and Slip-Resistance of Base and Sealer Coats: Provide an orange peel (preferred) or rougher texture as needed to develop a SCoF = 0.60 or greater.
      a. At ramps or any other surface sloping more than 1/2 in. in 1 ft , SCoF shall be 0.80 or greater.

B. Required qualities of epoxy resin flooring and base, tested as an assembly:

1. Compressive strength: 9,000 to 14,000 lb/ft²; ASTM C579.
2. Flexural strength: 3,200 to 4,500 lb/ft²; ASTM C580.
3. Tensile strength: 1,600 lb/ft² minimum; ASTM C307.
4. Abrasion resistance: 0.15 g maximum weight loss; ASTM D4060, CS-17 wheel, 1000 g load, 1000 cycles.
5. Impact resistance: 16 ft-lbs; MIL D-3134F.
6. Indentation: 0.03 in. maximum; MIL D-3134F.
7. Hardness: 75-85; ASTM D2240, Shore D.
8. CoE (thermal expansion) 0.19-0.21 x 10^{-6}; ASTM D696.
9. Water absorption: 0.15% maximum; ASTM C413.
10. SCoF (slip resistance) 0.60 minimum, static coefficient of friction, wet, leather; VIOS V41.22 or equal performance under one of the ASTM tests, as judged by A/E.
    At stair treads, landings and ramps, provide 0.80 SCoF minimum.
11. VOCs in epoxy resin: Less than 1% by weight.
12. Flammability: Self-extinguishing; ASTM D570 or D635.

C. Product / Producer:
1. Selbachek 6631, by BASF.
2. Cheminert, by Dex-O-Tex.
3. Dur-A-Quartz, by Dur-A-Flex
4. MasterQuartz DES, by Polymerica.
5. Stonshield HRI, by StonHard, Inc.
6. Morritex, by Valspar.
7. Equal product in quality and performance as reviewed and approved by A/E and Owner.

2.2 SEAMLESS QUARTZ BASE [09673.sqb]

A. Construction. 2 coat epoxy resin basecoat and epoxy sealer coat, containing 100% solids epoxy and silica / quartz aggregate. Construct to the same thickness as, and monolithic with, epoxy resin flooring.
1. Height: 4 in. against walls
2. Cove feature: Provide a seamless cove transition from floor to base, formed to a uniform radius of 1/4 to 3/8 in.
3. Top edge: Form to a uniform curved profile having a radius equal to the thickness of the base

B. Qualities: Identical to epoxy resin flooring in composition, texture and color.

C. Product / Producer: Same as for epoxy resin flooring.

2.3 ACCESSORIES

A. Fill Material, for depressions, cracks and holes in concrete substrate. Epoxy-compatible cement as recommended by epoxy resin flooring producer.

B. Joint Sealant Materials: Silicone that is compatible with all components of epoxy resin flooring assembly and close to it in color.

PART 3 EXECUTION

3.1 MOISTURE TEST

A. Determine whether the concrete slab is adequately dry for flooring installation. Between 14 and 21 days before the date of starting work, perform moisture tests on each area in which epoxy resin flooring will be placed over concrete.
   1. At slabs on grade. One test for each 1000 ft^2 area.
   2. At elevated slabs. One test for each floor level.

B. Test for allowable moisture content using one of the following methods following ASTM F710, as recommended by the producer of the epoxy resin flooring:
   1. Anhydrous calcium chloride test, as weighed by laboratory; ASTM F1869.
   2. Electrical conductivity test in hole drilled in concrete; ASTM F2170, using a probe such as the GE Protimeter.

C. Moisture vapor emission rate (MVER = lb. emitted in 24 h from a 1000 ft^2 area.):
   1. Convert the results of the ASTM F1869 or F2170 test to a MVER measurement.
   2. Before installing epoxy resin flooring in any area, the MVER figure (expressed in pounds) shall be less than 3.5 lb.

3.2 EXAMINATION AND NOTIFICATION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

B. Concrete shall be smooth and level, with maximum surface variation no greater than 1/8 in. from a 10 ft straightedge placed in direction of flow. Direct the grinding of high spots and filling of low spots thus detected as specified in Preparation following.

C. At kitchen areas, notify MDCPS Food and Nutrition Dept. at least 48 hours before starting surface preparation and installation of epoxy resin flooring so that foodstuffs and movable equipment can be removed.

3.3 PREPARATION

A. Perform moisture tests and examination as specified. Do not start epoxy resin flooring work until the MVER test figure specified above is 3.5 lb or less.

B. Remove fixed and movable equipment before installing flooring.

C. Grind down ridges and other irregularities. Fill depressions, cracks, and holes with specified fill material.

D. Cleaning and Bonding Preparation before Installation: Shot-blast concrete and filled surfaces to obtain optimal bond of flooring to concrete.
   1. Use shot-blasting equipment that continuously confines and collects shot and debris to produce dust-free cleaning and scarifying for maximum adhesion of flooring..
   2. Remove grease, oil, dirt, dust and other contaminants.
   3. Remove sufficient material to provide a sound surface free of laitance, glaze, efflorescence, and any bond-inhibiting curing compounds or form release agents.
   4. Repair, using specified fill material, damaged and deteriorated concrete exposed by shot blasting to bring to sound condition.

3.4 PROJECT CONDITIONS

A. Install epoxy resin flooring and initially cure for 48 hr at ambient temperatures between 50 to 85 °F under dry, ventilated (but not windy), dust-free conditions. Keep work area free of traffic and other trades during installation and for at least 48 hours after.

B. At new concrete, allow slabs to damp-cure for at least 28 days without the use of curing agents, plastic film or sealers.
   1. If the epoxy resin flooring producer's requirements are stricter than the 28-day minimum figure stated above, increase curing time to meet producer's time figure.

3.5 THICKNESS AND SLIP-RESISTANCE OF EPOXY RESIN FLOORING

A. Overall thickness of epoxy resin flooring assembly: 1/8 in. in all areas.

B. Texture and Slip-Resistant Texture of epoxy resin flooring assembly:: Provide an orange peel (preferred) or rougher texture as needed to develop a SCoF = 0.60 or greater.
   1. At ramps or any other surface sloping more than 1/2 in. in 1 ft , SCoF shall be 0.80 or greater.

3.6 INSTALLATION OF EPOXY RESIN FLOORING

A. Apply epoxy resin flooring with integral cove base using an installer approved by the producer of the flooring materials.

B. Apply following Contract Documents, the flooring producer's current published instructions, and approved shop drawings, except as more stringently specified herein.

C. Repair of concrete: Patch or repair cracks and level uneven areas in epoxy resin flooring using specified materials and following producer's recommendations.

D. Clean, using cleaning materials and procedures recommended by flooring producer.

E. Reinstall fixed and movable equipment that was moved before flooring installation after new flooring is complete.

3.7 PROTECTION

A. Protect installed floor from damage and undue wear during overall construction operation. Use protective materials recommended by producer that will not harm the new flooring.

SECTION 09900

PAINTING OF UNPAINTED SURFACES

PART 1 GENERAL

1.01 SUMMARY:

A. Section Includes:

1. Section 09902 - "PAINT, PUTTY, AND CAULKING MATERIALS FORM", pages 1 through 11, attached to and a part of this section.
2. Field painting of exposed and covered pipes, ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of equipment installed under mechanical and electrical work, except as otherwise indicated.
3. Six year warranty for labor and materials from the paint manufacturer.

B. Related Section:

1. 07900 - Joint Sealers.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. D3359-95a Test Methods for Measuring Adhesion by Tape Test.
2. D3927-87 Standard Guide for State and Institutional Purchasing of Paint.
3. D4262-83(88) pH of Chemically Cleaned or Etched Concrete Surfaces.
4. D4263-83(93) Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.

B. OSHA Workers Environmental Conditions.

C. National Fire Protection Association (NFPA): NFPA 30 - Flammable and Combustible Liquids Code.

D. Steel Structural Painting Council (SSPC) - 6.

1.03 DEFINITIONS

A. Alkyd: Oil-based paint.

B. Latex: Water-based paint.

C. New Work: Surface or area of a surface not previously painted, including areas patched, replaced, or sandblasted causing a painted or unpainted surface or part of a painted or unpainted surface to exist.

D. Old Work: Surface that has been previously painted.

E. Paint: All coating systems materials, including primers, emulsions, enamels, stains,

varnishes, sealers and fillers, and other applied materials used as prime, intermediate, or finish coats.

F. Smooth: A surface free from roughness, ridges, and projections.

1.04 SUBMITTALS

A. "APPROVED PAINT, PUTTY, AND CAULKING MATERIALS" Form:

1. Submit this form according to instructions in Part 1 of this section, at the Pre-Construction meeting.
2. Complete the form in compliance with requirements of this section.
3. Submittals for acceptance by A/E and Owner.

B. Product Data: Submit Manufacturer Safety Data Sheet (MSDS), manufacturer's technical information, including paint label analysis and application instructions for each material proposed for use.

C. Manufacturer’s information showing compliance with low-VOC standards for paints and coatings as defined in USGBC LEED Reference Guide for Green Building Design and Construction 2009 and elsewhere in these specifications.

D. Samples:

1. Color Chips:

a. Before starting work, furnish color chips for surfaces to be painted to the A/E. Color chips shall comply with approved colors as selected by the A/E.
b. Use representative colors when preparing samples for review.

2. Representative Samples:

a. Submit representative samples for review of color and texture only.
b. Provide listing of material and application for each coat of each finish sample.
c. Provide three samples of each color and material on 6 inch x 18 inch panels with texture to simulate actual finish. Label and identify each as to location and application.

1) Provide three samples of each color and material on 6 inch x 18 inch samples of natural and stained wood finish on actual wood surfaces. Label and identify each as to location and application.
2) Provide three 6 inch x 18 inch samples of masonry for each type of finish and color, defining filler, prime, and finish coat. Label and identify each as to location and application.

d. Resubmit samples as requested by A/E until acceptable sheen, color, and texture are achieved.

3. Paint Sample: Provide 4-one quart containers of each color or type. Label each

container with the project name, project number, name of the Contractor, name of the supplier, designated use, and type of paint in the container.

E. Warranty:

1. Submit paint manufacturer's proposed 6-year warranty document.
2. Submit paint manufacturer's proposed program of inspection and approval before and during the Work as required by paint manufacturer to implement the submitted 6-year warranty.
3. At the end of the paint work, provide to the Owner, from the authorized paint manufacturer representative, a signed and notarized letter stating that the surfaces painted have met all the conditions for paint adhesion.

1.05 QUALITY ASSURANCE

A. Qualifications: Paint applicator shall be licensed in the State of Florida or in Broward County and use state or county-certified journeymen. Provide a legible copy of license and, when applicable, a journeyman's certification attesting to qualification requirements.

B. Certifications:

1. Paint applicator shall provide a certification attesting to having worked on projects similar in scope to this project for a minimum of 5 years. Paint applicator not providing such documentation or not having the required experience will be removed from the project and replaced by the Contractor.

C. Only Owner approved materials will be allowed on the job site.

D. Quality assurance issues, including but not limited to, material selection, surface integrity and other tests, surface preparation, painting procedures, workmanship, and warrantability require review and acceptance by A/E.

E. Pre-Construction Meeting: At this meeting, or within 24 hours after that, Contractor shall meet with the Owner, A/E, Painting Subcontractor, representatives of the proposed materials manufacturers, and other parties involved in the work of this section. The agenda shall include:

1. Review of proposed materials and compliance with specifications.

2. Procedures to be followed and methods to be used in painting of new work with special emphasis on testing, repair, and preparation of surfaces.

a. Discuss and agree to modifications to the procedures established in Part 3 of this section required by the paint manufacturer to uphold the required 6-year warranty. Modifications, if any, are to be noted in writing by the manufacturer. Provide signed and notarized copies to A/E and the Owner and to all other parties present at the preconstruction meeting.

3. Coordination of the mockup requirements of this section and of other related sections.

4. Review of extent, procedures, and schedules for on-site tests, observation, and supervision by Materials Manufacturer's Representative according to requirements of this section and to enable the manufacturer to issue the required guarantees.
5. Review of warranties and guarantees required by the various parties, as specified in this section, in addition to the general guarantee required by Instructions to Bidders and General Conditions and statement by all parties concerned of their agreement or objection to the terms. Such statements shall be recorded in writing as part of the minutes of the meeting, with action suggested or taken to comply with contract requirements.

F. Coordination of Work:

1. Review other sections of the specifications in which prime paints are to be provided to ensure compatibility of total coatings system for various substrates.
2. Upon request from other trades, furnish information or characteristics of finish materials to be provided, to ensure compatible prime coats are used.
3. Phase projects to allow a minimum of 28 days for stucco and plaster to cure properly. If painting begins before the 28-day curing period, then a moisture and pH test shall be made according to ASTM D4262 and ASTM D4263. Provide a written record of such test and receive written approval from the A/E.

G. Mockups:

1. Provide a mockup of each wall surface condition, allowing space for a minimum of 100 sq.ft. for each color of paint to be used for project wall surfaces. Construct and cure, for a minimum of 28 days, the mockup walls in the same manner as required for the permanent walls.
2. After coordinating and receiving approval for application onto designated mockup sample walls, apply the approved paint samples.
3. Duplicate painted finishes of prepared samples on actual wall surfaces and other exterior and interior building components or on specially constructed mockup walls.
4. Provide full coat finish samples on at least 100 sq.ft. of surface, as directed, until required sheen, color, and texture are obtained. Simulate finished lighting conditions for review of in-place Work.

    a. Final acceptance of colors will be from samples applied on mockup.

H. Surfaces to be Painted:

1. Except where natural finish of material is specifically noted as surface not to be painted, paint exposed surfaces with colors as designated in schedules.
2. Where items or surfaces are not specifically mentioned, paint same as similar adjacent materials or areas.
3. If color or finish is not designated, coordinate with A/E for selection.

I. The following categories of Work are not included as part of field-applied finish work, unless otherwise specified:

1. Pre-Finished Items: Do not include painting of factory-finished or installer-

finished specified items such as, but not limited to, pre-finished partition systems, acoustic materials, architectural woodwork and casework, elevator entrance doors and frames, elevator equipment, finished mechanical and electrical equipment, light fixtures, switchgear, and distribution cabinets.

2. Concealed Surfaces: Painting is not required, unless noted otherwise on the Drawings, on concrete or masonry surfaces such as walls or ceilings in concealed and generally inaccessible areas, foundation spaces, furred areas, utility tunnels, pipe spaces, duct shafts, and elevator shafts.
3. Finished Metal Surfaces: Metal surfaces of anodized or enameled aluminum, stainless steel, chromium plate, copper, bronze, and similar finished materials will not require finish painting.
4. Operating Parts: Moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sensing devices, motor and fan shafts will not require finish painting.

J. Shop Priming:

1. Shop priming of ferrous metal items is included under various sections for structural steel, metal fabrications, hollow metal work, and similar items.
2. Shop priming of fabricated components such as architectural woodwork, wood casework, and shop-fabricated or factory-built mechanical and electrical equipment or accessories are included under other sections of these specifications.

K. Do not paint over code-required labels such as Underwriters Laboratories (UL) and Factory Mutual (FM), name, equipment identification, performance rating, or nomenclature plates.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to job site in original, new, and unopened packages and containers bearing manufacturer's name and label, and following information:

1. Name or title of material.
2. Federal Specification number.
3. Manufacturer's stock number and date of manufacture.
4. Manufacturer's name.
5. Contents by volume, for major pigment and vehicle constituents.
6. Application instructions.
7. Color name and number.
8. Indicate if paint is for interior or exterior use.

B. Storage:

1. Store materials not in actual use in tightly covered containers.
2. Maintain containers used in storage of paint in a clean condition, free of foreign materials and residue.
3. Protect from freezing or extreme heat, 95 degrees F. or above.
4. Keep storage area neat and orderly.
5. When flammable materials are to be left on-site during the Work, store the tightly covered materials in cabinets meeting the requirements of NFPA 30 and have FM and UL labeling.
6. Remove from the project site contaminated products from oil-based products and their by-products by the end of each working day.

1.07 PROJECT CONDITIONS

A. Environmental Requirements:

1. Apply water-based paints only when temperature of surfaces to be painted and surrounding air temperatures are between 50 and 90 degrees F., unless otherwise allowed by paint manufacturer's printed instructions.
2. Do not apply paint in rain, fog, or mist, or when relative humidity exceeds 85 percent, or to damp or wet surfaces, unless otherwise allowed by paint manufacturer's printed instructions.
3. Do not apply paint in areas that are not broom clean and free of dust and debris.
4. Painting may be continued during inclement weather if areas and surfaces to be painted are enclosed and heated within temperature limits specified by paint manufacturer during application and drying periods.

B. Workers Environmental Conditions:

1. Comply with the standards established in OSHA Workers Environmental Conditions.
2. Take precautions to ensure that personnel and work areas are adequately protected from fire and health hazards resulting from handling, mixing, and application of paints.
3. Illumination: Provide lighting equal to the permanent lighting planned for designated space.
4. Ventilation: Provide adequate ventilation to prevent buildup of fumes.

1.08 SEQUENCING AND SCHEDULING

A. Phase projects to allow a minimum of 28 days to properly cure concrete and stucco/plaster surfaces before the application of paint.

B. Phase the project to allow reasonable time for the inspection and written approval at each phase of the work by the Paint Manufacturer's Representative.

1.09 WARRANTY

A. Provide a written guarantee, co-signed jointly and severally by the Painting Subcontractor and Materials Manufacturers, against cracking, peeling, flaking,

chalking, and mildew on interior painted surfaces, and additionally against erosion and unreasonable fading on exterior surfaces, for 6 years; agreeing to repair and repaint surfaces affected by such defects, at no cost to the Owner including necessary removal or protection of other work, without limit, within 30 days after notification by the Owner, and to perform such work based on the provisions of this section, including extension of the guarantee to cover new work.

1.010 OVERAGE MATERIALS

A. Provide two 5 gallon containers, properly labeled and sealed, of each type and color of finished paint used on the project. If less than 10 gallons of a particular type and color was used, then provide 1 one-gallon container.

PART 2 PRODUCTS

2.01 MATERIALS

A. All paints and coatings specified in this section used in the building's interior shall comply with USGBC LEED Reference Guide for Green Building Design and Construction 2009 edition requirements to achieve IEQ Credit 4.2 Low-emitting materials – Paints and Coatings. All paints and coatings applied to interior walls and ceilings must not exceed the VOC content limits established in Green Seal Standard GS-11, Paints, 1st edition dated May 20, 1993. Anti-corrosive and anti-rust paints applied to interior ferrous metal substrates shall not exceed the VOC content limit of 250 g/L established in Green Seal Standard GC-03, Anti-corrosive paints, 2nd edition dated January 7, 1997. All clear wood finishes, floor coatings, stains, primers, and shellacs applied to interior elements shall not exceed the VOC content limits established in the South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings, rules in effect on January 1, 2004.

B. Use materials as follows:

1. Latex-based materials shall be used for painting of exterior and interior finishes.
2. UltraSpec by Benjamin Moore
3. ProMar 200 with GreenSure certification by Sherwin-Williams
4. A/E approved equivalent.

C. Primers, Undercoats, Split and Finish Coats: Use materials from same manufacturer when such materials are applied on same surface.

D. Paints for interior and exterior use shall be factory tinted with each stage of coating application (primer, first coat, and finish coat) to be visually distinguishable from the preceding coat until the final coat. The final coat shall match the selected color.

1. Label each container indicating whether it is primer, first coat, or finish coat.
2. Label each container with the name and number of the color.
3. Label each container indicating if it is intended for exterior or interior usage.

E. Color Selection:

1. If color is not listed for a specific area or item, Contractor is not relieved of responsibility for providing colors subsequently selected.
2. Color selection made by A/E is to determine basic color required for surface.
3. Colors with same designation but produced from two or more sources shall match when viewed from distance of 24 inches or more.
4. Final application of colors shall match prepared samples approved by A/E.

F. Storage Cabinets and Disposal Containers for Flammable Materials:

1. Meet the requirements of NFPA 30.
2. Contain Factory Mutual (FM) label and Underwriters Laboratories label.

PART 3 EXECUTION

3.01 INSPECTION

A. Pre-Construction Inspection: In conjunction with the meeting required in Part 1 of this section, the Painting Subcontractor and the Materials Manufacturer Representative shall conduct on-site inspections and perform tests to determine

1. Whether the corrective and preparatory work specified below is adequate, excessive, or insufficient to obtain the required performance criteria required in this section and the guarantee.

B. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

C. Start of painting operations implies contractor's acceptance of the surface conditions and responsibility for required standards of quality and appearance.

3.02 PREPARATORY WORK

A. Remove electrical outlet and switch cover plates, finish hardware escutcheons and cover plates, air-conditioning registers, and other finished items installed on surfaces to be painted, and replace afterwards or provide protection as approved by A/E. Protect items and surfaces that cannot be removed or that do not interfere with the painting, and leave clean and completely free of paint.

B. Clean surfaces of all dirt, dust, or other contaminants that affect adhesion of paint or appearance of paint. Clean grease and oil from metal surfaces with turpentine or mineral spirits, and wipe dry before priming. Wire brush or sand metal surfaces to remove rust and scale. Touch-up factory primed surfaces with compatible factory primers. Schedule the cleaning so that contaminants from the cleaning process will not fall onto the wet painted surfaces.

C. Fill nail holes, cracks, open joints, and other defects after priming or first coat is dry and before second coat is applied.

D. Allow all coats to dry thoroughly before applying succeeding coats. Comply with paint manufacturer's recommendations.

E. Prime finished work not shop coated when delivered to the job or as soon as possible after delivery. Back prime all woodwork to be erected against masonry or concrete before erection. Protect the tops and bottoms of all wood doors with a heavy coat of varnish before installation.

F. Clean and sand surfaces between coats with 150 Fine sandpaper or as recommended by the paint manufacturer.

3.03 APPLICATION

A. General:

1. Perform work in a thorough and professional manner in conformance with accepted good practices and requirements of authorities having jurisdiction.
2. Protect finished materials and areas not to be painted by using drop cloths, masking, or other accepted methods.
3. Provide adequate ventilation for proper drying of surfaces before and after painting.
4. Drying Period: Allow each coat to dry thoroughly before succeeding coats are applied. Minimum drying time shall be according to manufacturer's recommendations.
5. Paint Shading: Each coat of paint shall vary sufficiently to easily distinguish it from previous coats of paint, both interior and exterior applications.
6. Observation and Acceptance: As required by paint manufacturer between coats before application of next coat of paint materials.

B. Apply materials, as they come from manufacturer, to dry surfaces according to manufacturer's directions as printed on container. Any mixing on site requires specific and special approval of both the Owner and the A/E.

C. Apply paint materials to give an even, solid color with each coat. For deep tone finish colors, use deep base primers recommended by manufacturer.

D. Apply paint materials by brush, roller, or spray method.

1. Select method best suited to profile, texture, and finish of existing surface, subject to suitability regarding safety and conditions in existing or occupied areas, and subject to approval by paint manufacturer and A/E.
2. Apply materials evenly, smoothly flowed on and cut in neatly, without runs, sags, wrinkles, shiners, streaks, and brush marks; drying uniformly to color and sheen selected. Make dividing lines that separate colors straight and clean cut.

E. Dry Film Thickness:

1. Comply with manufacturer's specifications.
2. Minimum Dry Film Thickness: 5 mils (unless otherwise recommended by paint manufacturer), total finished application. Reduction of minimum thickness due

to special coating characteristics or application procedures requires written approval for each case.

3.04 FIELD QUALITY CONTROL

A. Notify A/E, material manufacturers representatives, and Owner when critical points in the painting and repainting work are reached, to allow timely inspection and approvals. Critical points include during and after the operation, plus other points designated by the Owner, A/E, or material manufacturer representatives:

1. Surface patching and preparation.
2. Sealing of surfaces.
3. Application of primer and transition coats. Adhesion testing of transition coats may be required.
4. Intermediate and finish coats.

3.05 ADJUSTING AND CLEANING

A. Remove construction debris, material containers, equipment, and other trash resulting from work of project.

B. Upon completion of work, remove stains and paint spots from floors, wall, woodwork, electric trim, hardware, fixtures, and other items of the Owner's property.

3.06 IDENTIFICATION OF SURFACES AND PAINTING SCHEDULE

A. Special Notes:

1. Sand surfaces normally smooth before application of paint materials and between coats of paint.
2. Preparation not completed or overlooked before application of first coat of paint shall be accomplished between coats of paint, regardless of acceptance on original preparation.
3. Severely corroded metal, if not specified for replacement, may need sandblasting according to SSPC-6 to achieve a warrantable surface for paint.

B. EXTERIOR SURFACES PAINT SCHEDULE

1. Stucco Walls:

1st Coat	Acrylic Primer-sealer pigmented.
2nd Coat	Acrylic latex semi-gloss.
3rd Coat	Acrylic latex semi-gloss.

2. Metal Doors:

1st Coat	Field applied rust inhibitive primer over shop primer.
2nd Coat	Acrylic latex enamel.
3rd Coat	Acrylic latex enamel.

3. Stucco Ceilings:

1st Coat	Acrylic latex primer.
2nd Coat	Acrylic latex semi-gloss.
3rd Coat	Acrylic latex semi-gloss.

4. Concrete or Blown Stucco Ceilings and Blown Stucco Walls.

1st Coat	Filler.
2nd Coat	Acrylic latex primer.
3rd Coat	Acrylic latex semi-gloss.
4th Coat	Acrylic latex semi-gloss.

5. Wood:

1st Coat	Sanding sealer.
2nd Coat	Acrylic latex semi-gloss.
3rd Coat	Acrylic latex semi-gloss.

C. INTERIOR SPACES PAINT SCHEDULE

1. Walls:

1st Coat	Acrylic latex wall primer.
2nd Coat	Acrylic latex semi-gloss.
3rd Coat	Acrylic latex semi-gloss.

2. Walls (Veneer Plaster only)

1st Coat	Alkyd-based penetrating chalky wall primer/sealer.
2nd Coat	Acrylic latex semi-gloss.
3rd Coat	Acrylic latex semi-gloss.

3. Metal Doors:

1st Coat	Field applied rust inhibitive primer over shop primer.
2nd Coat	Acrylic latex semi-gloss.
3rd Coat	Acrylic latex semi-gloss.

4. Ceilings Not Acoustically Treated:

1st Coat	Acrylic latex primer.
2nd Coat	Acrylic latex semi-gloss.
3rd Coat	Acrylic latex semi-gloss.

5. Wood Natural Finish - Shelving and Cabinets:

3 coats of wood sanding sealer.

6. Wood Natural Finish - Interior Doors, Frames and Trim:

1st Coat Sanding sealer.
2nd Coat Gloss varnish.
3rd Coat Gloss varnish.

7. Wood Semi-Gloss Finish - Interior Wood Surfaces and Doors:

1st Coat Wood primer.
2nd Coat Acrylic latex semi-gloss.
3rd Coat Acrylic latex semi-gloss.

D. INTERIOR AND EXTERIOR METALS PAINT SCHEDULE

1. Galvanized Metal: Apply neutralizer and allow to dry thoroughly.

1st Coat Galvanized metal primer.
2nd Coat Acrylic latex enamel (or aluminum paint)
3rd Coat Acrylic latex enamel (or aluminum paint).

2. Metal Sash - Doors and Frames:

1st Coat Metal primer.
2nd Coat Acrylic latex enamel (or aluminum paint).
3rd Coat Acrylic latex enamel (or aluminum paint).

3. Exposed Ferrous Metal:

1st Coat Rust inhibitive primer
2nd Coat Acrylic latex enamel.
3rd Coat Acrylic latex enamel.

4. Exterior Ungalvanized Metal Including Pipe Systems Subjected to Corrosive/Chemical Environments. System shall be at least 10 mil minimum dry film thickness.

1st Coat High performance rust inhibitive primer of aluminum epoxy mastic or accepted equivalent.
2nd Coat High performance chemical resistance coating.
3rd Coat High performance chemical resistance coating.

5. Other Metals Not Previously Mentioned:

1st Coat Rust inhibitive metal primer.
2nd Coat Acrylic latex enamel (or aluminum paint).
3rd Coat Acrylic latex enamel (or aluminum paint).

END OF SECTION

SECTION 09902

PAINT, PUTTY, AND CAULKING MATERIALS FORM

Date _____

General Contractor _____

Painting Sub-Contractor _____

Project Number _____

Project Name _____

Project Address _____

1. Paint, putty, and caulking materials as specified are accepted for use on only the project designated above.
2. Use paints, stucco and masonry paints, enamels, and metal finish coats with the specific base coats as specified.
3. Submit 3 completed typewritten or legible hand printed forms for each project for A/E's acceptance. Complete forms by providing all information required. Provide additional copies of the following forms as needed to include all paint groups.
4. Only materials accepted in writing shall be allowed on the job site.
5. Deviation from the above will be sufficient grounds for condemning not only such materials, but all work completed, in which case the Contractor shall properly prepare and repaint surfaces previously painted, to the satisfaction of the Owner, at no additional cost to the Owner.

I. EXTERIOR STUCCO LATEX PAINT:

A. Prime Coat:

1. Trade name _____

2. Manufacturer _____

3. Identification number _____

B. First Coat:

1. Trade name _____

2. Manufacturer _____

3. Identification number _____

C. Second Coat:

1. Trade name _____

2. Manufacturer _____

3. Identification number _____

II. METAL COATINGS:

A. Prime Coat:

1. Trade name _____

2. Manufacturer _____

3. Identification number _____

B. First Coat:

1. Trade name _____

2. Manufacturer _____

3. Identification number _____

C. Second Coat:

1. Trade name _____

2. Manufacturer _____

3. Identification number _____

III. INTERIOR AND/OR EXTERIOR SEMI-GLOSS

A. Prime Coat:

1. Trade name _____

2. Manufacturer _____

3. Identification number _____

B. First Coat:

1. Trade name _____

2. Manufacturer _____

3. Identification number _____

C. Second Coat:

1. Trade name _____

2. Manufacturer _____

3. Identification number _____

IV. INTERIOR AND/OR EXTERIOR HIGH GLOSS ENAMEL

A. First Coat:

1. Trade name _____

2. Manufacturer _____

3. Identification number _____

A. Second Coat:

1. Trade name _____

2. Manufacturer _____

3. Identification number _____

C. Third Coat:

1. Trade name _____

2. Manufacturer _____

3. Identification number _____

V. INTERIOR PAINT

A. First Coat:

1. Trade name _____

2. Manufacturer _____

3. Identification number _____

B. Second Coat:

1. Trade name _____

2. Manufacturer _____

3. Identification number _____

C. Third Coat:

1. Trade name _____

2. Manufacturer _____

3. Identification number _____

VI. ALCOHOL (denatured):

A. Trade name _____

B. Manufacturer _____

VII. CAULKING COMPOUND (gun grade):

A. Trade name _____

B. Manufacturer _____

VIII. CAULKING COMPOUND (knife grade):

A. Trade name _____

B. Manufacturer _____

IX. GALVANIZED METAL WASH:

A. Trade name _____

B. Manufacturer _____

C. Other _____

X. PUTTY GLAZING FOR METAL AND WOOD SASH, ALUMINUM GRAY:

A. Trade name _____

B. Manufacturer _____

XI. SPACKLING COMPOUND:

A. Trade name _____

B. Manufacturer _____

XII. REDUCERS: Paint Materials shall be reduced with a reducer recommended by the manufacturer and accepted in writing by A/E.

1. FLUID OIL COLORS:

   A. Manufacturer _____

2. FLOOR PAINT (Floor and Deck Enamel):

   A. Manufacturer _____

3. INTERIOR CONVENTIONAL FLAT WALL PAINT:

   A. Manufacturer _____

4. INTERIOR WALL PRIMER SEALER:

   A. Manufacturer _____

5. LINSEED OIL - RAW:

   A. Manufacturer _____

6. LINSEED OIL - BOILED:

   A. Manufacturer _____

7. LACQUER - FINISH COAT:

   A. Manufacturer _____

8. LACQUER - SAND SEALER:

   A. Manufacturer _____

9. MINERAL SPIRITS:

   A. Manufacturer _____

10. PAINT AND VARNISH REMOVER:

    A. Manufacturer _____

11. TURPENTINE (Gum):

    A. Manufacturer _____

12. TURPENTINE (Steam):

    A. Manufacturer _____

13. VARNISH (Exterior and/or Interior High Gloss):

A. Manufacturer _____

14. VARNISH (Interior Semi-Gloss):

A. Manufacturer _____

15. ALUMINUM PAINT:

A. Trade Name _____

B. Manufacturer _____

C. Identification Number _____

This is to certify the previously listed paint materials have been accepted by the A/E and the Owner for use on the specified project as designated.

SIGNED: _____
Painting Contractor

DATE: _____

SIGNED: _____
Owner's Representative

DATE: _____

Five signed copies are required. All five copies shall be returned to the A/E's office for acceptance and distribution.

END OF SECTION

SECTION 10170

SOLID PLASTIC TOILET PARTITIONS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Toilet partitions and urinal screens, complete with hardware.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. E84-96a Test Method for Surface Burning Characteristics of Building Materials.

1.03 SUBMITTALS

A. Product Data:

1. Show details of construction, assembly and anchorage to building construction, manufacturer's specifications including description of hardware, and maintenance instructions.
2. Include test reports confirming Class C and toxicity requirements.

B. Shop Drawings:

1. Provide dimensioned partition plans, elevations, details, swing of doors, color, and location of hardware items and required wall blocking.
2. Label components and fully describe anchorage devices and substrates.
3. Show relationship to plumbing fixtures.

C. Samples:

1. 6 inch by 6 inch samples of panel material in both stock and custom colors.
2. Include sample of fastener and shield for wall bracket anchorage.

D. Copy of manufacturer's standard 15-year warranty submitted with shop drawings, guaranteeing against material defects or faulty fabrication, assembly, and installation.

1.04 QUALITY ASSURANCE

A. Installer Certification: Provide documentation from the toilet partition manufacturer that installers have been factory-trained in the installation of these partitions.

B. Mock-Up: If required by A/E, install mockup of stall in area designated by A/E. Approval by A/E is required before ordering, production, or delivery of remaining partitions.

C. Gravity cam or integral hinges are not allowed.

1.05 PRODUCT DELIVERY, HANDLING, AND STORAGE

A. Ship components with protective wrap. Store and handle according to manufacturer's printed instructions.

1.06 WARRANTY

A. Upon completion of installation, submit warranty for 15-years starting at date of substantial completion, stating that failed products or installation shall be replaced at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Solid Plastic Toilet Partitions:

1. Ampco Products, Hialeah, FL: High Density Polyethylene.
2. Capitol Partitions, Columbia, MD: Poly-Pro HDPE.
3. Comtec Industries, Scranton, PA: Series S200.
4. Santana Products, Scranton, PA: Poly-Mar HD.

2.02 MATERIALS

A. Panels, pilasters, and doors of 1 inch thick seamless high-density polyethylene resin compound. A/E shall select color from manufacturer's stock or custom colors. All edges shall be machined to a 0.250" radius. Phenolic resin construction is not acceptable.

1. Plastic material shall comply with the following:

a. Flame Spread of less than 200 and Smoke Developed of less than 450 when tested according to ASTM E84.
b. Products of combustion of "no more toxic" than those from burning wood when tested according to NBS-TOX, 48.1.
c. Integral color shall be uniform throughout panel and all panels shall match.

B. Hardware: Provide solid plastic hardware when available.

1. Headrails: Extruded aluminum alloy with a clear anodized finish; anti-grip design, with stainless steel headrail brackets.
2. Hinges: Continuous hinge, aluminum, self-closing spring loaded barrel, snap-on covers, and tamper resistant sex bolts, 54 inches long.

a. Model A19 by Santana.
b. 400 Series by Markar Products, Lancaster NY.
c. Accepted equivalent.

3. Wall Brackets: Plastic to match type and color of plastic panels and full panel

length. Through-bolt brackets to panels and pilasters with tamper resistant sex bolts. Wall brackets shall be used for panel and pilasters, pilaster to wall, and panel to wall connections.

4. Pilasters: Plastic to match type and color of plastic panels with leveling bolts.
5. Shoes and Fasteners: Plastic shoes to match type and color as plastic panels. Use tamper resistant sex bolts.
6. Door Pulls, Door Strikes, and Door Stops: Heavy chrome-plated Zamac or stainless steel.
7. Door Latches: Stainless steel or aluminum housing, slide bolt, and button. Use tamper resistant sex bolts.
8. Provide clear anodized aluminum bars fastened to bottom edge of panels and doors with theft-proof countersunk screws. Bars shall be flush with faces of panels.
9. Finish of exposed portion of screws, bolts, and nuts shall match finish of attached hardware item. Sex bolts shall be stainless steel barrel nut and shoulder screw design with tamperproof head. Color to match bracket.

C. Anchorages:

1. Connection to wall shall provide a rigid and durable anchorage to wall construction. Use plastic shields, expansion bolts or "butterfly" type bolts. Finish of exposed portions shall match finish of wall brackets.
2. Plastic shields will not be accepted unless partition manufacturer can demonstrate that they will not work loose in wall or cause a less than rigid and durable anchorage, and be guaranteed by the partition manufacturer and the partition installer against pullout or loosening.

2.03 FABRICATION

A. Fabricate compartments to the following configuration. Dividing panels and doors shall be 58 inches x length required and with bottom edge of panels 12 inches from the floor. Top of pilasters shall be 82 inches above finish floor and fastened to 3 inch high shoes of same material as pilaster.

B. Fabricate urinal screens to the following configuration. Dividing panels shall be 42 inches x 24 inches long and with bottom edge of panels 18 inches from the floor. Provide ceiling support and fasten to floor shoes.

C. Using template provided by toilet accessories manufacturer, provide cutouts for recessed items.

D. Compartments for handicapped use shall be fabricated according to the latest accessibility code requirements.

E. Stall doors shall be self-closing.

PART 3 EXECUTION

3.01 PREPARATION

A. Verify dimensions at areas to receive partitions and plumbness of walls and soundness of wall surfaces that would affect installation of holding brackets. Verify blocking is installed in stud walls to receive partition anchorages.

B. Verify spacing of plumbing fixtures to assure compatibility with installation of partitions.

C. Do not begin installation of partitions until conditions are satisfactory.

3.02 ERECTION

A. Install partitions rigid, straight, plumb, and level. Follow partition manufacturer's printed installation instructions and final approved shop drawings.

B. Provide uniform clearance of not more than 1 inch between panels and walls, and clearance of not more than 1/4" at vertical edges of doors uniform from top and bottom.

C. Locate wall brackets with holes for wall anchorages occurring in masonry or tile joints wherever possible.

D. Conceal evidence of drilling, cutting, and fitting.

3.03 ADJUSTING AND CLEANING

A. Perform final adjustments to leveling devices and hardware.

B. Clean exposed surfaces of partitions, hardware, fittings, and accessories.

1. Avoid soiling other adjacent finishes.
2. Follow partition manufacturer's printed cleaning instructions.

END OF SECTION

SECTION 10200

WALL LOUVERS

PART 1 GENERAL

1.01 SUMMARY

A. Related Sections:

1. 07900 - Joint Sealers.

1.02 SUBMITTALS

A. Product Data: Include material specifications and printed installation instructions before starting work.

B. Submit FBC NOA for all wall louvers.

C. Shop Drawings:

1. Indicating louver locations and elevations, opening clearance dimensions and tolerances, head, jamb, and sill details, blade configurations, screens, frames, gage of metal, stiffeners, clips, fastening and anchor gage devices, and color standard selections.
2. Signed and sealed by a Florida registered professional engineer.

1.03 QUALITY ASSURANCE

A. Louvers shall be tested and certified according to Building Services and Research Information Services (BSRIA) and be 100 percent effective against water penetration.

B. Louvers, louver frames, mullions, and fastenings shall be designed to resist wind velocity pressures determined by American Society of Civil Engineers (ASCE) 7 (most current edition).

C. Deflection shall not exceed 1/180th of member span.

D. Certification: Submit manufacturer's certification that louvers and fastenings conform to code, minimum safe and deflection limits, and anodized film thickness requirement.

E. All wall louvers shall comply with all FBC NOA requirements for HVHZ.

PART 2 PRODUCTS

2.01 MATERIALS

A. Wall Louvers:

1. Manufacturers:

a. Vertical "Storm Resistant/Storm Class" aluminum louvers.

1) Model RS-4600, by Construction Specialties, Inc., (division of C/S Group of Companies), Cranford, NJ.
2) Model SCV8 by Airolite, Marietta, OH.
3) A/E approved equivalent.

b. Horizontal "Storm Resistant/Storm Class" aluminum louvers:

1) Model RS-8400 by Construction Specialties, Inc., (division of C/S Group of Companies), Cranford, NJ. or accepted equivalent.
2) A/E approved equivalent.

2. Sizes: As indicated on drawings.
3. Fabrication:

a. Materials: Fabricate blades, jamb frames, and mullions from extruded 6063-T52 aluminum alloy.
b. Bird Screens: Removable type, 1/4" square aluminum in aluminum channel frames.
c. Insect Screen: 18x16 fiberglass mesh or 18x14 metal mesh.
d. Fasteners: Approved stainless steel fasteners for securing louver frames to wall construction.
e. Finish: Kynar 500 as base vehicle. Clear or color anodized aluminum. Color as selected by A/E.
f. Sealant: As specified in Section 07920.

PART 3 EXECUTION

3.01 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.02 INSTALLATION

A. Install louvers where indicated on drawings according to manufacturer's printed installation instructions and accepted Shop Drawings.

B. After installation is complete, clean louver assemblies with materials and methods as recommended by manufacturer.

END OF SECTION

SECTION 10400

IDENTIFYING DEVICES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Labor and materials required for installation of plaque and signage

1.02 SUBMITTALS

A. Submit properly identified manufacturer's literature before starting work.

B. Shop Drawings:

1. Submit a full scale shop drawing or "rub" of plaque, for approval, before casting.
2. Submit a shop drawing of school name and address numbers for approval.

C. Each room shall receive 1 Raised Image laminated room sign.

D. Submit sign schedule showing each sign and text and/or image to be printed on each sign.

E. Submit manufacturer color sample sheet for selection by A/E.

F. Samples: Submit 3 samples of laminated signs to A/E for approval before fabrication. Approved samples may be used in work.

PART 2 PRODUCTS

2.01 MATERIALS

A. Dedication Plaque:

1. Material: Aluminum
2. Size: 14 inches x 20 inches high.
3. Text: Shall include name of facility, date of building dedication, A/E, and City of Pompano Beach Commissioner Names.
4. Finish: Stippled background with polished letters.
5. Manufacturer's approved fasteners for concealed mounting.
6. Manufacturers:

a. A.R.K. Ramos.
b. Gemini Inc.
c. Sheidow Bronze Corp.

B. Raised Image Laminated Signs:

1. Comply with Florida Building Code (FBC) for accessibility requirements.
2. 1/8" thick minimum plastic laminated material with 0.008" thick minimum plastic

face layer, of sizes, quantity, colors, with raised numbers, letters, Braille, or symbols as indicated on Drawings or as specified in this section for accessible signage, room identification, and life safety signage. Tape applied or glued raised text, braille, or symbols are not allowed.

a. Manufacturers:

1) Andco Industries Corp., Greensboro, NC.
2) A&J Signs Corp., Hialeah Gardens, FL.
3) ASE (Architectural Signs and Engraving) Inc., Orofino, ID.
4) Best Sign Systems, Montrose, CO.
5) Industrial Frames, Inc., Miami, FL.
6) Mohawk, Schenectady, NY.

3. 1/32" Raised Images:

a. Letters: Size, according to Drawings or 1 inch high, Helvetica medium.
b. Numbers: Size according to Drawings or 1 inch high Helvetica medium.
c. Braille: Tactile Grade II. Adhered labels are not allowed.
d. Symbols: Use Braille, letters, numbers, and Group One symbols sized per requirements of standard spacing.

4. Sizes:

a. Accessible Signage, Room Identification, and Life Safety Signage: 1-3/4" wide by length required or as custom designed.
b. Symbol Signage: 9 inches x 9 inches or as custom designed.
c. Directional Signage: 9 inches x 9 inches or as custom designed.

5. Mountings:

a. Mount using tamperproof screws, shields, and double face tape to hold signage in place. Use of adhesives is not allowed.

6. Colors:

a. Dark color background to be selected by A/E from manufacturer's color list for sign face and Braille and light color (to be selected by A/E from manufacturer's color list) raised text or symbols for the following:

1) All Rooms in Facility:

a) Interior/exterior signage for room names and room numbers. Room names and numbers shall be as listed on drawings.
b) Minimum one room name/room number/Braille sign per each entrance.

b. Red background for sign face and Braille, with white raised text or symbols for the following:

1) "FIRE EXTINGUISHER INSIDE" at each main door of a room containing a fire extinguisher. Provide a total of 1 sign of this type.

2) "STORAGE NOT PERMITTED" at mechanical and electrical rooms. Provide a total of 1 sign of this type.

PART 3 EXECUTION

3.01 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.02 INSTALLATION

A. Erect plaque to wall with concealed mounting where directed by A/E.

B. Mount facility name and address cast aluminum letters where indicated by A/E via threaded pins in drilled holes with mastic cement, and 1/2" diameter aluminum tube spacers.

C. Mounting of Laminate Plastic Signs:

1. Mount laminated signs with centerlines at 3'-6" and 5'-0" above finish floor according to FBC and as indicated on drawings with tamperproof fasteners and predrilled holes and double face tape. Use of adhesives is not allowed.

2. Signage shall be left clean and without any rough edges. Signage shall be left without any defects concerning installation from plumb and level, concerning material quality or any other discrepancy in mounting.

END OF SECTION

SECTION 10522

FIRE EXTINGUISHERS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Fire extinguishers and cabinets including necessary accessories.

B. Related Sections:

1. 09900 - Painting
2. 10400 - Identifying Devices
3. 15300 - Fire Protection

1.02 SUBMITTALS:

A. Product Data: Properly identified product data for fire extinguisher cabinets, mounting brackets and fire extinguishers.

B. Shop Drawings:

1. Shop and erection drawings for review indicating materials, dimensions, fasteners, and installation methods.

1.03 QUALITY ASSURANCE:

A. Comply with applicable standards of:

1. National Fire Protection Association (NFPA).

B. Equipment, accessories, materials, and quality of construction shall have a 5 year warranty against defects.

C. Fire extinguishers for "Low Hazard Areas" shall be in fire extinguisher cabinets.

1.04 SOURCE QUALITY CONTROL:

A. Manufacturer: Provide equipment manufactured by one manufacturer except where otherwise noted, uniform throughout as to method and type of construction used.

B. Nameplates: Identify the manufacturer with appropriate nameplates, UL labels, manufacturer's labels, and model numbers.

C. Pack each extinguisher with a hanging bracket acceptable for wall mounting with a latching metal, retainer strap around the cylinder, ready for installation, in a sturdy cardboard box labeled to identify contents fully when delivered to the site.

D. Store product in manufacturer's original protective packaging in a dry protected space until installed.

E. State Fire Marshall Tag Requirements: Size 2-1/4" x 5 1/4".

1. Notice not to remove.
2. Serial number of extinguisher and type of extinguisher.
3. Name of person who serviced the extinguisher.
4. Permit number of person who serviced the extinguisher.
5. Type of service performed.
6. Month and year the service was performed.

1.05 WARRANTY

A. Provide a 5-year warranty against defects for equipment, accessories, materials and quality of construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Extinguishers:

1. Dry Chemical Type:

a. General Fire Extinguisher Corp.
b. Larsen's, MP and DC series.
c. Potter Roemer, 3000 and 3300 series.
d. J-L Industries, Cosmic and Galaxy series.

2. Carbon Dioxide Type:

a. General Fire Extinguisher Corp.
b. Larsen's, CD Series.
c. Potter Roemer, 3400 series.
d. J-L Industries, Sentinel series.

B. Fire Extinguisher Cabinets, aluminum:

1. Larsen's: Architectural series.
2. Potter Roemer: Alta series.
3. J-L Industries: Academy series.

C. Extinguisher Brackets:

1. General Fire Extinguisher Corp. Model MVCP-5.
2. Accepted equivalent.

2.02 EQUIPMENT

A. Fire Extinguisher Cabinets and Supports:

1. Fire extinguishers in "Low Hazard Areas" shall be contained in an aluminum, fully recessed fire extinguisher cabinet at locations as shown on drawings.

2. Fire extinguisher brackets for ABC type models shall be provided in places where cabinets are not called for.

B. Fire Extinguishers: Dry chemical and ABC type multi-purpose with fog nozzle attached to a hose.

1. Types of Fire Extinguishers:

a. Hazardous Areas: 4A-60BC.

1) Storage rooms where paper products are stored.

b. Flammable Areas: (Sodium Bicarbonate) 40BC.

1) Air handling rooms.
2) Flammable storage areas.

c. Low Hazard Areas: 2A-10BC.

1) Hallways and remaining rooms.
2) Class A or B fire areas.

2. For use where wall brackets are specified (Hazardous Areas):

a. The extinguisher shall be a multi-purpose, dry chemical stored pressure type with a corrosion-resistant reusable metal cylinder with a durable red finish.
b. The extinguisher shall have a squeeze type valve, handle, and operating lever of corrosion-resistant metal having no plastic parts.
c. The extinguisher shall have a valve locking pin with a pull ring at one end of stainless steel or hard aluminum and shall not be removable without breaking the metal or plastic seal. One end of a metal chain shall be fastened to the valve lock pin pull ring with the other end securely attached to the extinguisher.
d. The extinguisher shall have a screw-in type visual pressure gage and discharge hose.
e. Each extinguisher shall have a securely attached nameplate or band bearing complete operating instructions, the name or mark of Underwriters Laboratories, Inc., a control number, the words "Listed", "Dry Chemical Fire Extinguisher", and the manufacturer's name and extinguisher model number. The classification shall also be indicated on the nameplate or band and shall indicate a minimum UL classification of 4A-60BC.
f. The extinguisher shall not exceed an overall height of 19-1/4", a cylinder diameter of 5-3/4" and an overall width of 9 inches.

3. For use where extinguisher cabinets are specified (Low Hazard Areas):

a. The extinguisher shall be a multi-purpose, dry chemical stored pressure type with a corrosion-resistant reusable metal cylinder of 5-pound capacity with a durable red finish.

b. The extinguisher shall have a squeeze type valve, handle, and operating lever of corrosion-resistant metal having no plastic parts.
c. The extinguisher shall have a valve locking pin with a pull ring at one end of stainless steel or hard aluminum and shall not be removable without breaking the metal or plastic seal.
d. The extinguisher shall have a screw-in type visual pressure gage and a discharge hose.
e. Each extinguisher shall have a securely attached nameplate or band bearing complete operating instructions, the name or mark of Underwriters Laboratories, a control number, the words "Listed", "Dry Chemical Fire Extinguisher", "Classification 2A-10BC", and the manufacturer's name and extinguisher model number.

4. Each type of extinguisher shall arrive on site, ready for use, charged with non-toxic, multi-purpose, silicon-treated ammonium phosphate type dry chemical and dry nitrogen gas.
5. Cabinet Door: Panel with full tempered glass, catch, and no lock.
6. Each 2A-10BC extinguisher shall also be at least the equal of the General Fire Extinguisher Corp. extinguisher Model TCP-5JH fitted with a discharge hose and provided with a Model MVCP-5 hanging bracket.

C. Fire Extinguishers: Alkaline dry chemical with a minimum UL classification of 20BC.

1. For Use With Wall Brackets (Flammable Areas):

a. The extinguisher shall be an alkaline dry chemical stored pressure type with a corrosion-resistant reusable metal cylinder with a durable red finish.
b. The extinguisher shall have a squeeze type valve, handle, and operating lever of corrosion-resistant metal shall have no plastic parts.
c. The valve locking pin with a pull ring at one end shall be of stainless steel or hard aluminum and shall not be removable without breaking the metal or plastic seal. One end of a metal chain shall be fastened to the valve lock pin pull ring with the other end securely attached to the extinguisher.
d. The extinguisher shall have a screw-in type visual pressure gage and discharge hose. Provide a discharge nozzle consisting of a 15 inch minimum hose assembly.
e. Each extinguisher shall have a securely attached nameplate or band bearing complete operating instructions, the name or mark of Underwriters Laboratories, Inc., a control number, the words "Listed", "Dry Chemical Fire Extinguisher", and the manufacturer's name and extinguisher model number. The classification shall also be indicated on the nameplate or band and shall indicate a minimum UL classification of 20BC.
f. The extinguisher shall not exceed an overall height of 19-1/4", a cylinder diameter of 5-3/4" and an overall width of 9".
g. Each extinguisher shall be ready for use, charged with an alkaline dry chemical, such as sodium bicarbonate or potassium bicarbonate, with a hanging bracket acceptable for wall mounting.

PART 3 EXECUTION

3.01 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.02 INSTALLATION

A. Install according to manufacturer's installation instructions and with approved shop drawings.

B. Verify rough openings for cabinets are correctly sized and located.

C. Install extinguisher cabinets accurately, without warpage, true to line, plumb and level at a maximum of 4'-6" height to the top of the fire extinguisher in the cabinet.

D. Install extinguishers using wall mount brackets true to line plumb and level at a maximum of 4'-6" height to the top of the fire extinguisher.

3.03 ADJUSTING AND CLEANING

A. Adjust extinguisher cabinets to provide tight fit at contact points and to ensure smooth operation, closure, and locking.

B. Cleaning:

1. Clean aluminum surfaces and glass promptly after installation exercising care to avoid damage to protective coatings and finishes.
2. Remove excess glazing and sealant compounds, dirt, and other substances.
3. Lubricate hardware and moving parts.

3.04 PROTECTION

A. Initiate and maintain protection and other precaution required to ensure that all units will be without damage or deterioration until time of acceptance.

END OF SECTION

SECTION 10800

TOILET ROOM ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

A. Related Sections:

1. 04220 - Concrete Unit Masonry.
2. 06100 - Carpentry.
3. 09310 - Ceramic Tile.
4. 10170 - Solid Plastic Toilet Partition.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions for each toilet accessory before starting work.

B. Samples:

1. Submit full-size samples of units to A/E for review of design and operation.
2. Acceptable samples will be returned and may be used in work.

C. Setting Drawings: Provide setting drawings, templates, instructions, and directions for installation of anchorage devices.

D. Submittals as required by Section 01910 and Section 01930.

1.03 QUALITY ASSURANCE

A. Coordination:

1. Inserts and Anchorages: Furnish inserts and anchoring devices to be set in concrete or built into masonry. Coordinate delivery with other work to avoid delay.
2. Accessory Locations: Coordinate accessory locations with other work to avoid interference and to assure proper operation and servicing of accessory units.

B. Source Quality Control:

1. Products: Provide products of same manufacturer for each type of accessory unit and for units exposed in same areas, unless otherwise acceptable to A/E.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Toilet Room Accessories:

1. A&J Washroom Accessories.
2. American Specialties.
3. Bobrick.
4. A/E approved equal.

2.02 MANUFACTURED UNITS

A. Toilet Paper Dispenser:

1. Surface mounted, multi-roll, stainless steel with theft resistant spindles and tumbler lock keyed like other bathroom accessories.
2. Manufacturers:

a. A&J Washroom Accessories: Model U840.
b. American Specialties: Model 20030.
c. Bobrick: Model B-2888.
d. A/E approved equal.

B. Grab Bars:

1. Lengths and configurations as indicated on drawings and as specified in this section.
2. Heavy duty with peened non-slip gripping surface, 1-1/2" diameter, stainless steel, with 1-1/2" wall clearance and with theftproof exposed fasteners.
3. Straddle bars, wall to floor with socket and horizontal grab bars according to manufacturer's model/series numbers.
4. Manufacturers:

a. A&J Washroom Accessories: UG130 Series.
b. American Specialties: 3500 Series.
c. Bobrick: B-6806 Series.
d. A/E approved equal.

C. Paper Towel Dispensers:

1. Surface mounted, equipped to dispense single-fold paper towels, stainless steel, with tumbler lock keyed like other bathroom accessories.
2. Manufacturers:

a. A&J Washroom Accessories: Model U190.
b. American Specialties: Model 20210.
c. Bobrick: Model B-262.
d. A/E approved equal.

D. Mirrors: Public and Staff Areas:

1. One piece roll formed frame of stainless steel angle with corners heliarc welded, ground and polished smooth, complete with minimum 20 gage galvanized steel back.
2. Tempered glass mirror electrolytically copper plated, No.1 quality, guaranteed against silver spoilage for a minimum 15 years. Sizes and locations as shown

on Drawings.

3. Manufacturers:

    a. A&J Washroom Accessories: Model U700 Series.
    b. American Specialties: Model 0600 Series.
    c. Bobrick: Model B-290 Series.
    d. A/E approved equal.

E. Feminine Napkin/Tampon Disposal:

1. Stainless steel, single recessed, self-closing doors, with tumbler lock keyed like other bathroom accessories.
2. Manufacturers:

    a. A&J Washroom Accessories: Models U582.
    b. American Specialties: Models 0473.
    c. Bobrick: Models B-254.
    d. A/E approved equal.

F. Soap Dispensers, Wall Mounted:

1. Surface mounted, stainless steel container, liquid type, with refill indicator, and with 40 oz. stainless steel soap container and tumbler lock keyed like other bathroom accessories.
2. Manufacturers:

    a. A&J Washroom Accessories: Model U124.
    b. American Specialties, Inc.: Model 9343.
    c. Bobrick: Model B-4112.
    d. A/E approved equal.

G. Soap Dispensers, Lav Mounted:

1. Soap dispenser with stainless steel container, lavatory mounted, 4 inch spout, 5 pound operating pressure, 20 ounce container. B-8221 by Bobrick or accepted equivalent.

PART 3 EXECUTION

3.01 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.02 INSTALLATION

A. Install toilet room accessories at locations shown on Drawings according to manufacturers' printed installation instructions.

B. Secure toilet room accessories to supporting substrate with fasteners and anchors of types necessary for rigid anchorage to substrate construction.

C. Install toilet room accessories plumb and true with horizontal lines level.

1. Conceal evidence of drilling or fitting in adjacent surfaces.

D. Special Tools or Keys:

1. Deliver properly identified special tools or keys of each type required for theftproof fasteners and for refilling dispensers or emptying receptacles.

E. Cleaning:

1. After installation, clean toilet room accessories in a manner not to damage finish and leave in conditions satisfactory to A/E.

END OF SECTION

SECTION 15010

GENERAL PROVISIONS

PART 1 GENERAL

1.01 SUMMARY

A. Substitutions and Product Options:

1. Products List: Submit list of major products proposed to be used with names of manufacturers and installing subcontractors.

2. Contractor's Options:

a. For products specified only by standard, select any product meeting standard.
b. For products specified by naming 1 or more products by manufacturer's name and catalog number, select any 1 of the products or manufacturers named.
c. Contractor may submit a request for substitution for any product or manufacturer not specifically named according to Instructions to Bidders and General Conditions.

3. Substitutions:

a. The A/E will consider written requests from the Contractor for substitution of products for 45 days after contract award date.
b. Submit a separate request for each product, supported with complete data, with drawings, and appropriate samples, including, in addition to the requirements of the General Conditions, the following:

1) Comparison of qualities of proposed substitution with product specified.
2) Changes required in other elements of the work because of proposed substitution.
3) Effect on construction schedule.
4) Cost data comparing proposed substitution with product specified.
5) Any required license fees or royalties generated by the proposed substitution.
6) Availability of maintenance service and source of replacement materials.

c. The Owner's decision on approval or rejection for substitution will be final.

4. A request for a substitution is a representation that the Contractor:

a. Has investigated proposed product and determined it is equal for less cost to or superior for equal cost in all respects to product specified.
b. Provides the same warranties or bonds for the proposed substitution as for the product specified.
c. Will coordinate installation of any accepted substitution into work and make other changes as may be required to make work complete.
d. Waives all claims for additional costs, under Contractor's responsibility, that may become apparent.
e. Has verified the proposed product qualifies for FPL Commercial/Industrial Energy Conservation Programs Standards rebates by meeting or exceeding FPL specified qualifications.

5. A/E will review requests for substitutions with reasonable promptness, and notify the Contractor, in writing, of the Owner's decision to accept or reject requested substitution.

1.02 SUBMITTALS

A. Submit shop and detail drawings, factory certified prints, brochures, and materials lists for items specified according to Specifications and Contract.

B. Substantial Completion Submittal Requirements:

1. Operating and Maintenance Manuals and Charts: Provide 3 complete sets of operating and maintenance instructions, literature, and information concerning equipment under this Division, including, but not limited to HVAC systems, indexed and bound in accepted loose leaf binders.
2. Record Prints:

a. Keep 1 complete set of prints on file at job site for sole purpose of recording "record" data. Mark changes in red on the prints as work progresses.
b. Update "record" prints before each requisition for payment for review and acceptance by A/E.
c. Deliver completed set of "record" prints to A/E before request for final payment.

1.03 QUALITY ASSURANCE

A. Qualifications: Perform work by workers skilled in their respective trades and install specified materials and equipment according to manufacturer's recommendations.

B. Where special qualifications are required, i.e., for welders or brazers, a currently active certificate of qualification from a recognized testing laboratory and dated within 12 months before performance of work will be required.

1. If quality of work of any such specially qualified worker creates reasonable

doubt as to skill, A/E may require worker to be removed and replaced.

C. Tradesperson Qualifications:

1. Contractor shall provide or cause to be provided by the appropriate subcontractors in the plumbing trades for all work required by this Division 15 a ratio of one licensed master or journeyman for every three trainees at all times as those terms are defined by Broward County Code. No other workers shall be allowed.
2. Where the work of these trades is subcontracted:

   a. The contractor shall include this requirement in those subcontracts.
   b. The subcontractor shall show capacity to bond the subcontracted work. The decision to require such bond to be issued remains with the general contractor.

D. To ensure compliance with the above tradesperson qualifications requirement, the General Contractor shall require the trade subcontractor to submit with each draw request, and shall in turn submit with the General Contractor's draw request, a certified payroll identifying each tradesperson employed for the work of this section during the payroll period, the qualification level of each tradesperson, and where licensed as a Master or Journeyman the license number of each individual.

1. This certified payroll shall also reflect the number of hours spent on this project performing the work of this section and shall reflect the appropriate ratio of qualified tradespersons as required by this section.
2. Failure to comply with this section either in providing the appropriate number of required licensed personnel or failure to submit the appropriate certified payroll information as required herein shall be a major breach of the contract and shall result in rejection of the payment application where the breach occurs and be cause for termination of the contract.

1.04 WARRANTY

A. Furnish copies to the Owner of guarantees for equipment or materials as specified in Instructions to Bidders and General Conditions.

B. The Contractor shall respond to repair of compressors, pumps, and other routine warranty service requests by completing repairs within 24 hours of service request by the Owner.

C. The Contractor shall respond to emergency warranty service requests with the arrival of service technician at affected site within 4 hours of notification of emergency. Repairs shall be expedited to bring system online as soon as possible. Emergencies include, but are not limited to failures of controls, cooling towers, and any other component causing system failure.

D. If problem is not correctable within specified time frames, the Contractor shall provide in writing an expected completion date to the Owner.

E. Inspections at End of Warranty:

1. At the end of the 1 year warranty period, the Owner will decide if the warranty items cited during the course of the warranty period have been completed to the satisfaction of the Owner.

PART 2 PRODUCTS

2.01 MATERIALS

A. Provide new materials, free from defects, of domestic manufacture unless otherwise noted.

2.02 EQUIPMENT

A. Use equipment scheduled in the Construction Documents to determine space and service requirements.

PART 3 EXECUTION

3.01 INSTALLATION

A. Clean surfaces free of grease, scale, rust, and other foreign matter and leave ready for painting.

B. Field paint exposed piping, ducts, hangers, and supports as specified in Section 09900.

1. Touch-up factory finishes marred in construction with factory touch-up kits.

C. Provide starters, required control items, and wiring diagrams for motors specified under this Division, unless otherwise noted.

D. Electrical items furnished shall conform to the requirements of Division 16.

3.02 FIELD SUPERVISION

A. Verify measurements at building site before starting work. Submit discrepancies and differences to A/E for consideration and decision before proceeding with work.

B. Obtain full information regarding:

1. Peculiarities and limitations of space available for installation of equipment.

2. Materials under contract.
3. Accessibility required to dampers, valves, and other apparatus, including any part of any system needing maintenance or operation.

C. Provide accurate layout, grades, and elevations. Set sleeves and openings in ample time for other trades to proceed in a timely manner. Take proper precautions to protect work and equipment from damage.

D. Cut openings and chases required to accommodate the Work and repair floors, walls, and ceilings damaged by such cuttings.

E. Perform required tests in the presence of A/E and authorities having jurisdiction. Give 48 hour notice before tests.

F. Insure compliance with safety codes and other codes and ordinances applicable to the performance of work under this Division.

3.03 FIELD QUALITY CONTROL

A. Work will be inspected by A/E during construction.

B. HVAC systems shall be operational and maintain 75 ± 2 degrees F. and a constant 55 ± 2 percent relative humidity for a period of at least 3 days (72 hours) before installation of specified interior finishes. These conditions shall be maintained at all times until interior finish installations are completed and accepted by A/E. Record conditions at least every 4 hours and provide supplemental temporary air-conditioning or dehumidification if HVAC is not operating at specified conditions. Exterior openings shall be be kept closed during these periods by using temporary or permanent barriers.

C. Maintain a repair log of equipment before substantial completion.

D. Prerequisites to substantial completion inspection shall be completed construction, testing, adjustments, repair logs, balancing, start-up, and required instruction periods on specified mechanical equipment and systems.

1. Air-conditioning:

a. Ductwork shall be installed complete with required dampers, deflectors, hangers, and insulation.
b. Air-conditioning units shall be leveled.
c. Control system components shall be installed and tested for function.
d. System testing and balancing shall be completed.

3.04 DEMONSTRATION

A. As a condition for substantial completion and after systems have been tested and checked as complete and operational, Upon the Owner's request and at no cost to the Owner, provide on-site training of the operation of systems to the Owner's maintenance and administrative staff.

B. Furnish a minimum of 8 hours or as needed to provide adequate in-service training. These sessions will be broken into segments to facilitate the training of individuals in operating the equipment. Operating manuals and user's guides shall be provided at training sessions.

C. The completion of such training shall be documented to the satisfaction of the Owner.

END OF SECTION

SECTION 15023

CODES AND STANDARDS

PART 1 GENERAL

1.01 REFERENCES

A. Comply with the most current version of the following:

1. Florida Building Code (FBC).
2. Florida Building Code (FBC) - Mechanical.
3. Florida Building Code (FBC) - Plumbing.
4. National Electrical Code - (NFPA 70).
5. National Fire Protection Association - (NFPA). NFPA 101 and other NFPA codes as applicable.
6. American National Standards Institute (ANSI) A117.1.
7. American Society of Civil Engineers (ASCE) 7.

1.02 QUALITY ASSURANCE

A. Where materials and equipment are available under the continuing inspection and listing service of Underwriters Laboratories (UL) and National Electrical Manufacturer's Association (NEMA), furnish materials and equipment so listed.

PART 2 NOT USED

PART 3 NOT USED

END OF SECTION

SECTION 15044

GENERAL COMPLETION

PART 1 NOT USED

PART 2 NOT USED

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

A. Construction, satisfactory testing, adjustments, balancing, start-up, and required instruction periods shall have been completed on specified mechanical equipment and systems before substantial completion inspection. All safety equipment shall be in place and operational. There shall be no undue equipment noises, leaks, or misaligned equipment.

1. Air-conditioning:

a. Ductwork: Installed complete, including required dampers, deflectors, hangers, and insulation.
b. Air-conditioning Units: Installed, cleaned, and leveled. New filters in place.
c. Condensers: Installed, leveled, and charged with refrigerant.
d. Insulation: Installed with no condensation leaks.
e. Control System Components: Installed and tested for function.
f. Safety Equipment: Installed and tested.
g. System Testing and Balancing: Complete.

2. Plumbing:

a. Piping: Pressure testing complete. System free flowing.
b. Plumbing Fixtures: Unchipped, leveled, clean, and handicapped accessible. Grouting completed.
c. Toilet Room Accessories. Installed and secured.
d. Insulation: Installed.
e. Domestic water: Permanent connection with backflow preventers in place.
f. Safety Equipment: Installed and tested.
g. Valving: Open.

3. Fire Protection:

   a. Water Flow Alarms: Tested and functioning.
   b. Fire Extinguishers: Installed.
   c. Sprinkler Heads: Supported and protected.
   d. Materials and Test Certificate: Complete and signed.

END OF SECTION

SECTION 15047

IDENTIFICATION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Identification including necessary accessories indicated on Construction Documents and specified in this section or as required for proper identification of equipment and piping.

B. Related Sections:

1. 02221 - Excavating, Backfilling, and Compaction for Utilities
2. 15410 - Piping (Plumbing).
3. 15510 - Piping (HVAC)

1.02 SUBMITTALS

A. Submit properly identified product and technical data including printed installation instructions before starting work.

1.03 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Color Coding: ANSI Z535.1 (latest edition) shall take precedence over any discrepancies in determining proper color code identification.
2. Conform to the standards established in ANSI A13.
3. Comply with OSHA standards.

PART 2 PRODUCTS

2.01 EQUIPMENT IDENTIFICATION

A. Identify equipment served by piping systems by number or legend as shown on Construction Documents.

B. Engraved Plastic Name Plates: Provide engraved laminated plastic name plates with 1 inch high letters on equipment cabinets.

C. Brass Tags: Provide appropriate sized brass tags on equipment where cabinets do not exist.

D. Piping Identification:

1. Color Coding: Identify piping with markers and directional arrows according to the following color coding system:

Description	Background	Letters
Hot Water	Yellow	Black
Cold Water	Green	White
Refrigerant	Yellow	Black
Fire	Red	White

2. Piping Identification Materials:

   a. Identify contents and flow direction of piping or pipes wrapped with insulation by using:

      1) Brady B-946 self-sticking vinyl.
      2) Champion America Inc., pressure sensitive vinyl.
      3) Seton Opti-Code.
      4) Ready Made adhesive pipe markers.

3. Valve Identification:

   a. Identify location and system under valve control with a color coded thumb tack under valve and lay-in ceiling tile.

E. Underground Tapes:

1. Electrical Warning Tape: 6 mil, 3 inches wide polyethylene.

   a. BURIED ELECTRICAL LINE BELOW - No.37236 by Seton or accepted equivalent.

2. 2" Metallic Detection Tapes:

   a. BURIED SEWER LINE BELOW - No.37220 by Seton or accepted equivalent.
   b. BURIED WATER LINE BELOW - No.37222 by Seton or accepted equivalent.

PART 3 EXECUTION

3.01 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

B. Verify surfaces are clean and dry before application of identification signage.

3.02 INSTALLATION

A. Brass Tags or Engraved Plastic Name Plates:

1. Install brass tags or engraved plastic name plates according to manufacturer's instructions.

a. Place brass tags or name plates in locations easily visible within the space at normal eye level or as otherwise directed by A/E.

B. Piping Markers and Directional arrows:

1. Location:

a. Pipes Passing Through Walls: Provide pipe markers and directional arrows on the pipe on each side of the wall.
b. Pipes Behind Access Doors/Panels: Provide pipe markers and directional arrows within view.
c. Continuous Run Pipe Lines: Provide pipe markers and directional arrows at intervals not exceeding 50 feet.
d. Risers and T Joints: Provide pipe markers and directional arrows at each riser and T joint.
e. Vertical and Horizontal Change of Direction: Provide pipe markers and directional arrows at each vertical and horizontal change of direction.

2. Special Requirements:

a. Directional Arrows: When identifying by directional arrows, point arrow head away from pipe markers and in the direction of flow.

1) Direction of Flow: If the flow can be in both directions, identify by using double-headed directional arrows.

b. Thin Film Pipe Markers and Thin Film Directional Arrows: When using both thin film pipe markers and thin film directional arrows on soft insulation, provide a spiral wrap of accepted pipe banding tape around the pipe as foundation for both markers and directional arrows.

C. Underground Tapes:

1. Electrical Warning Tape: Install warning tape 8 inches below finish grade on all underground outside electrical lines.
2. 2" Metallic Detection Tapes: Install metallic detection tape 4 inches to 6 inches below finish grade on all underground outside plumbing and air-conditioning lines.

END OF SECTION

SECTION 15051

MECHANICAL SUPPORT DEVICES

PART 1 GENERAL

1.01 SUMMARY

A. Related Sections:

1. Individual controllers for mechanical equipment specified in this Division with installation in Division 16.
2. Motor control centers, motor control panels, and other group controllers for mechanical equipment specified under Division 16.

1.02 SUBMITTALS

A. Properly identified manufacturer's catalog cuts and technical data before starting the work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Motors:

1. Gould "e Plus".
2. Baldor.

B. Starters:

1. Allen-Bradley.
2. Accepted equivalent.

2.02 EQUIPMENT

A. Motors:

1. Open Motors: Induction type, unless otherwise noted, with pressure gun grease fittings.

a. Provide slide rails where motor drives require adjustment.
b. Connected load shall not cause running current to exceed the nameplate amperage.

c. Rated Temperature Rise: 60 degrees.

2. Motors 1/6 HP and Under: May be split phase type, unless otherwise noted.
3. Motors Smaller Than 3/4 HP: Single phase, open, capacitor type according to NEMA standards wound for voltage specified on the drawings, 60 Hz, AC, unless otherwise noted.
4. Motors 3/4 HP and Larger: 3 phase, Class B, general purpose, squirrel cage, open type, induction motors according to NEMA Design B standards, wound for voltage specified on the drawings, 60 Hz, AC, unless otherwise noted.
5. Motors 1 HP and Larger: In addition to motors 1/6 HP and under, shall be high efficiency/high power factor minimum of 0.85 at rated load.

B. Starters:

1. For Motors Smaller Than 1/2 HP: Allen-Bradley Bulletin 609, across-the-line type with "on/off" push button (unless otherwise noted) suitable for mounting in standard electric switch box.
2. For Motors 1/2 HP and Larger: Allen-Bradley Bulletin 709 with control circuit transformers, fused CLF primary, overload protection in 3 phases and "manual-off-auto" switch in covers, unless otherwise noted.

   a. Provide NEMA 1 enclosures, unless otherwise noted.

3. Manual Starters for Small 3 Phase Motors: Where indicated, Allen-Bradley Bulletin 609, with toggle operator and 3 overload heaters.

   a. Provide NEMA 1 enclosures, unless otherwise noted.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install specified equipment according to manufacturer's recommendations and applicable codes and regulations.

END OF SECTION

SECTION 15090

SUPPORTS, ANCHORS, AND SEALS

PART 1 GENERAL

1.01 SUMMARY

A. Related Sections:

1. 15410 - Piping (Plumbing).
2. 15430 - Piping Specialties (Plumbing).
3. 15515 - Valves, Hangers, and Specialties.

1.02 REFERENCES

A. Pipe Supports: ANSI B31.1, Power Piping.

1.03 SUBMITTALS

A. Submit properly identified manufacturer's literature before starting work.

PART 2 PRODUCTS

2.01 MATERIALS

A. Inserts:

1. Malleable iron case of galvanized steel shell expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, and lugs for attaching to forms.
2. Size insert to suit threaded hanger rods.
3. Wall Support:

   a. Pipe Sizes to 3 Inches: Cast iron hook.
   b. Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamps.

4. Vertical Support: Steel riser clamp.
5. Floor Support:

   a. Pipe Sizes to 4 Inches and All Cold Pipe Sizes: Cast iron adjustable pipe saddle, locknut nipple, floor flange and concrete pier to steel support.
   b. Hot Pipe Sizes 6 Inches and Over: Adjustable cast iron roll and stand, steel screws and concrete pier or steel support.

6. Provide copper plated supports for copper piping or provide sheet lead packing

between support and piping.

B. Hanger Rods: Provide steel hanger rods, threaded both ends, threaded one end, or continuous threaded.

C. Flashing:

1. Steel flashing: 26 gage stainless steel.
2. Safes: 5 pounds per square foot sheet lead or 8 mil thick neoprene.
3. Caps: Stainless steel, 22 gage minimum except 16 gage at fire resistant structures.

D. Sleeves:

1. Pipe Through Floors: Form from 18 gage galvanized sheet metal.
2. Pipes Through Beams, Walls, Fireproofing, Footings, Potentially Wet Floor: Form from steel plate or 18 gage galvanized sheet metal.
3. Size large enough to allow for movement due to expansion.

PART 3 EXECUTION

3.01 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.02 INSTALLATION

A. Inserts:

1. Use inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams wherever practicable.
2. Where concrete slabs form finished ceiling, furnish inserts flush with slab surface.

B. Supports:

1. Support PVC according to manufacturer's requirements.
2. Support riser piping independently of connected horizontal piping where practical.

C. Priming: Prime coat exposed steel (not galvanized) supports.

D. Flashing: Flash and counterflash where mechanical equipment passes through weather or waterproofed walls, floors, and roofs.

E. Sleeves: Where piping passes through floor, ceiling, or wall, close space between

pipe or duct and construction with noncombustible insulation. Provide tight fitting metal caps on both sides and caulk (See Division 15010 for caulking requirements).

END OF SECTION

SECTION 15180

MECHANICAL SYSTEMS INSULATION

PART 1 GENERAL

1.01 SUMMARY

A. Related Sections:

1. 15510 - Piping (HVAC).
2. 15410 - Piping (Plumbing).
3. 15515 - Valves, Hangers, and Specialties.
4. 15890 - Ductwork.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. C534-94 Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
2. C547-95 Specification for Mineral Fiber Pipe Insulation.
3. C552-91 Specification for Cellular Glass Thermal Insulation.
4. C553-92 Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
5. C585-90 Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).
6. C612-93 Specification for Mineral Fiber Block and Board Thermal Insulation.
7. D1056-91 Specification for Flexible Cellular Materials-Sponge or Expanded Rubber.
8. D1668-95 Specification for Glass Fabrics (Woven and Treated) for Roofing and Waterproofing.
9. E84-96a Test Method for Surface Burning characteristics of Building Materials.
10. E96-95 Test Methods for Water Vapor Transmission of Materials.

B. National Bureau of Standards (NBS).

C. National Fire Protection Institute: NFPA 90A.

D. Underwriters Laboratories (UL) - 723.

E. Insulation Contractor’s Association of South Florida Inc.

1.03 SUBMITTALS

A. Submit properly identified manufacturer's catalog cuts, performance curves, and procedures before starting work.

1.04 DELIVERY AND STORAGE

A. Protect materials from the weather during storage and installation.

1.05 QUALITY ASSURANCE

A. Materials shall be labeled, listed, or have certified test reports submitted from testing laboratory accepted by the Owner.

B. Comply with the most stringent requirements between the Insulation Contractors Association of South Florida Inc. and as specified.

C. There shall be no fiberglass in contact with the HVAC airstream anywhere in the system whether protected by encapsulation or not.

D. Foam plastic insulation shall be certified, by an independent third-party national recognized laboratory, that the product emits less than 1 part per million formaldehyde out gassing after 24 hours.

1.06 FIRE HAZARD RATING

A. Fire hazard rated materials shall be UL labeled or a certified test report by a Owner accepted testing laboratory shall be submitted indicating compliance with specified fire hazard requirements.

B. Insulation (including adhesives) shall be fire retardant or self-extinguishing. Finishing jackets, insulation, and adhesives shall have composite fire and smoke ratings complying with ASTM E84, NFPA 255, and UL 723, as plain or on a composite basis.

C. When insulation, vapor barrier covering, wrapping materials, and adhesives are applied separately in field, each item shall be tested individually.

D. When insulation, vapor barrier covering, wrapping materials, and adhesives are factory composite systems, they shall be tested as an assembly.

E. Insulation materials, adhesives, coatings, and other accessories shall have a fire hazard rating not more than 25 for flame developed and not more than 50 for fuel contributed and smoke developed, except as follows:

1. Flexible unicellular insulation.
2. Nylon anchors for securing insulation to ducts or equipment.
3. Factory premolded 1 piece PVC fitting and valve covers

F. Flame resistance treatments subject to deterioration due to effects of moisture or high humidity are not acceptable.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Insulation:

1. Armaflex.
2. Armstrong.
3. Certain-Teed.
4. Cell-U-Foam.
5. Foamglas.
6. Manville.
7. Owens-Corning.
8. Pittsburgh Corning.

B. Insulating Cement:

1. Keene Powerhouse.
2. Benjamin Foster.
3. Fibrex FBX fast set.

2.02 MATERIALS

A. Insulation: Type and thickness as specified.

1. Provide fire retardant or self-extinguishing insulation, including adhesives.
2. Finishing jackets, insulation, and adhesives shall have composite fire and smoke ratings per ASTM E84, NFPA 255, and UL 723.

B. Domestic Hot Water Supply Piping Insulation:

1. 1" thick molded fiberglass insulation with pre-sized factory applied FRJ jacket of glass cloth with longitudinal lap and butt joint strips with self-sealing adhesive.
2. Insulation may be 1/2" insulation for vertical branches to individual fixtures.
3. Minimum density of 7-1/4 pounds per cubic foot, maximum thermal conductivity factor of 0.26K at 75 degrees F. mean temperature, and alkalinity of 0.696.
4. Flame Spread: 25 or less.
5. Smoke Developed: 50 or less.
6. Accessories: Adhesives, mastics, cements, tapes for fittings, and related materials shall have the same composite ratings as listed above.

C. Cold Drainage Piping Drinking Fountain, and Electric Water Cooler Drain Piping Insulation:

1. Elastomeric (foam plastic) thermal insulation 1 inch thick with built-in vapor barrier rated self-extinguishing ASTM D1056.
2. Maximum thermal conductivity factor of 0.26K at 70 degrees F. mean temperature, density of 5-6 pounds per cubic foot, and a water vapor transmission of 0.1 perms.

D. Hot Water Storage Tank Insulation:

1. 3 inch thick block insulation with V-grooves.
2. Secure with 24 gage galvanized wire or 1/2" wide galvanized bands on 12 inch centers.
3. Finish with exposed smooth coat of insulating cement and when dry apply Foster GPM mastic with glass cloth reinforcing

E. Heat Exchanger Insulation:

1. 1-1/2" thick calcium silicate applied in sectional form or lags cut to fit, apply dry.
2. Fasteners: 24 gage galvanized wire or 1/2" wide galvanized bands on 12 inch centers.
3. Finish: Smooth coat of insulating cement and finish with 1200 degrees F glass cloth applied with fire resistant adhesive.
4. Density of 14 lbs. per cubic foot and factor thermal conductivity of 0.42K.

F. Tape: As recommended by the insulation manufacturer.

G. Insulating Cement: All-purpose mineral wool cement.

H. Molded Fiberglass Pipe Insulation:

1. Rigid molded sectional pipe covering with integral factory jacket.
2. Comply with ASTM C547.
3. Maximum Thermal Conductivity: 0.23K factor at 75 degrees F. mean temperature.
4. Alkalinity: Less than 0.6 percent.

I. Foamed Plastic Insulation:

1. Closed cell.
2. Comply with ASTM C534.
3. Maximum Thermal Conductivity: 0.27K factor at 75 degrees F. mean temperature.
4. Water Vapor Permeability: 0.1 perms.

J. Flexible Fiberglass Ductwrap Blanket Insulation:

1. 2.2/2.3 inches thick, 3/4" pcf density fiberglass blanket with UL approved aluminum foil vapor seal facing reinforced with fiberglass scrim, laminated to 30 lb. kraft paper, R = 6.5.
2. Comply with ASTM C553, TYPE I, Class B-4.
3. Maximum Thermal Conductivity: 0.24K factor at 75 degrees F.

K. Rigid Fiberglass Ductboard Insulation:

1. Comply with ASTM C612.
2. Maximum Thermal Conductivity: 0.24K factor at 75 degrees F.
3. Provide scrim foil facing having a minimum 3 pcf density, 2 inches thick.

L. Accessories:

1. The following accessories shall be used in the application of thermal insulation:

a. PVC fittings cover and PVC jacketing:

1) Certain-Teed "Snap Form".
2) Manville Corp. "Zeston".
3) Proto.

b. Vapor Seal Mastic:

1) Benjamin Foster 30-86 or 30-25.
2) Childers CP-30.

c. Lagging Adhesive:

1) Benjamin Foster 81-42W.
2) Childers CP-50.

d. Breather Mastic:

1) Benjamin Foster 45-00 or 30-86.
2) Childers CP-10.

e. Insulation Bonding Adhesive (to metal):

1) Benjamin Foster 85-20, or 85-15.
2) Childers CP-82.

f. Insulating and Finishing Cement:

1) Fibrex Inc. FBX Super Blend Cement.
2) Manville Corp. No.375 Insulating and Finishing Cement.
3) Keene Corp. Super Powerhouse.

g. Coatings: Sealfas G-P-M mastic or accepted equivalent.
h. Fire Resistive Mastic: As manufactured by Benjamin Foster or accepted equivalent.
i. Sealants: 81-33 as manufactured by Benjamin Foster or accepted equivalent.
j. Staples: Type 304 or 316 stainless steel outward clinching type.
k. Wire: 16 gage, copper weld wire.
l. Bands: 3/4 by 0.015" thick galvanized steel.

2.03 SYSTEMS INSULATION BY TYPE

A. Interior Domestic Hot Water Supply/Return Piping Insulation:

1. Molded Fiberglass Pipe Insulation: 1 inch thick with pre-sized factory applied FRJ jacket of glass cloth with longitudinal lap and butt joint strips with self-sealing adhesive.
2. Contractor's Option: Foamed plastic insulation, 1 inch thick.

B. Electric Water Cooler Drain, Cold Drainage Piping Refrigerant Suction Piping, and Interior Condensate Drain Piping Insulation:

1. Foamed Plastic Insulation: 1 inch thick with field applied vapor barrier mastic at joints.

C. Interior Concealed Ductwork Insulation:

1. Flexible fiberglass Ductwrap Blanket Insulation:

a. 2.2 inches thick, 3/4 pcf density.
b. 2.0 inches thick, 1-1/2 pcf density.

D. Interior or Exterior Exposed Ductwork Insulation:

1. Rigid Fiberglass Ductboard Insulation: 2 inches thick, 3 pcf density, with field applied fab and mastic finish consisting of a 10 x 10 glass fabric imbedded in 2 coats of a white breather weather barrier mastic.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install insulation according to applicable codes and regulations.

B. Except as specified, install materials according to manufacturer's recommendations and specifications for obtaining conformance to construction documents.

C. Packages or standard containers of insulation, jacket material, cements, adhesives, and coatings delivered for use and samples required for acceptance shall have manufacturer's stamp or label attached listing manufacturer, brand name, and a description of material.

D. Provide allowances for expansion/contraction, and wall and manhole penetrations.

E. Run continuous through wall, floor, and ceiling penetrations.

F. Insulation materials shall not be applied until:

1. Test results specified in other sections of these specifications are completed and accepted.
2. Rust, scale, dirt, and any other foreign material have been removed.
3. Ductwork or piping material are clean, dry, joints firmly butted together, and tightly sealed at all joints, seams, and fittings.

G. Wrap butt joints with a 3 inch wide strip of the same material as the jacket.

H. Provide aluminum jackets over the insulation where sealant is required.

I. Insulation shall be kept clean and dry at all times.

J. Duct Materials:

1. Internal duct lining is not allowed.
2. Duct materials solid exposed to the airflow shall be noncombustible metal.
3. Duct insulation for thermal or acoustical purposes shall be separated from airflows by solid metal.
4. Provide natural noise attenuation procedures, as recommended in ASHRAE, Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), and industry good engineering practices.
5. Fiberglass ducts or ductboards shall not be used to convey air.

K. Protection Shield: Where pipe or tubing insulation pass through hangers, provide:

1. For Piping 4 inches and smaller: A protection shield, 180 degree arc, 16 gage galvanized sheet metal covering, minimum 12 inches long.
2. For Piping Larger than 4 inch diameter: A protection shield, 180 degree arc, 16 gage galvanized sheet metal covering, minimum 18 inches long.
3. Hangers not exceeding maximum spacing distances recommended by

insulation manufacturer to prevent crushing or compressing insulation.

L. Ductwork sizes shown on drawings are actual internal "air side" dimensions.

M. Flanges, Fittings, and Valves on Insulated Piping:

1. Provide pre-molded glass fiber fittings wired or taped on and adhered with canvas jacket.
2. Terminate insulation and jacket neatly and finish with insulating cement troweled to a bevel and of the same thickness as adjoining insulation.
3. Vapor seal insulation on cold systems.

N. Vapor Barriers:

1. Intact and continuous.
2. Do not install with staples.

O. Omit Pipe Insulation From the Following:

1. Screwed unions, except at "cold drains" and air- conditioning wastes. Terminate insulation neatly at both sides of unions with insulation cement.
2. Discharge lines from safety and relief valves.
3. Nickel or chrome plated piping.

P. All ductwork shall be insulated, except as noted below:

1. Outside air intake ductwork in non-air conditioned spaces only.
2. Exhaust air ductwork.

Q. Ceiling supply air registers located on perimeter rooms and corridors shall be field insulated with flexible fiberglass ductwrap insulation as specified. Insulation shall cover the upper body and installation flanges.

R. All appurtenances subject to condensation shall be protected as necessary and covered with vapor seal mastic.

3.02 APPLICATIONS

A. Molded Fiberglass Pipe Insulation Installation (Hot Water Supply/Return):

1. Tightly butt together sections of insulation on pipe runs sealing longitudinal seams of jacket with self- sealing laps. Position longitudinal seam so seam is on bottom to prevent dirt and moisture infiltration. Seal end joints with 3 inch wide straps of vapor barrier tape. Seal ends of insulation with vapor seal mastic at valves, fittings and flanges.
2. Cover valves, fittings, and flanges with insulation similar to adjacent pipe

covering, or one piece PVC cover sections as specified.

B. Foamed Plastic Insulation Installation (Return Suction Piping, Interior Condensate Drains, and Electric Water Cooler Drains):

1. Insulation shall be slipped on pipe without slitting. Butt joints shall be sealed with the manufacturer's recommended adhesive.
2. Where slip-on techniques are not possible, the insulation shall be carefully slit and applied to the pipe. Seal joints with the manufacturer□s recommended adhesive.
3. Insulate valves and fittings with fabricated foamed plastic insulation, or one piece PVC cover sections as specified.
4. Provide mastic vapor barrier for chilled water service insulation for areas subject to conditions of 90 degrees F or 85 percent relative humidity or higher.

C. Flexible Fiberglass Ductwrap Blanket Insulation Installation:

1. Apply insulation to duct with joints tightly butted. Prepare stretch-out dimensions and cut out insulation so a 2 inch minimum overlap is created that will overlap the facing and insulation at the other end, and the adjoining seam. Install so insulation is not excessively compressed at duct edges. Foil face shall be on outside. Seams shall be stapled approximately at 6 inches on center with outward clinching staples.
2. On ductwork having a 24 inch or larger dimension, insulation shall be secured to the bottom of the duct with mechanical fasteners spaced at not more than 18 inches on center. and held in place with washers or clips. Cut off protruding pin after clips are secured.
3. Seal all insulation joints, pinheads, tears, punctures, washers, clips, and staples with 2 coats of a vapor barrier mastic type sealant, reinforced with 1 layer of 4 inch woven glass fabric.

D. Rigid Fiberglass Ductboard Insulation Installation:

1. Apply insulation tightly and smoothly to duct.
2. Secure insulation on the sides and bottom of duct by impaling insulation over pins or anchors located not more than 18 inches apart and held in place with washers or clips.
3. Cut off protruding pins after clips are secured and seal with vapor barrier mastic.
4. Apply insulation with joints tightly butted.
5. Seal ductwork joints, punctures, and pin heads with a vapor barrier mastic type sealant.
6. Insulation shall be continuous through walls and floors except at fire dampers and at combination smoke/fire dampers.
7. Finish with field applied fab and mastic finish consisting of a 10 x 10 glass fabric imbedded in 2 coats of a white breather weather barrier mastic.

E. Electric Duct Heaters:

1. Insulate all sides of electric duct heaters (except control panel side) installed in supply air ducts, as specified for supply air ductwork.

END OF SECTION

SECTION 15440

PLUMBING FIXTURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Basic Requirements: Provisions of Section 15010, BASIC MECHANICAL REQUIREMENTS, are a part of this Section.

1.02 SUMMARY

A. General: Provide plumbing fixtures, traps, tailpieces, trim, devices and appurtenances as indicated.

1.03 ADDITIONAL REQUIREMENTS

A. Related Sections: Other Sections of Division 15 which relate to the requirements of this Section may include but are not limited to the following:

1. 15050, BASIC MECHANICAL MATERIALS AND METHODS
2. 15060, PIPE AND FITTINGS
3. 15410, PLUMBING PIPING SYSTEM
4. 15450, PLUMBING EQUIPMENT

B. Related Divisions: Other Divisions of these specifications which relate to the requirements of this Section may include but are not limited to the following:

1. Division 1, ALTERNATES

1.04 SUBMITTALS

A. General: Refer to paragraph entitled "SUBMITTAL" in Section 15010. Provide shop drawings and manufacturer's data sheets for the following items:

1. Manufacturers Literature:

a. Dimensional outline drawing for each plumbing fixture including fittings and trim.

b. Outline drawings and data sheets for the following items of plumbing equipment:

(1) Each type of floor drain or floor sink including trap primer.
(2) Shower pan material.
(3) Each type of roof drain.
(4) Each clean-out and clean-out covers including wall access cover.
(5) Water hammer arrester including capacity and pipe connection size.

2. Installation Instructions:

   a. Manufacturer's printed installation instructions including copies shipped with each fixture.

   b. Mounting templates for fixtures.

   c. Pressure and fixture unit capacity for water hammer arresters.

3. Maintenance Instructions:

   a. Exploded parts list for each item.

1.05 APPLICABLE STANDARDS

A. General: All equipment, material, accessories, methods of construction and reinforcement, finish quality, workmanship and installation shall be in compliance with the paragraph entitled "Code Compliance" in Section 15010.

B. Handicap Access: Fixtures indicated to provide handicap access shall be designed, manufactured and installed in accordance with ANSI 117.1-1986 and the “Florida Accessibility Code for Building Construction” from the Florida Board of Building Codes and Standards, Department of Community Affairs, October 1997 Revision with amendments.

C. ASSE: Fixtures and devices shall comply with the standards of the American Society of Sanitary Engineers, where required.

D. ADA: Fixtures, devices and installation clearances and heights shall comply with the requirements of the Americans with Disabilities Act (ADA).

E. PDI: Fixtures and devices shall comply with the standards of the Plumbing and Drainage Institute, where required.

PART 2 - PRODUCTS

2.01 GENERAL

A. Manufacturer: Refer to paragraph entitled "MANUFACTURERS" in Section 15010.

B. Material: Fixtures shall be white vitreous china unless otherwise indicated. Where enameled iron fixtures are specified, they shall be furnished with acid resisting enamel.

C. Quality: Plumbing fixtures shall be "First Quality" as defined and set forth in Commercial Standard CS77-28 as promulgated by the U.S. Department of Commerce. Fixture fittings shall comply with ANSI/ASTM A112.18.1M - 1989. Plumbing trim for water closet bowls, tanks and urinals shall comply with ANSI/ASTM A112.19.5 - 1990.

D. Similar Character and Design: Fixtures and fittings of a similar type shall be from a single manufacturer.

E. Vitreous China Fixtures: Vitreous china fixtures shall comply with ANSI A112.19.2M - 1990.

F. Enameled Cast Iron Fixtures: Enameled cast iron fixtures shall comply with ANSI A112.19.1M - 1986.

G. Porcelain Fixtures: Porcelain enameled steel fixtures shall comply with ANSI A112.19.4M - 1990.

H. Exposed Metal: Exposed metal shall be polished chromium on either brass or bronze, unless otherwise indicated. Supply valves shall have renewable seats and discs. Hot and cold water supply to fixtures shall be provided with stops. Provide P-trap with clean-out for each lavatory and sink except as indicated.

I. Concealed Carriers: Provide a cast iron or steel concealed arm, floor-mounted carrier with cast iron feet and steel uprights to support all wall mounted lavatories, sinks, urinals, and water closets. Carriers shall comply with ANSI A112.6.1.M - 1979 and shall have adjustable support plates, alignment truss, and mounting fasteners. Floor mounted carriers shall withstand an applied vertical load of 250 pounds on the front of the fixture indefinitely without breaking or permanently deforming. Supports and carriers shall have adjustments capable of permitting field alignment to allow for actual site conditions.

J. Trap Primers: Traps primers shall be water supply-fed type and shall comply with ANSI/ASSE 1018-86.

K. Vacuum Breakers: Vacuum breakers shall be full-line size, bronze with rough chrome plating, or polished chrome plating where exposed, full-line size, and shall conform to ASSE 1001-1988 or 1020-1988 as applicable.

2.02 FLOOR DRAINS

A. General: Floor drains and floor sinks shall be cast iron, shall comply with ANSI/ASME A112.21.1M - 1990, and shall be adjustable to accommodate the finished floor. Strainer size shall be as recommended by the manufacturer unless otherwise indicated. Strainers shall be polished nickel alloy or polished brass. Provide tapped boss and trap primer connection and flashing flange or clamp, unless otherwise indicated or required.

B. Floor Sinks: Floor sinks shall have cast iron body with acid-resisting enameled interior. Provide with nickel-bronze grate, trap primer connection, and nickel-bronze dome strainer unless otherwise indicated.

2.03 CLEANOUTS AND CLEANOUT ACCESS COVERS

A. Size: Clean-outs shall be at least the same nominal pipe size as the pipe to which they are connected, to a maximum of 6 inch diameter, unless otherwise indicated.

B. Material: Clean-outs shall comply with ANSI A112.36.2M - 1983 and shall be water- and gas-tight cast iron construction with adjustable housing to accommodate finished floor or grade elevation. Clean-outs in waterproofed floors shall have a flashing flange and clamp device. Clean-outs shall have a countersunk internal bronze plug and scoriated nickel-bronze removable cover; wall clean-outs shall have polished stainless steel cover specifically manufactured for the wall finish at each location. Floor clean-outs for floors with finish coverings shall have the top recessed for tile or carpet, with a clean-out marker, manufactured for the finished floor material.

C. Access Cover: Access covers for concealed wall clean-outs shall be nickel-bronze with scoriated hinged cover or round stainless steel cover with countersunk machine threaded center screw, unless otherwise indicated.

2.04 WATER HAMMER ARRESTER

A. Manufactured Water Hammer Arrester: Water hammer arresters shall be designed, manufactured, tested and certified in accordance with PDI Standard WH201, 1977 Revision. Arresters shall be Type L copper tube construction, with a piston and heat sink. The piston shall have pressure lubricated O-rings separating the compressed air charge from the flowing fluid to dissipate the kinetic energy generated in the piping system. Each arrester shall be sized according the table and shall have a male sweat connection. Unless specifically indicated otherwise, calculated or field constructed air chambers are not acceptable.

B. Manufacturer:

ENGINEERED WATER HAMMER ARRESTERS						
Fixture Units	1-11	12-32	33-60	61-113	114-154	155-330
PPP, Inc.	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"
Sioux Chief	652-AS	653-BS	654-CS	655-DS	656-ES	657-FS

C. Calculated Air Chambers: Calculated air chambers shall be constructed of the same pipe material as the lines in which they are installed. The calculated air chamber shall be sized in strict accordance with PDI WH201, 1977 Revision, Table 1, for the size of line, distance from riser, and flow pressure involved; drain and vent valves for replenishing the air charge and panels providing access to the air chamber recharging valves shall be provided.

PART 3 - EXECUTION

3.01 GENERAL

A. Vacuum Breakers: Where not provided as an integral part of a device or fixture, provide vacuum breakers at each fixture to prevent back-siphonage.

B. Piping: Plumbing piping to fixtures shall be secured to the wall framing system prior to installation of the wall surface material to assure a solid installation which will not move. Fixture piping which can be moved shall be removed and re-secured to the wall structure; replacement of the wall, finishes, trim, etc. shall be included at no cost to the Owner.

C. Clearances: Install fixtures in accordance with manufacturer's data, with sufficient clearances to coordinate with accessories, specialties and equipment.

D. Mop Sinks: Unless otherwise indicated, mop sinks or basins shall be floor mounted and sealed watertight, at walls and seams.

3.02 TRAP PRIMERS

A. General: Install trap primers where indicated or required. The trap primer outlet shall extend vertically a minimum of 12 inches before a change in direction to horizontal is made. The horizontal line to the trap primer connection shall be installed sloping to the trap it serves. Provide a vacuum breaker where required. The supply to each trap primer shall be provided with an isolation valve.

B. Access Covers: Provide a minimum 12 inch by 12 inch stainless steel access cover for each trap primer.

3.03 CLEAN-OUTS AND CLEAN-OUT ACCESS COVERS

A. Exterior Clean-outs: Extend exterior clean-outs to finished grade. Provide a concrete pad 18 inches by 18 inches, 6 inches thick around clean-out; slope top down approximately 2 inches from the clean-out to edge of pad so that edge of pad is flush with finished grade.

B. Locations: Clean-outs shall be provided at not more than 50 feet apart in horizontal drainage lines of 4 inch nominal diameter or smaller, and at not more than 75 feet apart for larger diameter pipe. Clean-outs shall be provided at each change of direction of 90 degrees or more. Clean-outs shall be provided in vertical sanitary and storm water piping, with the centerline not more than 18 inches above the finished floor level, at each floor with a horizontal offset or horizontal branch connection.

3.04 WATER HAMMER ARRESTERS

A. General: Install water hammer arresters on both hot and cold water piping in accordance with manufacturer's recommendations. Water hammer arresters shall be installed at each valve-operated plumbing fixture, or at the end of piping branches serving a battery of valve-operated fixtures. In addition, water hammer arresters shall be installed at each solenoid valve, at each remotely-operated valve, or at each quick-closing valve as defined by PDI WH-201, as close to the point of quick closure as possible.

3.05 INSULATION OF HANDICAPPED LAVATORY EXPOSED PIPING

A. General: Insulate hot water supply and waste lines for handicapped lavatories with 1/2 inch thick elastomeric or fiberglass insulation. All joints shall be sealed and provided with a white finish.

3.06 DRAINS

A. General: Drains shall be located at the low point of indicated slopes, or 1/2 inch below the finished surface, Install to prevent ponding around the perimeter of the drain.

3.07 ROOF DRAINS

A. Fire Stopping: Roof drains penetrating a fire rated roof shall be proved with a fire stop. The rating of the fire stop shall be equal to the rating of the roof.

3.08 FIXTURE INSTALLATION

A. General: Obtain mounting templates and dimensions prior to roughing-in plumbing connections. Mount fixture on carrier which is bolted to the building structure with through-bolts or pre-set inserts. Floor-mounted fixtures shall have supports, blocking or a non-shrink grout setting bed to prevent movement or flexing. Floor-mounted, wall mounted and countertop fixtures shall be sealed watertight with a flexible, non-permeable caulk or mastic. Provide stainless steel escutcheons at each water supply and waste piping penetration of a wall or cabinet; caulk each escutcheon. Adjust all fixtures level and plumb at proper mounting height.

B. Rough-In: During rough-in, water and waste stub-outs shall be located to prevent gaps between the fixture and the finished wall, and to allow exposed pipe to be installed straight and plumb from the stub-out to the fixture. Continuously cover wall openings and open pipe ends to prevent construction debris from entering.

C. Special Fixtures: For equipment to be connected later or under a separate contract, provide valved and capped water lines; provide floor drains, open site drains, or capped water connections as indicated or required.

D. Fixture Connections: Provide valve cocks or stops in pressure piping to fixtures in lines 1/2 inch or smaller; provide gate valves in piping 3/4 inch and larger. Provide a water seal trap with each fixture (including floor drains and floor sinks) whether indicated or not. Drains shall be sized as indicated or required but in no case less than 1-1/2 inch pipe size.

E. Fixture Mounting Criteria: Plumbing fixtures shall comply with the following mounting criteria unless specifically dimensioned otherwise on the drawings:

1. Standard access fixtures:

a. Wall hung water closet - 16.5 inches from finish floor elevation to top of seat.

b. Wall hung lavatory - 31 inches from finish floor elevation to top of rim.

c. Urinal - 24 inches from finish floor elevation to the top of the rim.

2. Handicap accessible fixtures:

a. Water closet - 19 inches from finish floor elevation to top of seat, maximum 44 inches from finish floor elevation to centerline of the flush valve control on the wide side of the toilet stall. The flush valve cannot be located under the grab bar because of room required to service diaphragm. Provide offset riser tube with a minimum of 2 wall supports. Flush valve or flush lever location shall be on the access side of the water closet.

b. Lavatory - maximum 34 inches from finish floor elevation to top of rim, minimum 29 inches from finish floor elevation to bottom of the apron, 27 inches clear knee space, 17 inches from wall to face of rim, minimum 9 inches from finish floor elevation to bottom of insulated P-trap, maximum 6 inches toe clearance between wall and insulated P-trap.

c. Urinal - maximum 17 inches from finish floor elevation to the top of the rim, 14 inches minimum from the wall to the face of the rim, maximum 44 inches from finish floor elevation to centerline of the flush valve control.

d. Drinking fountain and water cooler - maximum 36 inches from finish floor elevation to spout outlet, minimum 4 inches water flow height measured vertically above the spout outlet, minimum 27 inches of clear space between finish floor elevation to bottom of the apron.

END OF SECTION 15440

SECTION 15515

VALVES, HANGERS, AND SPECIALTIES

PART 1 GENERAL

1.01 SUMMARY

A. Related Sections:

1. 15090 - Supports, Anchors, and Seals.
2. 15410 - Piping (Plumbing).
3. 15510 - Piping (HVAC).
4. 15540 - Pumping Equipment (HVAC).
5. 15855 - Air Handling Units.
6. 15970 - HVAC Control System.
7. 15990 - Tests (HVAC).

1.02 REFERENCES

A. The American Society of Mechanical Engineers (ASME) Publications: ASME Boiler and Pressure Vessel Code - Current edition.

1.03 SUBMITTALS

A. Submit the following:

1. Pressure Relief and Reducing Valves: Catalog cuts; pressure range, and settings.
2. Flexible Connectors: Catalog cuts.
3. All Valves: Catalog cuts, schedule of proposed installation locations, pressure ratings, and materials of construction.
4. Inserts: Catalog cuts and load tables.
5. Supports: Catalog cuts or drawings.
6. Anchors: Drawings and details of installation.
7. Shop Drawings of support equipment.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Valves:

1. Clow.
2. Chicago.
3. Crane.
4. DeZuric.
5. Grinnell.
6. Homestead.
7. Hammond.

8. Jenkins Lunkenheimer.
9. Mueller.
10. Milwaukee.
11. Nibco.
12. Stockham.

2.02 VALVES.

A. General:

1. Gate and globe valves shall not be installed with the stem pointing downwards. Valves may be installed with the stem at or above a horizontal plane. Provide adequate clearance for stem rise.
2. Check valves may be installed either in the horizontal or vertical position. Non-spring loaded check valves shall only be installed in the vertical position when the flow is upwards.
3. Butterfly valves may be installed with the stem in any position. Whenever possible the stem shall be installed as outlined for gate and globe valves.
4. Provide all valves with a 1-1/2" diameter brass tag having 1/2" high black filled numbers and 1/4" high legend above, as manufactured by Seton or accepted equivalent.

    a. Legend shall include abbreviations such as: PLMG, CW, HW, GAS, HVAC, etc.
    b. Valve tag fasteners shall consist of No.6 brass beaded chain with brass "S" hooks. The use of color coded one piece nylon ties is acceptable instead of beaded chain fasteners. Brass "S" hooks are required with ties.
    c. Record all valve tag numbers in as-built drawings and submit before requesting final payment.

5. Provide ease of access to valve handwheel or lever to maintenance personnel.

    a. Valves installed above a ceiling shall have the stem placed 15 degrees above the horizontal position whenever possible.
    b. Provide colored thumbtack indexes at all ceiling tiles where valves are installed directly above.
    c. Index all colored thumbtacks in the as-built drawings.

6. Provide chain actuators for all valves in mechanical equipment rooms installed at a centerline height at or above 7 feet above the floor.

    a. Actuators shall consist of a cast iron sprocket rim attached to the valve, malleable iron chain guide, and chain of sufficient length to descend to a floor height of not more than 3'-6".
    b. Valves larger than 12 inches and valves not suitable for chain actuators shall be provided with electrical actuators, motors, and switches.

c. Install switches where directed.

B. Gate Valves:

1. To 2":

a. Class 150, bronze, union bonnet rising stem, inside screw, solid wedge disc, non-asbestos packing, soldered ends.
b. Manufacturers:

1) Nibco S-134.
2) Milwaukee 1169.
3) Accepted equivalent.

2. 2-1/2" and above:

a. Class 125, outside screw and yoke, iron body, bronze trim, (IBBM), rising stem, solid bronze wedge disc up to size 3-1/2" and cast iron with bronze wedge face rings in larger sizes, non-asbestos packing, flanged ends.
b. Manufacturers:

1) Nibco F-617-0.
2) Milwaukee F-2885.
3) Accepted equivalent.

C. Globe and Angle Valves:

1. To 2":

a. Class 150, bronze, union bonnet rising stem, inside screw, integral seat, renewable Teflon discs, non-asbestos packing, soldered or threaded ends.
b. Manufacturers:

1) Nibco S-235-Y, Milwaukee 590-T, or accepted equivalent for globe.
2) Nibco T-335-Y, Milwaukee 595-T, or accepted equivalent for angle.

2. 2-1/2" & above:

a. Class 125, bolted bonnet, outside screw, iron body, bronze trim, (IBBM), rising stem, renewable bronze seat ring and disc up to 3" or 4" size and iron disc with bronze disc face rings in larger sizes, non-asbestos body gasket, flanged ends.
b. Manufacturers:

1) Nibco F-718-B.
2) Milwaukee F-2981.
3) Accepted equivalent.

D. Check Valves:

1. To 2":

a. Class 125 or Class 200, bronze, screwed bonnet, Y pattern, renewable Teflon discs, soldered or threaded ends.
b. Manufacturers:

1) Nibco T/S-235-Y.
2) Grinnell 3300.
3) Milwaukee 590-S.
4) Accepted equivalent.

2. 2-1/2" & above:

a. Class 125, silent, non-slam type spring loaded, iron body, bronze seat and plug, single disc, stainless steel spring, guided disc top and bottom, wafer or lug type.
b. Manufacturers:

1) Muessco 105 AP.
2) Milwaukee 1400.
3) Accepted equivalent.

E. Butterfly Valves:

1. 2-1/2" to 6":

a. 200 psi WOG, cast iron body with extended neck for insulated piping, lugged, with lugs drilled and tapped according to ANSI B-16, silicon bronze or aluminum bronze disc, EPDM seat, and 416 stainless steel stem.

1) Valve shall comply with API-609 and MSS-SP-67.
2) Provide valves with lever-lock operator having position lock and 10 degree balancing notches.
3) Provide a memory stop capable of allowing valve closing and re-opening to previously balanced position.

b. Manufacturers:

1) Nibco.
2) Milwaukee CL-223E with options and accessories.

3) Accepted equivalent.

2. 8" and above:

a. 200 psi WOG, sizes 2"-12" and 150 psi WOG for larger sizes. Cast iron body with extended neck for insulated piping, lugged, with lugs drilled and tapped according to ANSI B-16, silicon bronze or aluminum bronze disc, EPDM seat, and 416 stainless steel stem. Valve shall comply with API-609 and MSS-SP-67. Provide valves with hand cranked heavy duty weatherproof gear operator with indicator and adjustable stops at all locations.

b. Manufacturers:

1) Nibco.
2) Milwaukee CL-323E or ML-323E with options and accessories.
3) Accepted equivalent.

F. Balancing Valves:

1. Up to 2":

a. 175 lb. WOG, non-lubricated, eccentric plug type, nickel seat, semi-steel body, neoprene or Teflon coated resilient plug, Buna filled Teflon U-ring seal or Buna (Vee) packing. Provide memory stop and lever handle.

b. Manufacturers:

1) DeZuric Series 100.
2) Accepted equivalent.

G. Ball Valves:

1. Plumbing: Allowed only for balancing service in domestic hot water return.
2. HVAC: Allowed only for shut-off, not for balancing service. Provide 3 inch stem extensions for insulated line.
3. Porting: No reduced ports shall be acceptable in any ball valve.
4. Up to 2":

a. Class 150, 400/600 psi WOG, full port, three piece construction, blowout-proof stem, non-asbestos packing, bronze body, silicone bronze stem, bronze/ brass/chrome plated ball, Teflon resilient seat, and EPDM O ring seal.

b. Manufacturers:

1) Nibco T/S-595-Y.
2) Hammond 8604/8601.
3) Milwaukee BA-30OSS/350S.
4) Accepted equivalent.

2.03 HOSE BIBBS

A. Interior:

1. Concealed Supply:

a. Flanged, all brass, chrome plated, 3/4" angle hose valve, with vacuum breaker.
b. Manufacturers: No.952 by Chicago Faucet or accepted equivalent.
c. Provide isolation valve in branch.

2. Exposed Supply:

a. All brass, 3/4" angle hose valve, with vacuum breaker.
b. No.998 by Chicago Faucet or accepted equivalent.
c. Strainers:

3. 3/4": "Y" type, 20 mesh monel screen, iron body, 250 lb. w.s.p. with blow-off outlet and plug, screwed ends. Muessco #11, or accepted equivalent.

4. 2-1/2" to 4": "Y" type, 1/8", iron flanged body, 125 lb. w.s.p. with blow-off tapping and plug, Muessco #751 or accepted equivalent. Basket type, cast iron flanged body, 125 lb. WSP, with blow-off tapping and plug.

5. 4" and above: "Basket" type, heavy gage perforated brass basket, 0.057" diameter perforations in sizes to 4 inches and 0.125" diameter perforations in sizes larger than 4 inches. Muessco #165 or accepted equivalent.

B. Flexible Connectors:

1. All sizes: Full line size with floating flanges. Rated 150 psi at 180 degrees F., wire reinforced, double arched, and with control rods and rubber washers. Mason Industries or accepted equivalent.

C. Pressure Relief Valves:

1. 3/4": Brass body, micro finished bevel for seats, cadmium plated springs, manual chilled lift ring, ASME Std. Bell and Gossett or water accepted equivalent.

D. Pressure Reducing Valves:

1. 3/4": Brass body and brass working parts with built-in strainer, 125 W.S.P. Bell and Gossett or accepted equivalent.

E. Air Vents:

1. Provide air vents at high points in chilled water systems.
2. Vents shall be automatic type unless otherwise indicated.
3. Automatic vents shall be Metraflex Model MU15 or accepted equivalent.
4. Manual air vents shall be bronze needle valves.

F. Dielectric Pipe Fittings:

1. Dielectric pipe fittings shall consist of insulators, insulating gasket, pipe connector and nut or flange as required.
2. Pipe connectors shall be suitable for soldered, screwed, or welded joints as required.
3. Dielectric unions shall be rated at 250 psi and cast iron flange unions at 175 psi.
4. Dielectric fitting shall be plated according to Federal Specifications of 0.005".
5. Fittings shall be as manufactured by Epco.

2.04 PIPE HANGERS AND SUPPORTS

A. Provide hangers, supports, and supplementary steel as required for the different applications.

B. Inserts, Hangers, Rods, and Clamps: Fig. numbers used refer to Grinnell, Fee and Mason, or Michigan Hanger Co.

1. Inserts: (Galvanized or stainless steel except as noted.)

   a. Universal concrete insert, Fig.282.
   b. Wedge type concrete insert, Fig.281.
   c. Expansion case, Fig.117.

2. Clamps:

   a. UFS beam clamp with weldless eye nut, Fig.292, clamp size 1, rod size 3/4".
   b. C-clamp with retaining clip, Fig.87.
   c. 1 beam clamp, Fig.131.
   d. Universal side 1 beam clamp, Fig.225.
   e. C-clamp, copper finish, Fig.CT-88.

3. Hangers: Use adjustable clevis type hangers as specified. Hangers for insulated pipes shall have a diameter large enough to include insulation and a protection shield shall be installed with each hanger.

a. Cast iron pipe: Fig.590.
b. Copper tubing: Fig.CT-65.
c. Insulated steel pipe: Fig.300.
d. Uninsulated steel pipe: Fig.260.
e. Trapeze.

4. Rods: Continuous thread, Fig.146. Sizes shall be as specified.
5. Riser Clamps:

a. Black steel, Fig.261.
b. Plastic coated, Fig.261C.
c. Copper finish, Fig.CT121.

C. Horizontal Steel Piping Support Spacing and Rod Size:

Pipe Size	Rod Diameter	Maximum Spacing
Up to 1-1/4"	3/8"	8 feet
1-1/2" & 2"	3/8"	10 feet
2-1/2" & 3"	1/2"	12 feet
4" & 5"	5/8"	12 feet
6"	3/4"	15 feet
8" & 12"	7/8"	18 feet
14" & 16"	1"	24 feet

D. Horizontal Copper Piping:

Pipe Size	Rod Diameter	Maximum Spacing
Up to 1-1/2"	3/8"	6 feet
2"	3/8"	8 feet
2-1/2", 3", & 4"	1/2"	8 feet

E. Insulation Protection Shield: Fig.167.

F. Wall Access: As specified under General Provisions.

PART 3 EXECUTION

3.01 INSTALLATION

A. Provide shut-off valves at inlets and outlets of equipment and branch connections to mains and as shown on Construction Documents.

B. Final connections to apparatus, equipment, automatic control valves, and pressure reducing valves shall be made with flanges or unions between shut-off valve and connection.

C. Flexible Connectors: Provide between vibrating equipment and piping.

D. Location of Valves and Chain Operators:

1. Install valves to be accessible for operation and free from interferences when operated.
2. Position so leakage will not contact any electrical equipment located below.
3. Provide valve chain operators for valves 4 inches and larger if the valve handle is more than 6 feet above the operating equipment room floor level.

E. Pipe Hangers and Supports:

1. Provide adjustable hangers, inserts, brackets, rolls, clamps, and supplementary steel as required for proper support of pipe lines.
2. Design hangers to allow for expansion and contraction of pipe lines and of adequate size to allow covering to run continuously through hangers.
3. Support piping independently of equipment.
4. Coordinate location of hangers with light fixtures.
5. Wire brush steel or iron supports and prepare surfaces under this section for painting.
6. Install plastic pipe loose to allow for contraction and expansion.
7. Hangers for PVC piping in storage tanks do not need rollers and hangers can be shop fabricated from stainless steel strap and anchor bolts.
8. Pipes supported by trapeze hangers and not mounted on pipe rollers shall be secured to the trapeze with pipe clamps or "U" bolts.
9. Hangers shall be placed at each change of direction, within 1 foot of valves and other appurtenances installed in horizontal piping and not more than 3 feet from end of each branch runout.
10. Special Supports: Provide clamps, hangers, and supports according to equipment manufacturer's recommendations.
11. Supports of wire, rope, wood, chain, strap, perforated bar, or any other makeshift devices are not allowed.
12. Where overhead construction does not allow fastening hanger rods in required locations, provide additional steel framing as required.
13. Refer to "Vibration Isolation" Section for supports requiring vibration isolators.
14. Maximum loading on inserts shall not exceed 75 percent of catalog rating.
15. Floor supports, wall brackets, and expansion tank supports as shown on Construction Documents or as required to support equipment. Submit shop drawings.
16. Buckling of piping due to inadequate provision for expansion shall be Contractor's responsibility. Piping shall be properly guided between expansion joints and anchor points.

F. Dielectric Fittings: Provide dielectric fittings between piping of dissimilar metals.

END OF SECTION

SECTION 15821

FANS

PART 1 GENERAL

1.01 SUMMARY

A. Related Sections:

1. 06100 - Carpentry.
2. 07600 - Flashing and Sheet Metal.
3. 09200 - Metal studs, Lath, Suspension Ceiling, Plaster, and Stucco.
4. 09510 - Acoustical Ceilings.

1.02 SUBMITTALS

A. Submit properly identified manufacturer's catalog cuts and technical data before starting work.

1.03 QUALITY ASSURANCE

A. Fans shall be constructed and rated according to AMCA Standards.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Ceiling Mounted Fans, Centrifugal Type:

1. Nutone Co.
2. Penn Ventilator Co.

B. Curb Mounted Exhaust Fans:

1. Cook.
2. Greenheck.
3. Hill Fan Co.
4. ILG.
5. Penn Ventilator Co.

2.02 EQUIPMENT

A. Ceiling Mounted Fans, Centrifugal Type:

1. Enclose in an acoustically insulated housing and provide with an integral back draft damper and aluminum inlet grille.
2. Provide capacities and electrical requirements as shown in schedule.
3. Statically and dynamically balance fan wheels at factory.

B. Curb Mounted Exhaust Fans:

1. Weatherproof Housing: Heavy gage galvanized steel with integral roof curb and weather protected intake hoods with filter finished with 2 coats of off-white epoxy enamel inside and out.

   a. Top of housing shall be removable for service access.

2. Forward curved centrifugal wheel and scroll housing fabricated of galvanized steel (direct) (adjustable belt) drive assembly (single) (two) speed motor all mounted on common (direct) (adjustable belt) base plate, complete with vibration suspension system.

   a. Provide adjustable pitch motor pulley and quick adjust belt tension and alignment system.

PART 3 EXECUTION

3.01 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.02 INSTALLATION

A. Install according to the manufacturer's recommendations and accepted Shop Drawings.

END OF SECTION

SECTION 15861

AIR MOVING EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

A. Related Sections:

1. 15240 - Vibration Isolation.
2. 15855 - Air Handling Units.
3. 15885 - Air Filtration Equipment.
4. 15890 - Ductwork.

1.02 REFERENCES

A. Air Moving and Conditioning Association (AMCA), Fan Construction and Testing Standards.

1.03 SUBMITTALS

A. Fans: Shop drawings, catalog cuts, and certified performance curves.

B. Inlet Vanes: Shop drawings, catalog cuts.

1.04 QUALITY ASSURANCE

A. Fans shall be constructed and rated according to AMCA standards.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fans:

1. Carnes.
2. Greenheck.
3. Loren Cook.
4. Penn Ventilator.
5. Powerline.
6. Trane.

B. Curb Mounted Exhaust Fans:

1. Cook.
2. Greenheck.
3. Hill Fan Co.

4. ILG.
5. Penn Ventilator Co.

2.02 EQUIPMENT

A. Unless otherwise noted, fans shall be as follows:

1. Centrifugal type.
2. Fan wheels shall be statically and dynamically balanced at the factory.
3. Fan brake horsepower ratings shall not exceed those scheduled.
4. Belt drives for fans shall be matched multiple V-belts rated for at least l.3 times motor horsepower.
5. Pulleys shall be cast iron adjustable pitch type.
6. Fan blades and housing of proper design, sufficient strength and rigidity to operate under installed conditions without objectionable noise and vibrations.
7. Surfaces provided with approved corrosion resistant coatings.
8. Provide drives to deliver design capacity at actual static pressures developed.

B. Propeller Fans:

1. Heavy-duty industrial type and designed for wall mounting.
2. Fans may be direct or belt driven by an open drip-proof electric motor.
3. Direct driven fans shall have fan wheel mounted on extension of motor shaft.

   a. Mount motor in rigid streamlined frame designed to provide vibration isolation for motor and with concealed wiring run to motor.
   b. Mount fan on a steel frame and shall have aluminum or steel blades with heavy hubs.
   c. Bearings shall be of permanently lubricated type.
   d. Motor speed shall not exceed 1800 rpm.
   e. Provide fan with a heavy gauge wire personnel guard easily removable for servicing fan.

4. If standard mounting is not large enough to fit the opening provided, fabricate auxiliary mounting plates to not impair air flow to wheel at the opening provided.

   a. Plates shall be made of zinc-coated steel in thicknesses as follows:

Wheel Diameter	Plate Thickness (M.S. Gage)
12" and less	18
Over 12" to 16"	16
Over 16" to 24"	14
Over 24" to 36"	12
Over 36" to 60"	10

5. Inline Centrifugal Fans:

   a. Fans shall be aluminum construction, centrifugal, with belt or direct

drives.

b. Fan wheels shall have aluminum airfoil blades, backwardly inclined non-overloading.
c. Motors on belt driven units shall be supported on exterior of fan casing with bearings encased within fan tube.
d. Support fan with vibration isolators.
e. Extend bearing lubrication lines outside of casing.
f. Provide variable inlet vanes as indicated.

C. Centrifugal Vent Set:

1. Fan housing and scroll shall be steel with baked-on enamel finish inside and out.
2. Fan wheel shall be steel with forward curved blades.
3. Support fan shaft by resiliently mounted prelubricated ball bearings.
4. Fan motors shall be open drip-proof type with belt drives and adjustable pulleys.

D. Ceiling Mounted Fans:

1. Fans shall have a centrifugal wheel enclosed in an acoustically insulated housing.
2. Units shall have integral back draft damper and an inlet grille.
3. Motor shall be resiliently supported and shall be completely removable through the face of the unit.
4. Discharge position shall be changeable through use of interchangeable casing panels.

E. Power Roof Exhauster:

1. Fans shall be standard outlet or up blast as scheduled, centrifugal type with backward inclined non-overloading wheels, and belt driven by an electric motor.
2. Fan shall have weatherproof, low profile aluminum housing suitable for curb mounting.
3. Fan shall have motor space accessible from outside and local disconnect switch.
4. Motor and fan shall be resiliently mounted.
5. Each fan shall be provided with aluminum or galvanized steel bird screen, disconnect switch, and multi-blade backdraft damper as indicated.
6. Belt drives shall be provided with not less than double belt pulleys and 2 belts.
7. Upblast fans shall be provided with a non-corrosive epoxy coating.

F. Curb Mounted Exhaust Fans:

1. Weatherproof Housing: Heavy gage galvanized steel with integral roof curb and weather protected intake hoods with filter finished with 2 coats of off-white epoxy enamel inside and out.

a. Top of housing shall be removable for service access.

2. Forward curved centrifugal wheel and scroll housing fabricated of galvanized steel (direct) (adjustable belt) drive assembly (single) (two) speed motor all mounted on common (direct) (adjustable belt) base plate, complete with vibration suspension system.

a. Provide adjustable pitch motor pulley and quick adjust belt tension and alignment system.

PART 3 EXECUTION

3.01 INSTALLATION

A. Provide roof or masonry openings required for proper fan installation.

B. Refer to Section 15240 - Vibration Isolation for proper isolator requirements.

C. Install fans according to manufacturer's recommendations and as shown on Construction Documents.

END OF SECTION

SECTION 15890

DUCTWORK

PART 1 GENERAL

1.01 SUMMARY

A. Related Sections:

1. 15260 - Vibration Isolation.
2. 15855 - Air Handling Units.
3. 15910 - Duct Accessories.
4. 15940 - Outlets (HVAC).
5. 15990 - Tests (HVAC).

1.02 REFERENCES

A. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), latest edition:

1. HVAC Duct Construction Standards (Metal and Flexible).

B. National Fire Protection Association (NFPA):

1. NFPA 45 Standard on Fire Protection for Laboratories Using Chemicals.
2. NFPA 90A Standard for the Installation of Air-conditioning and Ventilating Systems of Other than Residence Type.
3. NFPA 96 Removal of Smoke and Grease Laden Vapors from Commercial Cooking Equipment.

C. National Electrical Code - 1999 (NEC) - 70.

D. American Society of Heating, Refrigerating, and Air-conditioning Engineers, Inc. (ASHRAE) 62 - Ventilation for Acceptable Indoor Air Quality.

1.03 SYSTEM DESCRIPTION

A. Provide double walled ducts with interior insulation for the first 15 feet from an AHU to provide for sound attenuation.

B. All ductwork shall be sealed to comply with SMACNA:

1. Seal Class A.
2. Leakage Class 6 for rectangular ducts.
3. Leakage Class 3 for round and oval ducts.

C. Use of fiberglass or components containing coated or exposed fiberglass within airstreams is prohibited.

1.04 SUBMITTALS

A. Ductwork:

1. Provide 1/4" scale composite Shop Drawings. Shop Drawings shall be coordinated with other trades before submitting.
2. Catalog Cuts: Medium pressure ductwork, duct sealer, and turning vanes.
3. Catalog Cuts, Ratings, and Performance Data: Flexible ductwork.

B. Casings, Plenums, and Housings: Details of construction.

C. Provide details of proposed typical ductwork fittings including:

1. Seams and joints.
2. Elbows, vaned and radius.
3. Transitions and Offsets.
4. Taps and outlet frames.
5. Branch connections and tees.
6. Splitter dampers.

D. Duct Hanger System: Catalog cuts and shop drawing.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Flexible: Genflex or Flexible Technologies.

B. Ductwork and Fittings:

1. Metalaire.
2. Semco.
3. Spiramatic.
4. United Sheet Metal.

2.02 MATERIALS

A. Ductwork shall be fabricated and installed according to the SMACNA Standards, except as shown on drawings or specified.

B. Ductwork shall have manufacturer's gage stamp intact.

2.03 LOW PRESSURE DUCTWORK

A. Includes ductwork from low pressure air handlers, exhaust, and outside and return air ductwork. Velocities shall not exceed 1,300 fpm and static pressures not to exceed 2 inches WG.

B. Provide galvanized steel ductwork, designed, constructed, installed and tested according SMACNA - "HVAC Duct Construction Standards" and as shown on drawings. Ductwork to have manufacturer's gage stamp. Provide cross-breaking or beading to prevent flexing, but do not reduce gage of metal below that required for flat

ductwork sheets.

C. Provide galvanized steel saddles at points of support of insulated piping saddles according to Section 15051.

D. The following ductwork and plenums shall be insulated, unless noted otherwise.

1. Return air ductwork in non-conditioned spaces, including mechanical rooms and space above ceilings.
2. Return air transfer boots.
3. Return/outside air plenums at air handlers.

E. Plenums:

1. Galvanized steel with the largest dimension of 30 inches and larger shall be 18 gage.
2. Plenums shall be constructed, designed, installed, and tested according to SMACNA as specified. Joints shall be angle reinforced pocket type. Provide fully gasketed joints between plenums and filter sections.
3. Provide plenum access doors where indicated on drawings. Doors shall be constructed according to Figure 6-12 of SMACNA - HVAC Duct Construction Standards.

F. Flexible Insulated Ductwork:

1. Lightweight duct, core of corrosion resistant reinforcing wire helix permanently bonded within fabric, insulated with 1-1/2" thick, 3/4 lb. density fiberglass flexible insulation and covered with a vapor barrier of aluminum metalized polyester film laminated to glass mesh, elastomer back coated. Duct shall meet NFPA 90A requirements and be listed as Class 1 Air Duct Material, UL 181.
2. Manufacturers:

a. Atco Rubber Products.
b. Genflex.
c. Thermaflex II.
d. Venture Type VTKC.
e. Wiremold Co.

G. Ductwork and splitter dampers within the ductwork shall be made of the same material.

H. Turning vanes shall be provided in square elbows and shall be of same material as the ductwork. Turning vanes shall be of airfoil type, double thickness factory fabricated.

I. Filter Sections (Air Handlers): Filter section casing shall be constructed of mill galvanized steel of 18 gage. Casing shall be sized to house filters indicated on drawings.

PART 3 EXECUTION

3.01 GENERAL

A. Install low and medium velocity ductwork as shown on drawings. 90 degree bends shall not be made in medium pressure flexible ducts.

B. Before systems are tested and balanced, ducts shall be thoroughly cleaned and blown out.

C. Where interferences arise during construction, make transition or division of ductwork on basis of pressure drop equivalent to original size. Obtain approval from A/E before fabrication.

3.02 INSTALLATION

A. Install ductwork materials and accessories according to the latest edition of SMACNA Low Velocity Duct Construction Standards as specified. These written specifications shall take precedence in case of conflict.

3.03 LOW PRESSURE DUCTWORK

A. Seams and joints in ductwork shall be made airtight. Seal duct joints with sealer as specified for field sealing of high pressure ductwork. Make exhaust ducts passing through return air chases airtight.

B. Install flexible ductwork shall be installed in sizes to match diffuser necks as indicated on drawings schedules. Duct length shall be not less than 5 feet and no longer than 7 feet. Duct shall be adequately supported to prevent kinks and sharp bends. Install according to manufacturer's recommendations and as shown on drawings.

3.04 DUCTWORK SUPPORTS AND HANGERS

A. Provide support and hangers according to SMACNA HVAC Duct Construction Standards.

B. Hangers shall be galvanized steel hung from inserts or clip angles secured to structure with expansion bolts in shear or tension as follows:

1. Roof Slab: In tension.
2. Structural Beams: In shear, 12 inches minimum from bottom of beam.
3. Joists: Use existing forming bolts openings only. Hangers shall be bent under ductwork at least 2 inches. Hangers for ducts over 48 inches wide shall be secured to bottom and sides of duct.

3.05 DUCT PENETRATIONS TO FLOOR AND FIRE WALLS

A. Joints around duct penetrations shall be packed with fire safing insulation and sealed with fire and smoke barrier caulk as specified in Section 07270, Firestopping and Fire and Smoke Barrier Caulking.

END OF SECTION

SECTION 15940

OUTLETS (HVAC)

PART 1 GENERAL

1.01 SUMMARY

A. Related Sections:

1. 15890 - Ductwork.
2. 15910 - Duct Accessories.

1.02 SUBMITTALS

A. Outlets: Catalog cuts and schedules of installation and performance data at noted capacities.

B. Outlet Accessories: Plaster frames, opposed blade dampers, and square to round neck adapter catalog cuts.

C. Samples: Submit color chips for manufacturer's standard baked enamel colors.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Air Outlets:

1. Air Guide.
2. Anemostat.
3. Carnes.
4. Krueger.
5. Metalaire.
6. Price.
7. Titus.
8. Warren Technology.

2.02 MATERIALS

A. Plaster frames shall be provided for plaster and dry wall ceiling and wall installations.

B. Finishes shall be as follows:

1. Devices installed on surfaces to be painted shall match surface color. Factory prime coat.
2. All Other Areas: Factory applied baked enamel. Color to match color chip furnished by A/E.
3. Aluminum Devices: Satin aluminum baked enamel, except as specified.

C. Provide a synthetic sponge rubber gasket between each frame and mounting surface

forming an airtight seal.

D. Manufacturer's published performance data shall be obtained from testing performed in a laboratory certified by the Air Diffusion Council. Testing shall be according to ADC Test Code 1062R4.

E. Air diffusers shall be provided with opposed blade volume dampers adjustable from diffuser face, blanking for proper coverage, and blow without producing objectionable noise or air motion at occupied level.

1. Diffusers in the same room shall be the same size and type, except as otherwise noted.
2. Diffusers shall be suitable for operation at 5 percent excess and 25 percent less than noted capacities.
3. Louvered face ceiling diffusers shall be of square, round, or rectangular face patterns. Provide:

    a. Removable central core, snap-in type.
    b. Flat flanged frame.
    c. Welded aluminum construction.
    d. White baked enamel finish.

4. Perforated ceiling diffusers are not allowed.

F. Grilles and Registers.

1. Ceiling return and exhaust registers shall be 1/2" x 1/2" x 1/2" grid type with opposed blade dampers and aluminum construction with white baked enamel finish. Frame shall be suitable for plaster frame mounting where required.
2. Sidewall return and exhaust registers shall be aluminum flange frame with fixed 45 degrees louvers spaced 3/4" with an opposed blade damper. Louvers shall be parallel to the long dimension.
3. Grilles shall be as specified for registers except dampers are not required. Perforated ceiling return grilles shall be of the lay-in type to match perforated ceiling diffusers.

G. Sidewall supply grilles and registers shall be aluminum flange framed, with 2 sets of adjustable vanes parallel to the long and the short sides and an opposed blade damper.

H. Supply and return, registers, diffusers, and grilles shall be provided with frames and finishes suitable for wall or ceiling finish and construction where installed. Coordinate with Construction Documents for ceiling types and locations.

I. Air outlets shall be provided as indicated on drawings. If outlet type is not indicated on the drawings, provide type used in similar areas elsewhere in the building.

PART 3 EXECUTION

3.01 EXAMINATION

A. Manufacturer of air distribution devices shall be responsible for examining application of each diffuser, grille, and register and guaranteeing each will provide comfort space conditions without drafts and excessive noise at noted capacity.

END OF SECTION

SECTION 16010

BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.01 GENERAL

A. 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.

B. 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.

C. 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.

D. 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.

E. 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 16709 at equipment as required. Install field connections to "packaged" equipment provided under other Divisions of these Specifications.

1.02 SCOPE OF WORK

A. 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.

B. Notices: Give notices, file Plans, pay fees, and obtain permits and approvals from authorities having jurisdiction. Include all fees in the Bid Price.

1.03 INTERPRETATION OF DRAWINGS

A. 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.

B. 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.

C. 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.

D. 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.

E. 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.

1.04 EQUIPMENT SIZE AND HANDLING

A. 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.

B. 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.

1.05 RECORD DRAWINGS

A. 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.

B. 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.

C. 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.

D. 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.

1.06 ABBREVIATIONS

A. Abbreviations: The following abbreviations or initials may be used:

A/C	Air Conditioning
AC	Alternating Current
ABV CLG	Above Ceiling
ADA	Americans with Disabilities Act
AF	Ampere Frame
AFF	Above Finished Floor
AFG	Above Finished Grade
AHU	Air Handler Unit
AIC	Amps Interrupting Capacity
AL	Aluminum
AMP	Ampere
ANSI	American National Standards Institute
ASA	American Standards Association
AT	Ampere Trip
ATS	Automatic Transfer Switch
AUX	Auxiliary
AWG	American Wire Gauge
BC	Bare Copper
BIL	Basic Impulse Level
BMS	Building Management System
BRKR or BKR	Breaker
CAB	Cabinet
C	Conduit or Raceway
CB	Circuit Breaker
CBM	Certified Ballast Manufacturers
CCTV	Closed Circuit Television
CKT	Circuit
CLEC	Clock Equipment Cabinet
CLG	Ceiling
CO	Conduit or Raceway Only
COAX	Coaxial Cable
COND	Conductor
CONN	Connection
CPU	Central Processing Unit
CRT	Cathode Ray Terminal (Video display terminal)
CT	Current Transformer
CU	Copper
CW	Cold Water
DC	Direct Current
DDC	Direct Digital Control
DEG	Degree
DISC	Disconnect
DO	Draw Out
DN	Down
DPST	Double Pole Single Throw
EMT	Electrical Metallic Tubing

EO	Electrically Operated
EOL	End of Line Resistor
EWC	Electric Water Cooler
FAAP	Fire Alarm Annunciator Panel
FACP	Fire Alarm Control Panel
FCU	Fan Coil Unit
FLA	Full Load Amperes
FM	Factory Mutual
GF	Ground Fault
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

Ø	Phase
OL	Overload
OSHA	Occupational Safety and Health Administration
P	Pole
PB	Pullbox
PIV	Post Indicator Valve
PNL	Panel
PR	Pair
PWR	Power
PF	Power Factor
PRI	Primary
PT	Potential Transformer
PVC	Polyvinylchloride
REF	Refrigerator
RGC or GRC	Rigid Galvanized Raceway
RMS	Root-Mean-Square
RPM	Revolutions Per Minute
RECPT	Receptacle
SCA	Short Circuit Amps
SD	Smoke Detector
SEC	Secondary
S/N	Solid Neutral
SPKR	Speaker
SPST	Single Pole Single Throw
SST	Solid State Trip
ST	Short Time Trip
STD	Short Time Delay
SW	Switch
SWGR	Switchgear
SWBD	Switchboard
TEL	Telephone
TTB	Telephone Terminal Board
TTC	Telephone Terminal Cabinet
TVEC	Television Equipment Cabinet
TYP	Typical
UL	Underwriters Laboratories
UON	Unless Otherwise Noted
V	Volt
VFD	Variable Frequency Drive
VSD	Variable Speed Drive
W	Wire
WP	Weatherproof
XFMR	Transformer

1.07 CODES, FEES, AND STANDARDS

A. 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.

B. 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.

C. 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.

D. Applicability: The codes and standards and practices listed herein, and their respective dates are furnished as the minimum latest requirements.

1. State of Florida.
2. Broward County.
3. City of Pompano Beach

E. Utility Company: Comply with latest utility company regulations.

F. State Code: Florida Building Code

G. Standards: American Society of Mechanical Engineers

1. ASME-A17.1 Elevator Code, plus Interpretations to Date.

H. NFPA: National Fire Protection Association (NFPA) Standards as referenced in the Florida Building Code

1.08 SUPERVISION OF THE WORK

A. 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.

1.09 COORDINATION

A. 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.

B. 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:

1. Door hardware
2. Roll-up doors
3. Roll-up grilles
4. Signage
5. Fire shutters
6. Elevators
7. Escalators
8. Sliding or automatic doors
9. Mechanical Division of the Specifications
10. Landscape Architect drawings
11. Lifts
12. Laundry equipment
13. Kitchen equipment
14. Conveyors
15. Interior design drawings
16. Fountains
17. Millwork design drawings and shop drawings

C. 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 16 Contract Documents or not.

D. 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.

E. Damage from interference caused by inadequate coordination shall be corrected at no additional cost to the Owner.

F. 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.

G. 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.

H. 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.

I. 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.

J. 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.

K. 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.

L. 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.

M. 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.

N. 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.

O. 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.

1.10 DEMOLITION

A. General: Relocate existing equipment and reroute existing raceways in areas being renovated as required to facilitate the installation of the new systems. The Owner shall require continuous operation of the existing systems, while demolition, relocation work or new tie-ins are performed.

B. Coordination: Prior to any deactivation, relocation or demolition work, arrange a conference with the Architect and the Owner's representative in the field to inspect each of the items to be deactivated, removed or relocated. Care shall be taken to protect equipment designated as being relocated and reused or equipment remaining in operation and integrated with the new systems.

C. Provisions: Deactivation, relocation, and temporary tie-ins shall be provided by the Contractor. Demolition, removal and the legal disposal of demolished materials shall be provided by the Contractor.

D. Owner’s Salvage: The Owner reserves the right to inspect the material scheduled for removal and salvage any items he deems usable as spare parts.

E. Phasing: The Contractor shall perform work in phases as directed by the Architect to suit the project progress schedule, as well as the completion date of the project.

PART 2 - PRODUCTS

2.01 MATERIALS

A. 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.

B. 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.

C. Basis of Bid: Each bidder represents that his bid is based upon the manufacturer's, materials, and equipment described in the Contract Documents.

D. 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.

E. Samples: Samples are to be submitted for items requested within Specification Sections to determine that the item meets specifications and requirements before being accepted for use on Project. Samples shall be submitted within 30 days after the award of the contract. Each sample shall be tagged, labeled, or marked, "Sample of ..... for (PROJECT). Accompany samples with copy, in duplicate of manufacturer's instructions regarding installation, and maintenance.

1. Provide samples of the following items:

   a.
   b.

2.02 SHOP DRAWINGS

A. 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.

B. 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.

C. 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.

D. Information: The shop drawing record submittal shall include the following information to the extent applicable to the particular item;

1. Manufacturer's name and product designation or catalog number.
2. Standards or specifications of ANSI, ASTM, ICEA, IEEE, ISA, NEMA, NFPA, OSHA, UL, or other organizations, including the type, size, or other designation.
3. Dimensioned plan, sections, and elevations showing means for mounting, Raceway connections, and grounding, and showing layout of components.
4. Materials and finish specifications, including paints.
5. List of components including manufacturer's names and catalog numbers.
6. Internal wiring diagram indicating connections to components and the terminals for external connections.
7. Manufacturer's instructions and recommendations for installation, operation, and maintenance.
8. Manufacturer's recommended list of spare parts.
9. 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.

E. 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.

F. 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.

G. 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.

H. 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.

I. 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.

J. 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.

K. 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.

L. 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.

M. 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;

1. Fabrication and Erection dimensions.
2. Arrangements and sectional views.
3. Necessary details, including complete information for making connections with other work.
4. Kinds of materials and finishes.
5. Descriptive names of equipment.
6. Modifications and options to standard equipment required by the contract.
7. Leave blank area, size approximately 4 by 2-1/2 inches, near title block (for Engineer's stamp imprint).
8. 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.
9. See specific sections of specifications for further requirements.

N. 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.

O. 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.

2.03 EQUIPMENT, MATERIALS, AND SUPPORTS

A. General: Each item of equipment or material shall be manufactured by a company regularly engaged in the manufacturer 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.

B. 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.

C. 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.

D. 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.

2.04 IDENTIFICATION OF EQUIPMENT

A. 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.

2.05 CONCRETE PADS

A. 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.

2.06 SURFACE MOUNTED EQUIPMENT

A. 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.

2.07 CUTTING AND PATCHING

A. 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.

B. 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.

C. 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.

D. 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.

2.08 SLEEVES AND FORMS FOR OPENINGS

A. 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.

B. Forms: Provide boxed out forms for Raceway penetrations only where allowed by the Architect. Fill opening after Raceway installation, with equivalent material.

2.09 OPERATING AND MAINTENANCE INSTRUCTIONS

A. 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.

B. 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.

C. 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.

D. Instructions: The instructions shall contain information deemed necessary by the Architect and include but not limited to the following:

1. Introduction:
    a. Explanation of Manual and its use.
    b. Summary description of the Electrical Systems.
    c. Purpose of systems.

2. System:
   a. Detailed description of all systems.
   b. Illustrations, schematics, block diagrams, catalog cuts and other exhibits.

3. Operations:
   a. 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.

4. Maintenance:
   a. Parts list and part numbers.
   b. Maintenance and replacement charts and the Manufacturer's recommendations for preventive maintenance.
   c. Trouble shooting charts for systems and components.
   d. Instructions for testing each type of part.
   e. Recommended list of on-hand spare parts.
   f. Complete calibration instructions for all parts and entire systems.
   g. General and miscellaneous maintenance notes.

5. Manufacturer's Literature:
   a. Complete listing for all parts.
   b. Names, addresses and telephone numbers.
   c. Care and operation.
   d. 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.
   e. Internal wiring diagrams and Engineering data sheets for all items and/or equipment furnished under each Contract.
   f. Guarantee and warranty data.

2.10 SERVICE AND METERING

A. Company: The utility company serving this project is FP&L which will be referred to as the Utility Company herein.

B. Service: Make arrangements with the Utility Company for obtaining a complete service. Pay charges and provide labor and material for the service. Service shall be obtained at 480Y/277 volts, 3 phase, 4-wire, 60 hertz, volts from the Utility Company. Provide underground cables and raceways for incoming services from the utility's transformer to equipment

B. 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 transformer vault to distribution equipment.

B. 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 1-1/2” Raceway from transformer secondary bushings to meter location.

B. 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 120/208 volts from the Utility Company. Provide underground cables and Raceways for incoming services from the utility's pad mounted transformer to distribution equipment. Provide Utility Company approved meter socket and empty 1-1/2” Raceway from transformer secondary bushings to meter location.

B. 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 120/208 volts from the Utility Company. Provide underground cables and Raceways for incoming services from the utility's transformer vault to distribution equipment. Provide Utility Company approved meter socket and empty 1-1/2” Raceway from transformer secondary bushings to meter location.

B. 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 120/208 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 1-1/2” Raceway from transformer secondary bushings to meter location.

C. 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.

D. 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.

E. 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.

F. Provide transformer pad per Utility Company requirements.

2.11 TEMPORARY LIGHT AND POWER

A. 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.

B. 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.

C. 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.

D. 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.

E. 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.

F. 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.

G. 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.

H. Payment: The Owner 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.

H. 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.

PART 3 - EXECUTION

3.01 WORKMANSHIP

A. 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.

B. 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.

C. 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.

3.02 PROTECTION AND CLEAN UP

A. 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.

B. 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.

C. 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.

D. 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.

3.03 SYSTEMS GUARANTEE

A. 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".

3.04 FINAL OBSERVATION

A. 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.

3.05 SPECIAL CONSIDERATIONS

A. 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)

cc: Owner, Architect, Engineer, Contractor, Sub Contractor and General Contractor
(List names as stated in cc: above)

SECTION 16020

TESTS AND PERFORMANCE VERIFICATION

PART 1 - GENERAL

1.01 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 in this section.

1.02 DESCRIPTION

A. 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.

B. Submission: Submit check out memos and completed testing results of all systems, cable, equipment, devices, etc., for acceptance prior to being energized or utilized.

1.03 QUALITY ASSURANCE

A. Compliance: Testing shall comply to the following standards;

1. NEMA
2. ASTM
3. NETA
4. ANSI C2
5. ICEA
6. NFPA

1.04 QUALIFICATIONS OF TESTING FIRM

A. 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.

B. Experience: The testing firm shall be regularly engaged in the testing of electrical equipment devices, installations, and systems.

C. 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.

D. 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.

E. Personnel: The testing firm shall utilize engineers and technicians who are regularly employed by the firm for testing services.

F. Proof of Qualifications: The testing firm shall submit proof of the above qualifications when requested.

G. Companies: NETA certified pre-qualified testing firms for this project are;

1. Electro Test Inc. (941) 693-7100
2. Industrial Electrical Testing, Inc. (904) 396-6501
3. Electric Power Systems (407) 578-6424

PART 2 - TESTS

2.01 EQUIPMENT

A. 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.

B. Adjustments: Adjust system to operate at the required performance levels and within all tolerances as required by NETA Standards.

2.02 APPLICATIONS

A. 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.

B. 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.

C. 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.

D. Ratings 600 Volts or Less: Cables 600 volts or less in size #1/0 AWG and larger shall be meggered using an industry approved "megger" with 500 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.

E. Ratings Above 600V: Cables above 600 volts in all sizes shall first be meggered, using an industry approved "megger" having 2500V internal generating voltage. When proper readings are obtained, the cables shall be "hy-potted" using (5) potentials and time periods as recommended by NETA, cable manufacturer for the type and voltage class of cables installed. Do not exceed (80%) of factory test voltage. Readings ("megger" and "Hy-pot") 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.

F. Main circuit breakers and feeder circuit breakers 200 amps and greater shall be tested using primary injection testing. As per NETA Specifications. Reports to include manufacturers time current curve number and trip time. Submit five (5) copies to the Engineer at substantial completion.

G. Transformers (75) KVA and larger. Perform Insulation resistance test and turns ratio test. Submit five (5) copies to Engineer at substantial completion.

2.03 MOTORS

A. 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.

B. 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.

C. 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.

D. Power Factor: Check power factor of all motors (5 HP) and larger while driving it's intended load, and at all operating speeds.

2.04 GROUNDS

A. 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.

B. Electrode Ground: The resistance of electrodes (main service, generators, transformer, etc.) shall not exceed 10 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 3 point method in accordance with IEEE Standard 81. Submit all ground test readings to the Engineer in tabulated format at substantial completion.

C. 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.

2.05 EMERGENCY SYSTEM

A. General: Submit emergency system tests in accordance with NFPA 110. Refer to emergency section of the specification for additional information.

PART 3 - EXECUTION

3.01 SUBMITTALS

A. Equipotential Ground Test Report: Complete report form at the end of this specification.

B. Cable Test Report: Submit Cable Test Report in Triplicate.

C. 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.

D. 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.

E. Tabulated Data: Submit data on 8-1/2 x 11 inch sheets with names of the personnel who performed the test.

F. Final: Submit accepted memos before a request for final inspection.

3.02 QUANTITIES

A. 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

SECTION 16030

ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.01 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.

1.02 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.

1.03 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.

D. ANSI Compliance: Comply with applicable requirements of ANSI Standard A13.1, "Scheme for the Identification of Piping Systems", and ANSI Standard Z53.1 "Color Designation."

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.

1.04 1SUBMITTALS

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

2.01 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
6. National Band and Tag Co.
7. Panduit Corp.
8. Seton Name Plate Co.
9. Thomas and Betts Co.
10. Carlton Industries, Inc.

2.02 LANGUAGE

A. General: Provide all products in this section in English.

B. General: Provide all products in this section in English and Spanish.

2.03 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: Provide manufacturer's standard pre-printed, flexible, permanent, conduit markers, extending 360 degrees around conduits. Markers shall be designed for attachment to conduit by adhesive, adhesive lap joint, matching adhesive plastic tape at each end of marker, or pretensioned snap-on. Color shall match system printing requirements.

C. Voltage Marking: Except as otherwise indicated, provide lettering which indicates voltage of the conductor(s) in conduit. Provide 4 inch minimum length with 7/8 inch minimum lettering for 2 inch and smaller conduit. Provide 8 inch minimum length with 1-1/4 inch minimum lettering for larger than 2 inch conduit. Provide one marker for each 20' section of conduit. Color shall match system printing requirements.

D. Painted Band: Provide painted bands in color to match plastic markers or tape on all conduit. Provide colors as specified herein.

E. Cable/Conductor Identification Bands: Provide manufacturer's standard aluminum wrap-around cable/conductor markers, of size required for proper application, and numbered to show circuit identification.

F. Cable/Conductor Identification Bands: Provide manufacturer's standard vinyl cloth self-adhesive cable/conductor markers of the wrap-around type; either pre-numbered plastic coated type, or write-on type with clear plastic self-adhesive cover flap; numbered to show circuit identification.

G. Plasticized Tags: Manufacturer’s standard preprinted or partially preprinted accident prevention and operation tags, of plasticized card stock with matt finish suitable for writing, approximately 3-1/4 x 5-5/8 inch, with brass grommets and wire fasteners, and with appropriate pre-printed wording including large size primary wording, e.g., DANGER, CAUTION, DO NOT OPERATE.

H. 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.

I. Engraved Plastic Laminate Nameplates: Provide engraving phenolic plastic laminate, in sizes and thicknesses indicated, engraved with 1/16 inch thick lines with square standard pica lettering and wording as specified herein, black face and white core plies (letter color) for normal systems, kelly green and white for equipment, bright orange and white for critical, bright yellow and white for life safety, 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 1/16 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.

J. 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.

K. 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.

2.04 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 <u>stenciled</u> black letters for raceway systems.

PART 3 - EXECUTION

3.01 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.

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 that house potential electrical hazards, and label with appropriate signage or indicators.

3.02 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. Utilize a stencil for application of paint.

B. Identification: Identify all raceways provided or utilized as part of this project as follows;

1. Apply bands 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:

SPEC-WRITER-NOTE: SELECT APPROPRIATE SERVICES

	Service	Label
a.	Low Voltage	120/208 Voltage
b.	High Voltage	277/480 Voltage
c.	Fire Alarm	Fire Alarm
d.	Alarm Monitoring	Alarm
e.	Telephone	Telephone
f.	Computer	Computer
g.	Telephone/computer	Telephone/computer
h.	Intercom	Intercom
i.	Nurse Call	Nurse Call
j.	Physiological Monitoring System	Phys. Monitoring
k.	Paging	Paging
l.	Emergency	Emergency
(1)	Life Safety	Life Safety
(2)	Critical Branch	Critical Branch
(3)	Equipment Branch	Equipment Branch

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:

	System	Color
(1)	Life Safety	Bright Yellow
(2)	Critical Branch	Bright Orange
(3)	Equipment Branch	Kelly Green
(4)	Essential Distribution (from Generator to Generator Distribution Panel)	Purple
(5)	Normal Power	Royal Blue
(6)	Miscellaneous Communications	Brown
(7)	Fire Alarm	Red
(8)	Telephone\Computer	Black
(9)	Nurse call	White
(10)	TV	Light Pink
(11)	Paging	Grey
(12)	Physiological Monitoring	Beige

3.03 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;

120/208

CONDUCTOR	VOLTS
Phase A	Black
Phase B	Red
Phase C	Blue
Neutral	White
Equip.Ground	Green

120/240

CONDUCTOR	VOLTS
Phase A	Black
Phase B	Orange(High Leg)
Phase C	Blue
Neutral	White

277/480

CONDUCTOR	VOLTS
Phase A	Brown
Phase B	Orange
Phase C	Yellow

Neutral	Gray
Equip.Ground	Green

3.04 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 yellow field for life safety, orange 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. Electrical Substations.
   e. Motor Control Centers.

f. Power Transfer Equipment.
g. Transformers.
h. Inverters.
i. Rectifiers.
j. Frequency Converters.
k. Motor starters.
l. Disconnect switches.
m. Enclosed circuit breakers.
n. Communication Control Panels, Terminal Cabinets and Equipment Cabinets.
o. Telephone Switching Equipment
p. Remote Annunciators
q. Terminal Boards
r. Security CCTV Cameras
s. 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.

   b. Designate branch of essential power system (i.e. Life Safety, Critical, or Equipment branch) on nameplate after the word emergency, and Equipment designation.

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 16110

RACEWAYS AND CONDUIT

PART 1 - GENERAL

1.01 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.

1.02 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.

1.03 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. Aluminum Conduit: Aluminum conduit shall not be used unless specifically called for. Install with aluminum fittings only, when specified.

C. 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
h. UL 1242: Intermediate Metal Conduit (IMC)

3. NEMA:

a. NEMA TC2: Rigid Nonmetallic Conduit (PVC)
b. NEMA TC3: Fittings for Rigid Nonmetallic Conduit (RNMC)
c. NEMA TC8: Utility Duct Type EB-35
d. NEMA RN1: Plastic Coated Metal Conduit
e. NEMA VE-1: Ladder Cable Tray
f. NEMA 8A, 8B, 8C, & 12A: Spine Cable Tray

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. WW-C-581E: Intermediate Metallic Conduit (IMC)
e. WC-1094A: Nonmetallic Rigid Conduit (PVC)
f. WC-582A Conduit, Raceway, Metal and Fittings; surface

5. ASTM:

a. ASTM-F-512: Utility duct type EB-35
b. ASTM-A525 & ASTM-386: Tray manufacturers

1.04 SUBMITTALS

A. Products: Submit manufacturer's product data, including technical information on each type of raceway system;

1. Conduit - PVC
2. Conduit - Metal
3. Conduit fittings
4. Plastic (PVC) solvent
5. Black mastic coating for conduit
6. Insulating and grounding bushings for conduit
7. Galvanizing and protective coatings for conduit
8. Section Modules
9. Cross Sectional Area
10. Dimensional Sketches
11. Rung attachment details screwed or welded
12. Cable trays
13. Fittings
14. Accessories
15. Load and deflection data

B. Compliance: Product data shall show compliance with this section of the specifications, including U.L. label, manufacturer and manufacturer's written installation instructions.

1.05 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 1/2inch conduit unless otherwise noted on drawings.

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 a tensile strength not less than 200 lbs.

G. Conduit Bends: The use of NEC Table 346.10 Exception is not allowed.

1.06 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. Intermediate metallic conduit

3. Flexible metal conduit

4. Liquid-tight flexible metal conduit

5. Heavy wall Schedule 40 PVC

6. Galvanized rigid steel conduit

7. Extra heavy wall Schedule 80 PVC

B. Materials Below Grade: The following conduit types are to be installed below grade where specifically noted herein;

1. Rigid galvanized conduit (heavy wall)

2. Intermediate metal conduit (IMC)

3. Schedule 40 PVC

4. Utility Grade Type EB plastic

5. Schedule 80 PVC

C. Materials on Roofs: The following conduit types are to be installed on roofs where specifically noted herein;

1. Rigid steel conduit (PVC) coated

2. Rigid steel conduit

3. Intermediate grade conduit

1.07 CABLE TRAY

A. Description: Provide a system of manufactured, factory assembled, cable raceway to provide a convenient method of routing, organizing, and separating cables of different systems, and running in close proximity of one another where specified herein. Unless otherwise noted, the system shall be a continuous system bonded together to make a continuous grounding path. Where system is discontinuous, provide a #10 bonding conductor between the pieces of the system, and bond as previously indicated. Cable tray shall include all supporting devices and equipment, as listed on drawings and as specified herein with all necessary fittings, and hardware (ie. splice plates, bolts, nuts, washers, clips, covers, etc.) required for a complete tray installation system.

1.08 UNDERFLOOR DUCT

A. Description: Provide the metallic single level under-floor duct system as shown on the drawings, and as specified herein. The systems consists of the duct lengths, junction boxes, support couplers, supports, elbows, plugs and all necessary parts to install a complete underfloor duct system. The underfloor duct components shall be Underwriters' Laboratories listed and shall be installed in accordance with the provisions of the National Electrical Code. The feeder ducts shall be blank duct and the distribution ducts shall be standard and/or super insert ducts as indicated on the drawings. Separate copper equipment grounding conductors shall be run in all ducts with circuit conductors.

1.09 FLUSH TRENCH DUCT

A. Description: Provide a complete standard Trenchduct System having a maximum coverplate deflection of 0.40 inches with a 200 lb. concentrated load. System shall consist of duct lengths, support couplers, supports, elbows, T's, and all necessary parts to install a complete system. The entire duct system shall be Underwriters' Laboratories listed and shall be installed in accordance with the provision of the National Electric Code.

B. Inspection: Final inspection must show all duct and other components in place. The system shall be free of obstructions and of moisture after the concrete has been poured. Provide to Owner one cover plate lifter.

1.10 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

2.01 ELECTRICAL METALLIC TUBING

A. Fittings: Provide steel set screw fittings. Steel fittings shall be fitted with nonremovable insulated throats, and male threaded ends provided with a locknut.

B. Fittings: Provide steel compression type fittings. Steel fittings shall be fitted with nonremovable insulated throats, and male threaded ends provided with a locknut.

C. Locknuts: Provide locknuts for securing conduit to enclosures with sharp edges for digging into metal, and ridged outside circumference for proper fastening.

2.02 BUSHINGS

A. Bushings: Bushings shall be provided on all terminations, all system conduits, 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.

E. Grounding Bushings: Grounding bushings shall be provided on all electrical system feeder conduits.

2.03 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.

2.04 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.

2.05 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.

2.06 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.

2.07 EXTRA HEAVY WALL PVC CONDUIT (SCHEDULE 80)

A. Conduit: Schedule 80, 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 5500 PSI, at 73.4 degree F., flexural strength of 12,500 psi, compression strength of 9000 psi. Manufacturer shall have five years extruding PVC experience.

2.08 INTERMEDIATE METAL CONDUIT

A. Type: Intermediate metal conduit (IMC) shall be high frequency electro-welded into tube form to produce a high ductile conduit that can be easily bent with standard tools approved for IMC.

B. General: 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.

C. Finish: The electro-galvanized zinc finish shall be corrosion resistant and shall not crack or flake. A chromate conversion coating shall be applied over the entire tube as an additional corrosive preventative. The interior shall be protected and lubricated with a special silicone hard finish enamel.

2.09 HEAVY WALL PVC TYPE EB-35 UTILITY DUCT

A. General: Duct shall be composed of high modulus C-250 compound and conform to all applicable industry standards, U.L. listed for underground concrete encasement only. Conform to NEMA TC-8 and ASTM Standard F-512 for utility duct. Duct shall have a low coefficient of expansion (3.30 X 10-5 IN/IN/degree F.), be U.L. listed and have a tensile strength of 4800 PSI. Manufacturer shall have five years experience extruding PVC of this specific type.

2.10 MALLEABLE IRON EXPANSION FITTINGS

A. Type: Conduit expansion fittings shall be malleable iron (hot dipped galvanized inside and outside).

B. Fittings: These fittings shall have a 4 inch expansion chamber to allow approximately 2 inch movement parallel to conduit run in either direction from normal.

C. Internal Bonding: Fittings shall have factory-installed packing and internal tinned copper braid packing to serve as a bonding jumper.

D. External Bonding: Unless the fitting used is listed by Underwriters Laboratories for use "without external bonding jumpers", an external copper bonding jumper shall be installed with each metal expansion fitting. One end of the fitting shall be clamped on each conduit entering fitting.

2.11 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 316 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.

2.12 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 16 gauge steel. Wireway shall be as manufactured by Hoffman Engineering Company, Square "D" or Steel City.

2.13 CABLE TRAY

A. Description: Design shall be such that all like parts are interchangeable and may be readily assembled and joined without use of special tools. The trays shall be free of sharp edges or burrs that might damage cable while being pulled into the trays.

B. Ladder Type Cable Tray: The cable tray and tray fittings shall be ASTM 6063-T6 aluminum alloy extrusion.

C. Ladder Type Cable Tray: The cable tray and tray fittings shall be mill galvanized.

D. Ladder Type Cable Tray: The cable tray and tray fittings shall be stainless steel.

E. Ladder Type Cable Tray: The cable tray and tray fittings shall be hot steel, dipped galvanized after fabrication.

F. Tray Type: Tray shall be ladder type.

G. Tray Type: Tray shall be trough type.

H. Tray Type: Tray shall be solid bottom type.

I. Tray Type: Tray shall be channel type in 4-5/8 inch width.

J. Tray Type: Tray shall be channel type in 6 inch width.

K. Rails and Rungs: Cable tray side rails shall be of aluminum channel type, and rungs shall be of welded or screwed construction ("swedged" or "riveted" construction is not acceptable).

L. Rails and Rungs: Cable tray side rails shall be of galvanized channel type, and rungs shall be of welded or screwed construction ("swedged" or "riveted" construction is not acceptable).

M. Clips: Cable tray hold-down clips shall be of the expansion guide type, shall be aluminum, and shall be provided with tray.

N. Clips: Cable tray hold-down clips shall be of the expansion guide type, shall be hot dip galvanized steel, and shall be provided with tray.

O. Hardware: Bolts, nuts and washer shall be galvanized steel compatible with aluminum so as not to cause a galvanic reaction.

P. Radius Bend: All tray fittings used to provide vertical and horizontal bends shall have a minimum radius of 12 inches, unless noted otherwise on the drawings.

Q. Radius Bend: All tray fittings used to provide vertical and horizontal bends shall have a minimum radius of 24 inches, unless noted otherwise on the drawings.

R. Radius Bend: All tray fittings used to provide vertical and horizontal bends shall have a minimum radius of 36 inches, unless noted otherwise on the drawings.

S. Manufacturers: Ladder type manufacturers shall be Atlas, Square-D, Cope Inc., Mono-Systems, or B-Line.

T. Spine Type: Cable tray shall be constructed of a rectangular aluminum tube which forms a spine to which cross rungs are attached on 6 inch centers.

U. Spine Type: Cable tray shall be constructed of a rectangular aluminum tube which forms a spine to which cross rungs are attached on 9 inch centers.

V. Spine Type: Cable tray shall be constructed of a rectangular aluminum tube which forms a spine to which cross rungs are attached on 12 inch centers.

W. Spine Type: Cable tray shall be constructed of a rectangular aluminum tube which forms a spine to which cross rungs are attached on 18 inch centers.

X. Spine Rungs: The cross rungs shall be bent up at their ends to a height of 3 inches to form an open sided ladder like assembly. The tray must not have side rails. Rungs shall emanate at right angles from the top or the bottom of the spine.

Y. Spine Rungs: The cross rungs shall be bent up at their ends to a height of 5 inches to form an open sided ladder like assembly. The tray must not have side rails. Rungs shall emanate at right angles from the top or the bottom of the spine.

Z. Spine Rungs: The cross rungs shall be bent up at their ends to a height of 6 inches to form an open sided ladder like assembly. The tray must not have side rails. Rungs shall emanate at right angles from the top or the bottom of the spine.

AA. Support: The tray system shall be center supported.

BB. Support: The tray system shall be wall mounted.

CC. Support: The tray system shall be double tier wall mounted.

2.14 CABLE TRAY SPLICE CONNECTIONS

A. Description: Each straight section, and each tray fitting, shall be provided with two "heavy duty" splice plates and appurtenant hardware. The "heavy duty" splice plates, when bolted together to form a tray joint, shall be designed to have the same strength (or better) than the tray, when such joint is placed in mid-span, between two tray supports.

B. Adjustable: Adjustable splice plates shall be installed where needed to accommodate non-standard vertical and horizontal bends.

C. Resistance: Splice plates resistance between sections shall not exceed 0.00033 ohms.

2.15 LADDER CABLE TRAY BARRIERS STRIPS

A. General: Barrier strips (dividers) shall be provided to separate the various voltage classes and use of cables (ie: communications/computers, from power cables, etc.). Provide barriers as required, whether shown on the drawing or not.

B. Material: Barriers shall also be aluminum, and shall be manufactured to accommodate straight, sections as well as vertical and horizontal bends, and with appropriate notches and slots for fastening same to the rungs.

C. Material: Barriers shall also be galvanized steel, and shall be manufactured to accommodate straight, sections as well as vertical and horizontal bends, and with appropriate notches and slots for fastening same to the rungs.

2.16 LADDER TRAY COVERS

A. Material: Tray covers shall be aluminum where called for on contract documents.

B. Material: Tray covers shall be galvanized steel where called for on contract documents.

C. Material: Tray covers shall be ventilated and flanged where called for on contract documents.

D. Material: Tray covers shall be solid un-ventilated and flanged where called for on contract documents.

2.17 CABLE TRAY DIMENSIONS

A. Width: Ladder type tray shall be 6 inches wide.

B. Width: Ladder type tray shall be 12 inches wide.

C. Width: Ladder type tray shall be 18 inches wide.

D. Width: Ladder type tray shall be 30 inches wide.

E. Width: Ladder type tray shall be 36 inches wide.

F. Width: Spine type tray shall be 6 inches wide.

G. Width: Spine type tray shall be 9 inches wide.

H. Width: Spine type tray shall be 12 inches wide.

I. Width: Spine type tray shall be 18 inches wide.

J. Width: Spine type tray shall be 24 inches wide.

K. Width: Spine type tray shall be 30 inches wide (Wall rack only).

L. Ladder type: Tray shall have a 3 inch loading depth.

M. Ladder type: Tray shall have a 4 inch loading depth.

N. Ladder type: Tray shall have a 5-3/8 inch loading depth.

O. Rung Spacing: Ladder type of tray rung spacing shall be 6 inches.

P. Rung Spacing: Ladder type of tray rung spacing shall be 9 inches.

Q. Rung Spacing: Ladder type of tray rung spacing shall be 12 inches.

R. Rung Spacing: Ladder type of tray rung spacing shall be 18 inches.

S. Strength: Cable tray shall be capable of carrying 50 lb./linear foot without exceeding 1.5 inch mid-span deflection when supported every 8 feet, NEMA Class 8A.

T. Strength: Cable tray shall be capable of carrying 50 lb./linear foot without exceeding 1.5 inch mid-span deflection when supported every 12 feet, NEMA Class 12A.

U. Strength: Cable tray shall be capable of carrying 50 lb./linear foot without exceeding 1.5 inch mid-span deflection when supported every 16 feet, NEMA Class 16A.

V. Strength: Cable tray shall be capable of carrying 50 lb./linear foot without exceeding 1.5 inch mid-span deflection when supported every 20 feet, NEMA Class 20A.

W. Strength: Cable tray shall be capable of carrying 75 lb./linear foot without exceeding 1.5 inch mid-span deflection when supported every 8 feet, NEMA Class 8B.

X. Strength: Cable tray shall be capable of carrying 75 lb./linear foot without exceeding 1.5 inch mid-span deflection when supported every 12 feet, NEMA Class 12B.

Y. Strength: Cable tray shall be capable of carrying 75 lb./linear foot without exceeding 1.5 inch mid-span deflection when supported every 16 feet, NEMA Class 16B.

Z. Strength: Cable tray shall be capable of carrying 75 lb./linear foot without exceeding 1.5 inch mid-span deflection when supported every 20 feet, NEMA Class 20B.

AA. Strength: Cable tray shall be capable of carrying 100 lb./linear foot without exceeding 1.5 inch mid-span deflection when supported every 8 feet, NEMA Class 8C.

BB. Strength: Cable tray shall be capable of carrying 100 lb./linear foot without exceeding 1.5 inch mid-span deflection when supported every 12 feet, NEMA Class 12C.

CC. Strength: Cable tray shall be capable of carrying 100 lb./linear foot without exceeding 1.5 inch mid-span deflection when supported every 16 feet, NEMA Class 16C.

DD. Strength: Cable tray shall be capable of carrying 100 lb./linear foot without exceeding 1.5 inch mid-span deflection when supported every 20 feet, NEMA Class 20C.

2.18 UNDERFLOOR DUCT SYSTEM

A. General: The duct shall be manufactured of steel formed into a rectangular shape. The distribution duct inserts shall be ellipsoid or similar shape to permit easy fishing and pulling of wire and cable. The distribution duct lengths shall have factory preset inserts space on 24 inches centers, and shall be 7/8 inch. Modular duct lengths of 5, 6, 10 and 12 feet shall be used to minimize on-the-job cuttings, and to assure smooth duct ends. The standard duct size shall have a minimum cross sectional area of 3.75 inches. The duct shall be protected, inside and out, with a finish as accepted by Underwriters' Laboratories, Inc.

B. Junction Boxes: Junction boxes shall be fabricate steel single, two, (single, three etc.) service types as indicated on drawings. The cross section anywhere in a wireway or compartment of the junction boxes shall meet the requirements of the Underwriters' Laboratories, Inc. The boxes shall be equipped with factory-installed leveling screws at each corner for adjustment of the junction box top to the concrete screen level and for rigid anchoring. For duct mounted on grade install an 8 X 8 X 16 concrete block flush with fill for mounting J-box, coupling and support leveling screws. The cover plate shall be 1/4 inch thick, and shall include a 1/8 inch inner-tile trim. A 1/8 inch outer-tile trim shall be provided as an integral part of the junction box. Flush type floor-covering trim shall be supplied where other than 1/8 inch tile is used. Submit sample of rug trim rings for approval before ordering. Finish shall be as selected by the Architect.

C. Support Couplers and Supports: The duct shall be joined and held with electrical continuity provided by strong support couplers at all duct joints. Intermediate supports shall be installed where required to limit maximum support spacing. Support couplers and supports shall be supplied with factory installed leveling lugs. The leveling lugs shall be firmly fixed to the form or concrete block and shall be used to locate duct inserts at the required level. Electrical Foreman must be on job to supervise the concrete pour and maintain duct level.

D. Accessories: Vertical and horizontal elbows shall be provided as indicated on the drawings, and shall have capacity at least equal to the connected duct. Other components shall be provided for specific requirements as indicated on the drawings or specified herein. All joints between components of the underfloor duct system shall be sealed against concrete entry. Where used, sealing compound shall be waterproof and unaffected by concrete. Marker screws shall be installed in accordance with the National Electrical Code. Unused openings are to be closed by suitable plugs.

E. Service Fittings: Service fittings shall be provided for high and low tension application. Service fittings shall be compatible with the duct inserts. Finish of service fittings shall be as shown and coated with clear epoxy for protection against abrasion and corrosion. Service fittings shall be installed at location where shown on the drawings after the floor covering has been installed. No fittings shall be installed until acceptance of outlet locations from the Architect has been obtained.

2.19 UNDERGROUND DUCT LINES

A. Description: Underground duct lines where shown shall be of individual conduits encased in concrete. The conduit shall be of plastic, unless indicated or specified otherwise. The conduit used shall not be smaller than 4 inches in diameter, inside, unless otherwise noted. The concrete encasement surrounding the duct bank shall be reinforced as shown and rectangular in cross-section, having a minimum concrete thickness of three inches. Conduit shall be separated by a minimum concrete thickness of 2 inches.

B. General: The concrete work shall conform to Section on "Concrete". The top of the concrete envelope shall be not less than 18 inches below grade. Concrete shall be installed in a continuous pour to eliminate joints in the duct run. Duct lines shall have a continuous slope downward toward manholes and away from buildings with a pitch of not less than 3 inches in 100 feet. Changes in direction of runs exceeding a total of 10 degrees either vertical or horizontal, shall be accomplished by long sweep bends having a minimum radius of curvature of 25 feet, except that manufactured bends may be made up on one or more curved or straightened sections or combinations thereof. Manufactured bends shall have a minimum radius of 36 inches.

C. Conduits: Conduits shall terminate in end-bells where duct lines enter manholes. Provide 4 to 6 inch reducers as required. Separators shall be of pre-cast concrete, high impact polystyrene, steel or any combination of these. The joints of the conduits shall be staggered by rows so as to provide a duct line having the maximum strength. During construction partially complete duct lines shall be protected from the entrance of debris, such as mud, sand and dirt by means of suitable conduit plugs. As the duct line is completed, a testing mandrel not less than 13 inches long with a diameter 1/4 inch less than the size of the stiff bristles shall be drawn through until the conduit is clear of all particles of earth, sand or gravel; conduit plug shall then be immediately installed.

D. Conduit: Plastic conduit, fittings and joints shall not have been stored in the sun or weather, in any excessively heated space, or unevenly supported during storage. Use and installation shall be in accordance with the National Electrical Code requirements for the installation of non-metallic rigid conduit. Plastic conduit shall be protected against the direct rays of the sun prior to installation. Conduit shall be Carlon Type EB, Queen City Plastics, or accepted substitution. Conduit shall be U.L. listed and conform to NEMA Standard TC6-1972.

E. Trench: Trenches for duct banks shall be completely dry before setting conduits or pouring concrete. Well pointing as required shall be provided if necessary to keep trench dry.

F. Racks: Wires and cables in manhole shall be placed on cable racks. Manhole shall be cleaned of all loose materials, dirt and debris immediately after completion of new work and shall be in a clean condition when project is completed. All racks shall be complete with insulators. Racks shall be McGraw Edison NOB-LOC type, Chance or accepted substitution.

G. Excavation: Backfilling shall be in layers not more than 8 inches deep, and shall be thoroughly tamped. The first layer shall be earth or sand, free from particles that would be retained on a 1/4 inch sieve. The succeeding layers shall be excavated material having stones no larger than would pass through a 4-inch ring. The backfill shall be level with adjacent surface, except that in sodded or paved areas, a space equal to the thickness of the sod or paving shall be left.

H. Finish: The surface disturbed during the installation of duct shall be restored to its original elevation and condition if not refinished in connection with site work.

I. Plugging: All unused conduit openings shall be plugged or capped with a suitable device designed for the purpose; caulking compound shall not be used for plugging conduit openings.

J. Counterpoise: Two #4 AWG bare stranded copper counterpoise shall be run above all duct banks and shall be run into all manholes and handholes and grounded. Counterpoise shall run to building and be grounded at each building service ground.

2.20 FLUSH TRENCH DUCT

A. General: Trenchduct body shall have a one piece bottom and side construction of 14 gauge steel which shall be rigidly supported by the adjoining concrete. Trenchduct shall be constructed without cross bars or straps to permit free lay-in of cables. Minimum width of trench base shall be 2-3/16 inches less than width of coverplate. Coupling lugs shall be provided on each section of trenchduct to permit proper alignment of the tile trim prior to tack welding into final position. Welding clips shall be provided on minimum 3 foot centers for installation on steel deck. Welds shall occur on 3 foot centers. Exterior leveling screws shall be provided in lieu of welding clips for underfloor duct installation. Leveling screws encased in rivnuts to permit 3/8 inch upward adjustment without removing coverplates. Adjustment can be made before or after concrete has hardened. Trenchduct shall be protected by a U.L. listed corrosion resistant coating and provided in lengths adaptable to specified plan. Corkene gasket shall be used between tile trim and coverplate.

B. Trim: Trenchduct trim shall be factory installed so that the exposed surface is flush with the coverplates. Trim shall be covered with factory-applied tape for protection. Prior to installation of the finished floor tile, or carpet, the trim shall be adjusted and permanently secured to the trench body with clips so that it shall accommodate a floor finish as required.

C. Coverplates: Coverplates shall be 1/4 inch thick level steel, and provided complete with hold down screws. Coverplates shall have overlapping joints and shall be fully gasketed with 1/16 inch thick neoprene-cork composition material. Countersunk holes at end of each coverplate (opposite the lap strip) are to be tapped to permit insertion of 3/4 inch eye bolt for removal of coverplates. Duct shall have 2 compartments, each compartment shall have 1 inch openings on 12 inch centers. All openings are to be field cut in coverplate with a metal hole saw and bushed with grommet.

D. Compartments: Fully adjustable compartment dividers shall be of 14 gauge steel with minimum 1/2 insch wide shelf at top covered with 1/16 inch thick corkene gasket for longitudinal bearing of coverplate. For compartments wider than 13 inches an interrupted partition 6 inches long or a support stud shall be provided to maintain maximum deflection of 0.040 inches with a 200 lb. concentrating load. Partition shall be adjusted so that it bears against the underside of the coverplate when the final leveling is completed. At this time, partition shall be permanently tack welded together with 1/16 inch fillet welds 1inch long on 1 foot centers. Paint the welds with accepted protective paint.

2.21 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-616.

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.

2.22 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.

2.23 TELEPHONE TERMINAL BOARDS

A. Terminal Boards: Telephone Boards shall be 8 foot high and of the width shown unless otherwise noted. Terminal boards shall be 3/4 inch A/C grade exterior plywood painted light gray with fire resistant paint.

B. Grounding: Each terminal board shall be provided with a #6 AWG bare copper conductor installed in 3/4 inch PVC conduit to the building service ground. Service ground attachment shall be made with an approved lug. Provide 6 foot excess ground conductor length at terminal board for connection to equipment.

C. Terminal Board Conduits: Conduits at Terminal board locations shall be neatly racked on a Kindorf Type rack secured to wall above and below terminal boards.

PART 3 - EXECUTION

3.01 CONDUITS

A. Provide as a minimum 3/4 inch conduit from each of the following device locations to cable tray or corridor ceiling cavity when cable tray is not available. Provide insulated bushings at ends of all conduits.

1. Telephone
2. Public Address/Music Computer System
3. Nurse Call
4. Dictation
5. Fire Alarm
6. Cable TV
7. Code Blue
8. CCTV
9. DDC
10. Data
11. Elevator Location Panel
12. Security
13. Intercom

B. Provide plenum-rated cable for all systems conductors.

3.02 TELEPHONE COMPANY COORDINATION

A. Telephone Company: The Contractor shall notify the Telephone Company when the conduit system is being installed. The Contractor shall coordinate the work with the Telephone Company as required.

3.03 CABLE TV COMPANY COORDINATION

A. Cable Television Company: The Contractor shall notify the Cable Television Company when the conduit system is being installed. The Contractor shall coordinate the work with the Cable Television Company as required.

3.04 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.

3.05 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.

3.06 TRENCH DUCT INSTALLATION

A. Flush Trench Duct: Examine area to receive floor-duct to assure adequate clearance for installation. Start work only after unsatisfactory conditions are corrected. Make all connections complete from trenchduct to panels and equipment rooms and allied parts as indicated on the drawings.

B. Trenchducts General: Trenchducts shall be accurately aligned and leveled. Concrete shall be vibrated to eliminate void areas and to assure a solid base under and alongside the trenchduct. Concrete poured to the height of trenchduct and care shall be taken that the concrete is finished level along both sides. Hand troweling shall be required on both sides of the trenchduct. Cooperate with the concrete installer to procure good workmanship where the concrete floor meets the trenchduct.

C. Trenchduct Handling: After floor fill is in place coverplate shall be cleaned of any excess concrete. Covers on ends and in middle of trenchduct runs shall be removed 24 to 36 hours after concrete is poured and left open for proper air circulation. Trenchduct shall be swabbed out and dried where moisture occurs. Keep material such as plaster, lumber, bricks, mortar, etc. off of trenchduct during construction. Before coverplates are set in place, trenchduct shall be vacuumed of foreign debris. Floor tile or carpet installer shall cement standard full tiles to coverplate.

D. Trenchduct Installation: Install trenchduct according to manufacturer's written recommendations and NEC.

3.07 UNDERFLOOR DUCT INSTALLATION

A. Single Level Underfloor Duct General: Examine area to receive floor-duct to assure adequate clearance for installation. Start work only after unsatisfactory conditions are corrected. Make all connections complete from floor duct to panels and equipment rooms and allied parts as indicated on the drawings. Install floor duct according to manufacturer's written recommendations and NEC.

B. Single Level Underfloor Duct Preparation: All of floor duct shall be accurately aligned and leveled. Concrete shall be vibrated to eliminate void areas and to assure a solid base under and around the floor duct. Coordinate and cooperate with the concrete installer to procure good workmanship where the concrete floor meets the floor duct.

C. Underfloor Duct Cleaning: After floor fill is in place coverplate shall be cleaned of any excess concrete. Floor duct shall be swabbed out and dried where moisture occurs. Keep material such as plaster, lumber, bricks, mortar, etc., off of trenchduct during construction. Before coverplates are set in place, floor duct shall be vacuumed for foreign debris. Floor tile or carpet contractor shall cement standard full tiles to coverplate.

3.08 MANHOLE INSTALLATION

A. Excavation: Excavation for manhole shall be to depths indicated and of whatever substance encountered. Excavated materials not required or suitable for backfill shall be removed from the project site. Provide sheeting and shoring as necessary for protection of work and safety of personnel. Remove water from excavation by pumping or other accepted method. Backfilling around structures shall consist of earth, loam, sand-clay, or sand and gravel, free from large clods of earth or stones not over 1-inch in size. accepted backfill material shall be placed symmetrically on all sides in loose layers not more than 9 inches deep. Each layer shall be moistened, if necessary, and compacted with mechanical or hand tampers, surfaces disturbed during the installation of manholes, and handholes shall be restored to its original elevation and condition as herein specified for underground service lines.

B. Finishing: Horizontal concrete surfaces of floors shall have a smooth trowel finish. Frames and covers shall be watertight and covers shall fit the frames without undue play. Steel and iron shall be formed to shape and size with sharp lines and angles. Castings shall be free from warp and blow holes that may impair their strength or appearance. Exposed metal shall have a smooth finish and sharp lines arises. Provide all necessary lugs, rabbets and brackets. Set pulling-in irons and other built-in items in place before depositing concrete.

C. Cleaning: After installation, cast-iron frames, covers and grating not buried in masonry shall be cleaned to the bare metal of mortar, rust, grease, dirt and other deleterious materials, and given a coat of bituminous paint. Steel frames and covers not buried in masonry shall be cleaned of mortar, dirt and grease by an accepted blasting method and shall be cleaned to bare metal. Surfaces contaminated with rust, dirt, oil, grease, or other contaminants shall be washed with solvents until thoroughly clean. Immediately after cleaning, surface shall be coated with a coat of pretreatment coating conforming to specification MIL-P-15328 or be given a crystalline phosphate coating conforming to Specification TT-C-490, Method 1, as soon as practicable after the pretreatment coating has dried, treated surfaces shall be primed with a coat of zinc chromate primer conforming to Specification TT-P-645 and one coat of synthetic gloss enamel conforming to Specification TT-E-489.

D. Sealing: Caulking compound for the sealing of conduits, ducts and sleeves shall be of putty-like consistence workable with the hands at a temperature as low as 35 degrees F., shall not slump at a temperature of 300 degrees F., and shall not harden materially when exposed to air. The compound shall readily caulk or adhere to clean surfaces of the following: Plastic conduit, concrete, masonry, sheaths of cables, and the common metals. The compound shall form a seal with the foregoing without dissolving, noticeably changing characteristics or removing any of the ingredients. The compound shall have no injurious effect upon the hands of workmen or upon the materials.

E. Capping: All unused conduit openings shall be plugged or capped with a suitable device designed for the purpose. Caulking compound shall not be used for plugging conduit openings.

3.09 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.

3.10 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.

3.11 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 in accordance with NEC 517. 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.

3.12 PVC CONDUIT

A. Restricted Location: PVC conduit shall not be used in any patient care areas or for any essential electrical system feeders. PVC shall be used for lightning protection down conductors and grounding electrode raceways.

B. 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.

C. 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.

D. 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.

E. Ground Conductor Installation: All individual bare copper ground conductors (i.e. service, transformer, or lightning protection grounds) shall be installed in PVC conduit.

F. 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.

G. Restrict Support: PVC conduit shall not be used to support fixture or equipment.

H. Bends: Field bends shall be made with an approved hotbox. Heating with flame and hand held dryers are prohibited.

3.13 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.

3.14 EXPANSION FITTINGS

A. Installation: Provide expansion fittings in each conduit run wherever it crosses an expansion joint. Install the fitting on one side of the joint with its sliding sleeve end flush with joint, and with a length of bonding jumper in expansion equal to at least three times the normal width of joints.

B. Location: Provide expansion fittings in each conduit run which is mechanically attached to separate structures to relieve strain caused by shift on one structure in relation to the other.

C. Length: Provide expansion fittings in straight conduit runs above ground which are more than one hundred feet long.

3.15 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.

3.16 CABLE TRAY INSTALLATION

A. Inspection: Examine area for clearances, to allow proper installation of the tray according to the routing indicated on the drawings. Check existing building steel and other supporting structures to establish the type of tray hangers to be used and at the proper spans. Consult the field engineer for questionable areas or conflicts.

B. Installation Criteria: Install cable tray in accordance with manufacturer's data, written instructions, NEC, NEMA and as specified herein.

C. Support: Cable tray support shall be by means of welded angle brackets to structural components, or trapeze type supports using mill-galvanized steel channel 1-5/8 inch square (similar to "Kindorf" or "Unistrut") with slots, 1/2 inch threaded rods, nuts, washers, beam clamps and "clip" angle (where necessary) welded to building steel to provide the means for beam clamp attachment.

D. Distance Separation: The vertical distance between multi-layer trays, (where called for on drawings) rung to rung, or to the bottom of the tray, shall be 18 inches, except where noted otherwise on the drawings. At least one side of each tray shall be accessible.

E. Securing Cables: Where ladder type tray is used, all cables within trays shall be secured to the rungs on 6 foot maximum centers. Vertical runs and bends shall be secured on 3 foot maximum spacing.

F. Tie Raps: Tie downs shall be as manufactured by Thomas & Betts self-locking "Ty-Rap" with sizes as required, or as accepted by the Engineer.

G. Grounding: All cable trays shall be grounded in accordance with the National Electric Code, and/or as shown on drawings.

H. Coordination: Wherever possible, install horizontal cable trays above water and steam piping. Coordinate installation of tray with other trades for clearances, to avoid conflicts.

I. Shop Drawings: Provide shop drawing of proposed cable tray installation to Division 15 for coordination.

END OF SECTION

SECTION 16120

WIRES AND CABLES

PART 1 - GENERAL

1.01 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.

1.02 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.

1.03 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

1.04 PRIMARY CABLE

A. Description: Cable shall be 5 KV three conductor #4/0 AWG compact sector stranded copper, belted, PILCP complete with compatible splices and transmitters -or- primary cable description: Cable shall be single conductor #4/0 AWG EPR copper, wire shield, complete with compatible splices and terminations.
B. Description: Cable shall be 5 KV grounded neutral, single conductors copper, #500 MCM, varnish cambric lead covered, with neoprene jacket with compatible splices and terminations.

1.05 SUBMITTALS

A. General: Submit product data on all different types of conductors specified.

1.06 FLEXIBLE WIRING SYSTEMS

A. General: Provide a flexible wiring system used to supply power to lighting fixtures, poke-thru power outlets and wall receptacles as shown on the contract documents.

B. Description: The prefabricated system shall be complete with all 120 and/or 277 volt 3 and/or 4 wire power getaway boxes, fixture adapters, jumper cable sets, wall switch boxes, wall power boxes, poke-thru power outlets etc.

C. Compliance: The system and its components shall comply with the requirements of Underwriters Laboratories, Inc. and shall be U.L. listed or labeled for intended use on this project and UL listed and labeled for use in return air plenum and rated to make and break under rated load. All work and materials shall comply with the National Electrical Code and applicable state and local building codes.

D. Final Condition: The system shall be of construction such that when installation is complete all system components shall be metal enclosed, in a locked mode and shall comprise a fully grounded system.

1.07 ALUMINUM CONDUCTORS

A. Connections: Wire from load side of all disconnect switches to connect moving, vibrating, heat producing equipment including indoor transformers shall be copper with same ampacity as feeder, even if feeder to disconnect switch is specified aluminum. Proper UL listed lugs must be provided in all disconnect switches for the type and size of conductors installed. Where an aluminum feeder connects to equipment that does not require an external disconnect switch the aluminum wire shall be spliced to copper with UL listed compression connectors before being connected to the lugs or terminals of the equipment, even though the lugs are accepted for combination copper and aluminum use.

B. Terminations, Splices and Taps: Where aluminum conductors, #1 AWG and larger are terminated, spliced or tapped, the connectors shall be color-coded, tool applied compression type made of aluminum with wire barrels factory prefilled with oxide inhibiting compound. Splices, lugs and taps shall be T & B, Anderson, Burndy or accepted substitution. Installation shall be as follows;

1. Installing tools and dies, of hexagonal or circumferential type made by the connector manufacturer shall be used for installation. Tooling shall be with color-coded or dieconnector coding system for inspection purposes. Where UL listing is applicable for connectors, the manufacturer's recommended tooling shall be used. Conductors shall be cleaned with a wire brush immediately before connecting.
2. Terminal lugs with bolting pads shall be tin-plated for low contact resistance.
3. The connectors shall meet the performance requirement Underwriters Laboratories Test of UL 486, except that heating or current cycling tests shall be for a minimum of 500 cycles.
4. Belleville type compression washers shall be used with all bolted connections properly tightened with a torque wrench. Compression washers shall be T & B Catalog Series 60800 or accepted substitution.
5. Taps and splices made of dissimilar metals shall be made with accepted connectors to avoid direct contact of similar metals.

1.08 ELECTRICAL DISTRIBUTION - AERIAL

A. General: The drawings indicate the extent and general arrangement of the aerial electrical-distribution system. Capacities of all equipment and material shall be not less than those indicated.

B. Codes: The installation shall comply with the requirements and recommendations of the latest edition of the ANSI C2 National Electric Safety Code for light loading conditions, Grade B construction.

C. Conformance with Agency Requirements: Where materials or equipment are specified to conform to the standards of ANSI, or to be constructed or tested, or both, in accordance with the standards of the National Electrical Manufacturers Association (NEMA), the Contractor shall submit proof that the items provided under this section of the specifications conform to such requirements. Where materials or equipment are specified to comply with ANSI, ASTM, AWPA or EEI standards, the Contractor shall provide the manufacturer's certificate stating that the material conforms to the referenced standard.

D. Prevention of Corrosion: All metallic materials shall be protected against corrosion. All ferrous metals such as anchors, bolts, braces, boxes, bodies, clamps, fittings, guards, nuts, pins, rods, shims, thimbles, washers, and miscellaneous parts not of corrosion resistant steel, shall be hot-dip galvanized in accordance with ASTM A 123 or A 153, except where other equivalent protective treatment is specifically accepted in writing by the Engineer.

E. Verification of Dimensions: The Contractor shall be specifically responsible for the coordination and proper relation of work to the site. The Contractor shall visit the premises and thoroughly familiarize himself with all details of the work and working conditions, to verify all dimensions in the field, and to advise the Engineer of any discrepancy before performing any work.

F. Fuses: Furnish to the Owner a complete extra set of 3 primary fuses for each size used on this project.

1.09 PRIMARY CABLE QUALITY ASSURANCE

A. Reference Standards:

1. ASTM Specification B-230 (Aluminum)
2. ASTM Specification B-231 (Concentric stranded aluminum)
3. ASTM Specification B-3 (Copper)
4. ASTM Specification B-8 (Concentric stranded copper)
5. IPCEA Applicable Standards
6. IEEE Publication No. 48-Standard for Potheads.
7. Association of Edison Illuminating Companies (AEIC) 1-68

B. Source Quality Control:

1. Tests to meet IPCEA Standards.
2. Field tests shall be as herein specified.

PART 2 - PRODUCTS

2.01 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, grounding conductors and branch circuits #6 AWG and smaller shall be installed with color-coded wire with the same color used for a system throughout the building. Conductors above #6 AWG shall either be fully color-coded or shall have black insulation and be similarly color-coded with tape in all junction boxes and panels in accordance with NEC 310-12. 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.

2.02 MANUFACTURERS

A. General: Branch circuit and feeder conductors shall be manufactured by one of the following: General Cable Co., Anaconda, Pirelli, Rome Cable Corporation, or American Insulated Wire Corporation.

2.03 MATERIALS FOR AERIAL DISTRIBUTION

A. Bolts and nuts: Federal Specification FF-B-575 and FF-N-836, steel, zinc-coated, type and size as required.

B. Conductors: Copper, ACSR or AAAC to match existing, equivalent size as indicated or required.

C. Copper, solid hard-drawn: Federal Specification QQ-W-343, of size indicated.

D. Fuse cutouts, primary: NEMA Standard SG 2 with NEMA Standard 100 mounting brackets where required and specified hereinafter.

E. Guy Strand: Zinc-Coated steel, ASTM Specification A 475.

F. Insulators: ANSI Standard C29.1 through 29.9 inclusive, as applicable and specified hereinafter.

G. Lightning arresters: NEMA Standard LA 1, with NEMA Standard mounting bracket where required and as specified hereinafter.

H. Poles: ANSI Standard 05.1, machine-trimmed by turning A5 & A6, and oil-borne preservatives and petroleum conforming to AWFPA Standards P8 and P9. Purchasing inspection and branding shall conform to AWPA Standards M1, M2 and M6 except poles may be drilled and gained after treatment.

I. Pole-line hardware: Zinc-coated, EEI Publication Nos. TDJ-1 through TD-24 inclusive, except 8, 13, 18 and 20; steel hardware material, ASTM Specifications A 575 or A 576.

J. Solderless Connectors and Splices: Federal Specification W-S-610, type class, style, and size as indicated or required. All connectors and splices shall be compression tool applied type, Burndy, Anderson or accepted substitution.

K. Steel and miscellaneous: ASTM Standard A36 or A575 or A576.

L. Wood preservative for poles and crossarms: AWPA P8 and P9.

M. Zinc coating for ferrous metals: ASTM Standard A 123 or A 153.

2.04 POLES

A. General: Poles shall be pressure-treated wood, southern pine. Poles shall be of the length and class indicated, except that longer poles shall be provided where necessary to maintain the minimum vertical clearances required by the National Electrical Safety Code after final unloaded sagging. All clearances specified by the National Electrical Safety Code shall be maintained. Footnote reductions to tables shall not apply and clearances shall not be reduced except where authorized in writing by the Engineer. Pole markings shall be located approximately 10 feet from the butt of the pole, except where other locations standard with the pole manufacturer are accepted. Poles shall be turned smooth full length, and shall be roofed prior to pressure treatment. Poles may be bored and gained after treatment. Poles shall have a minimum of 8000 pounds/square inch fibre stress. Treatment of pentachlorophenol shall provide minimum retention of 45 pounds/cubic as determined by the Limeignition Assay method. Penetration shall be minimum 3-1/2 inches or 90 percent of sapwood for all poles.

B. Standards: Poles held in storage for more than 2 weeks shall be stored in accordance with ANSI Standard 05.1. The handling of poles shall be in accordance with ANSI Standard 05.1 except that pointed tools capable of producing indentations more than 1 inch in depth shall not be used.

2.05 PRIMARY CABLE

A. PILCP Cable: Conductors shall be copper soft drawn or annealed, uncoated and conform to ASTM Specifications (B-230) (B-3) latest edition before stranding. The conductors shall conform to AEIC-1-68 standards.

B. PILCP Cable: Conductors shall be aluminum soft drawn or annealed, uncoated and conform to ASTM Specifications (B-230) (B-3) latest edition before stranding. The conductors shall conform to AEIC-1-68 standards.

C. EPR Cable: Conductors shall be copper soft or annealed, uncoated and conform to ASTM specifications (B-230) (B-3) latest edition before stranding.

D. EPR Cable: Conductors shall be aluminum soft or annealed, uncoated and conform to ASTM specifications (B-230) (B-3) latest edition before stranding.

E. VCLC Cable: Conductors shall be copper soft drawn or annealed uncoated and conform to ASTM specifications (B-230) (B-3) latest edition before stranding.

F. VCLC Cable: Conductors shall be aluminum soft drawn or annealed uncoated and conform to ASTM specifications (B-230) (B-3) latest edition before stranding.

G. Standards: Stranding shall be Class B. and shall conform to the latest editions of ASTM Specifications (B-231) (B-8) size shall be as shown on drawings.

H. Construction: The conductors shall be covered with an extruded semi-conducting layer. The layer shall be extruded over the conductor to a minimum nominal thickness of 0.15 inches. It shall fit tightly to, but strip readily from the conductor, and be thoroughly bonded to the insulation. The semi-conducting tape shall conform to IPCEA Specifications S-19-18, latest edition.

I. Covering: Each conductor shall be covered with the appropriate thickness. The insulation wall thickness shall conform to the wall thickness requirements of IPCEA. The cable shall, as a minimum limit, meet the physical and electrical requirements of IPCEA. The cable shall be suitable for operation at a maximum continuous conductor temperature of 85 degrees C.

J. Insulation: EPR cable insulation shall be covered with an extruded layer of semi-conducting thermosetting material which shall be identified as being semi-conducting. Over this layer shall be applied a concentric serve of #24 AWG annealed solid bare copper wires, over which shall be applied a lapped non-metallic binder tape. A PVC jacket shall be applied over the cable in accordance with IPCEA.

K. Insulation: VCLC cable shall have varnished cambric cloth which shall consist of closely woven cotton cloth treated on both sides with a high temperature, long-aging, black insulating varnish. The tapes shall be applied helically over the conductor with a coat of mineral base oil slipper compound on alternate layers. A lead sheath shall be applied over the cable to a thickness as specified by IPCEA for the size of conductor. A neoprene jacket shall be applied over the lead sheath in accordance with IPCEA.

L. Testing: All cable manufactured under this specification shall be electrically tested according to IPCEA Standards. These tests shall consist of AC voltage, DC voltage, insulation resistance and corona extinction level. Cable shall be G.E. PWC or accepted substitution.

M. Potheads: Potheads shall be installed on all terminations and shall be designed for installation of the appropriate KV cable rating. Provide in accordance with wire manufacturers specific instructions as detailed. G & W or accepted substitution.

N. Splice Instructions: Splices shall be designed in accordance with wire manufacturers specific instructions and shall be designed for splicing the appropriate rating cable of size as shown. G & W or accepted substitution.

O. PILCP Splices: Splices to PILCP cable shall be made with transition joints (G & W or accepted substitution) for PILCP/EPR cables, in accordance with cable manufacturer specific instructions.

P. Terminations: Cable terminations at oil switch shall be 1/C cableheads (G & W or accepted substitution), complete with mounting gaskets, internal wire rope connections, stress cones, compound, entrance fittings, etc. required.

Q. Terminations: Cable terminations at transformer shall be load break elbow connectors, Elastimold or accepted substitution. Leave sufficient slack in cable to facilitate pulling of elbows. Elbows shall be installed as required for cable.

2.06 FIREPROOFING OF CABLES IN MANHOLES

A. General: All wire and cables in manholes shall be fireproofed. Strips of fireproofing tape approximately 1/16 inch thick by 3 inches wide shall be wrapped tightly around each cable spirally in one-half lapped wrapping, or in two butt-jointed wrappings with the second wrapping covering the joints in the first. The tape shall be applied with the coated side toward the cable, and shall extend one inch into the ducts. To prevent unraveling, the fireproofing (Arc-proofing) tape shall be random wrapped with tape conforming to type FGT of specification MIL-I-15126. The fireproofing (arcproofing) tape shall consist of a flexible, conformable fabric having one side coated with a flame-retardant, flexible, polymeric coating and/or a chlorinated elastomer. The tape shall not be less than 0.050 inch thick, and shall weigh not less than 2.5 pounds per square yard. The tape shall be non-corrosive to cable sheath, shall be self-extinguishing, and shall not support combustion. The tape shall not deteriorate when subjected to oil, water, gases, saltwater, sewage and fungus. The tape shall have a tensile strength of not less than 40 pounds per inch width, and when tested under USA Standard L14.184 cut strip method, the tape shall retain 65 percent of its original tensile strength for the following tests for 168 hours for each requirement;

1. Immersion in distilled water,
2. Immersion in 3 percent salt water,
3. Exposure to ultra-violet light (30-watt germicidal lamp),
4. Exposure to sunlight (Type S-1 sun lamp), and
5. Exposure to concentrated sewage.

B. Testing: The completed installation of fireproofing shall be capable of withstanding a 200 ampere arc for 30 seconds and shall be determined by tests made of a sample assembly consisting of a 30 inch diameter lead tube fireproofed (arcproofed) as specified above. The lead tube shall have a wall thickness of 1/8 inch. The sample assembly shall be exposed to an arc current from 7/8 inch electrodes located one inch from the assembly at three different points. At each point, the arc current of not less than 195 and not more than 210 amperes at 40 volts D.C. shall be blown magnetically against the assembly until the lead tube melts at the arc contact point. For each of the three tests, the fireproofing (arcproofing) shall prevent the arc current from melting the lead tube for at least 25 seconds at any one point, and for an average of 30 seconds for the three points.

2.07 FLEXIBLE WIRING SYSTEMS

A. Power Getaway Plates and Boxes: All power getaway plates and boxes shall be factory assembled and shall be clearly marked for designation of service, voltage and connector identification. Boxes or plates shall be of 1, 2, 3 or 4 receptacle construction as specified on the drawings.

B. Conduit Entry: Boxes shall have provisions for 1/2 or 3/4 inch conduit entry. All ceiling mounted outlet boxes shall be as noted on drawings (size shall be coordinated with system being installed) and shall contain three (minimum) getaway receptacles.

C. Receptacles: All box receptacles shall be prewired with #12 AWG stranded copper conductors, type TW, 600 volts rated, consisting of 1 or 2 phase conductors, a common neutral, plus an equipment grounding conductor connected to the metal box. Receptacles shall be uniquely polarized for service and function and shall be flush mounted into individual metal cavities. The metal cavities shall receive the power heads of the cable sets by a positive mating engagement.

D. Circuits: The maximum connected load per branch circuit shall be as indicated on the drawings and specifications. In no instance shall the connected loads exceed 20 amperes per circuit. Two different circuits of the same electrical phase shall not be connected to the same connector sharing a common neutral conductor.

E. Connectors: The connectors of the system shall be of 3 and/or 4 wire construction molded from U.L. listed material and so color coded and keyed that only units of the same service and voltage and function can be physically mated and electrically connected. Color coding shall comply with Section 16120 to the extent feasible.

F. Rating: Entire system shall be 20 ampere rated and shall be U.L. listed for disconnect under maximum rated load.

G. Manufacturer: System shall be of one manufacturer Hubbell, Metalux, Miller or Walker.

H. Lighting Fixture Adapters: Adapter assemblies shall be provided in the lighting fixtures. Fixture adapters shall be prewired and U.L. listed. Each fixture adapter shall be wired per fixture type and ballast circuit designation.

I. Jumper Cable Sets: All jumper cable sets shall have factory prewired, locking, metal enclosed power head and receptacle connector assemblies. The double receptacle box assembly on cable sets shall be encased within an assembly of two 16 gauge steel stampings. Each cable head shall have a pair of positive-acting spring steel latches. The latches shall engage the metal opening of receptacles in system components such as distribution boxes, tap boxes and lighting fixtures. The steel latches of cable heads shall provide grounding of non-current carrying metal equipment by bonding mated components of the system. The mating connections shall be U.L. approved for disconnect under load. All cables shall be clearly marked and color-coded for designation of service and voltage, catalog number and length. Line voltage branch circuit cable sets shall have 2 or 3 #12 AWG stranded copper conductors, type TW, 600 volts, plus and equipment grounding conductor with galvanized steel armor interlocked overall. The equipment grounding conductor shall be in contact with armor over the length of the cable. This conductor shall terminate in connectors at both ends of cable sets and shall be bonded to the steel stampings of connector heads. Cable sets shall be prewired for distribution of one or two circuits with a common neutral.

2.08 INSULATORS FOR AERIAL DISTRIBUTION

A. General: Insulators shall conform to ANSI Standards Nos. C29.2, C29.4, C29.5, C29.6, or C29.7, as applicable for the installation, with testing in accordance with ANSI Standard C29.1. Two suspension-type insulators shall be used on the primary system at corners, dead-ends, and angles, as shown or required. Vertical and horizontal pin insulators shall be used for straight primary conductor construction. Pin insulators shall be used for standoff application. All insulators shall have sky-glaze finish. Suspension insulators shall be Chance C907-1009, ferrous fitted, ANSI Class 52-9. Pin insulators shall be McGraw Edison NP9D8S. Spool insulators shall be used for neutral conductor. Mechanical strength of suspension and pin insulators shall exceed the ultimate strength of the conductor attached thereto.

B. Spools: Spool insulators shall conform to ANSI Standard C29.3.Insulators shall be not smaller than class 53-2. Spool insulators shall be Chance C909-1032 or accepted substitution. Clevis shall be Chance 0327 or accepted substitution.

2.09 GUYS FOR AERIAL POLES

A. Guys: Guys shall be provided where shown on drawings and shall be in conformity with the National Electrical Safety Code C2. Angle thimble eye guy bolts shall be provided at each guy terminal. Guys shall be grounded. Threaded log or swamp anchors shall be provided in marshy ground; rock anchors in rock, installed at right angles to the guy; elsewhere anchors shall be of an accepted 8 inch screw type. All guy anchors and attachments shall provide a strength exceeding the required guy strength. Tripleyes shall be provided on all anchor rod and eye-bolt guy attachments to protect the strand. An accepted half-round hot galvanized steel guy protector, minimum 18 gauge, not less than 8 feet long, shall be provided at the anchor of each guy, securely clamped to the guy or anchor at bottom and top. When field conditions prevent the indicated guy lead, anchors shall be placed in a location accepted by the Engineers, and the guy strength increased by the ratio of the sine of the lead angle indicated to the sine of the lead angle provided, except that the lead angle shall be not less than 15 degrees. Guy strand shall be 7 strand, Semens Martin grade, zinc-coated steel, with a breaking strength not less than 6,000 pounds, nor less than indicated, except where two or more guys are used to provide the required strength. Anchors shall be Chance no-wrench type or accepted substitution and shall be machine installed. Provide polyethylene (yellow) guy guard for guy wire.

2.10 POLE - LINE HARDWARE (AERIAL)

A. General: Pole line hardware shall be hot-dip galvanized. Suitable washers shall be installed under bolt heads and nuts on wood surfaces. Washers used in through-bolts shall be approximately 2 inches square and 3/16 inch thick. The diameter of holes in washers shall be the correct standard size for the bolts on which the washers are used. Washers for use under the heads of carriage bolts shall be of proper size to fit over square shank of the bolt. Eye-bolts, bolt eyes, eyenuts, strainload plates, lag screws, guy clamps, fasteners, hooks, shims, and clevises shall be used wherever required to adequately support and protect the poles, crossarms, guy wires, and insulators even though not specifically shown on the drawings. Ridge pin brackets shall be Chance C206-0166 or accepted substitution. Cutout and arrestor brackets shall be McGraw Edison DC59B1 or accepted substitution.

2.11 LIGHTNING ARRESTERS (AERIAL)

A. General: Lightning arresters shall be provided where indicated. Selection of arrester ratings and classification according to use shall be described by NEMA LA 1. Arresters shall be equipped with suitable mounting brackets for the applicable method of mounting. Arresters shall be connected by means of a soft-drawn-copper conductor, not lighter than #6 AWG, to ground conductor. Arresters shall have sky-glaze finish and shall be distribution type rated 9 KV for use on 7.2/12.47 KV Y system McGraw Edison type E6 or accepted substitutions.

2.12 PRIMARY FUSE CUTOUTS (AERIAL)

A. General: Primary-Fuse cutouts shall be distribution class, heavy-duty, open type rated 7.2/12.47 KV grade Y, 200 amperes, 95 KV BIL, 15 KV maximum design, 8000 rms amperes I.C. symmetrical. Fuse type shall be equal to existing fuses being replaced. Insulator color shall be sky-glazed or similar. Switch shall have mounting bracket as required to mount to steel crossarm, solid fuseholder cap, loadbreak hooks and terminal for #6 bare copper. McGraw Edison type LMO or accepted substitution.

2.13 TERMINATORS (AERIAL)

A. General: 15 KV, 110 KV BIL bracket type terminators shall be installed on poles where shown on drawings.

B. Description: The terminators shall be G & W #PAT1701 "slip-on" terminator with "PW" kit for VCLC-N cables.

C. Rating: Terminators shall be rated 15 KV, 110 KV BIL, 12-1/2 inch creepage.

D. Material: The terminators shall be factory filled with an insulating material which eliminates the need for heating and pouring of hot compounds. Physical characteristics of the dielectric material shall be as follows;

1. Gel temperature, approximately 175 degrees F.
2. Flexible to at least -20 degrees F.
3. Flash point Cleaveland Open Cup 480 degrees F.
4. Fire point ASTM D92 570 degrees F.
5. Specific Gravity (77.77 degrees F.) ASTM D70 0.904
6. Power factor (60 degrees C.20V/mil stress 60 cycle)

ASTM D150 0.04 percent

7. Dielectric constant (25 degrees C.) ASTM D150 2.2

E. Standard: The terminator shall be rated in accordance with IEEE No. 48 pothead standards.

2.14 GROUNDING

A. General: The neutral conductors, guy wires and non-current-carrying parts of equipment shall be grounded. Ground conductor shall be soft-drawn copper, having a current capacity of at least 20 percent of that the largest conductor to which it is connected, but not smaller than No. 6 AWG and not smaller than indicated on the drawings. Ground conductor shall be connected to a copper-clad-steel ground rod not less than 3/4 inches in diameter. The ground rod shall be driven at least 8 feet into the ground approximately 18 inches out from the base of the pole. After installation is completed, the top of the ground rod shall be approximately 8 inches below finished grade. The total ground resistance shall not exceed 25 ohms. Where this condition cannot be obtained with one rod driven 8 feet in the ground, a longer rod, deep-driven section rods, or additional rods shall be installed until the required ground resistance is obtained. Ground resistance shall be measured in normally dry conditions, not less than 48 hours after rainfall. The ground conductor shall be protected by half-round wood, plastic, or fiber molding from the ground line to a point at least 8 feet above the ground line and throughout the communication spaces. The molding shall be stapled to the pole at intervals not exceeding 2 feet, with one staple not more than 3 inches from each end. Single-point serrated staples of a type suitable for use with the plastic or fiber molding shall be used for stapling molding to the pole. Where not covered by molding, the conductor shall be stapled to the pole at intervals not exceeding 2 feet. All connections shall be made with solderless connectors or by the molded fusion-welding process (Caldweld or accepted substitution). Equipment and neutral ground shall be separate and independent from the lightning arrester ground, but shall be bonded thereto at the equipment. Resistance of each ground shall be measured separately before bonding.

PART 3 - EXECUTION

3.01 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.

3.02 FLEXIBLE WIRING SYSTEM INSTALLATION

A. Flexible Wiring Installation: Examine area to receive system to assure adequate clearance for installation. Start work only after unsatisfactory conditions are corrected. The electrical Contractor shall be responsible for properly interfacing the system with the conventional wiring system components, conduit and conductors. Provide all necessary out-of-system components, conduit, conductors, boxes and other equipment or devices to make a complete operable system.

B. Location: The locations of system components, including cable routings shown on the plans, are approximate and workmen shall use good judgement in their placements to eliminate all interference with ducts, piping, etc.

C. Workmanship: All cable routing shall be done in a neat and workmanlike manner consistent with recognized good practice and in accordance with the manufacturer's instructions.

3.03 PRIMARY CABLE

A. Installation: The termination of all cables shall be protected from accidental contact, deterioration of coverages, contamination and moisture in accordance with the National Electrical Code, and by use of the termination devices as specified hereinafter. Termination and splices shall be made by adequately trained personnel, using methods and materials suitable for the work as necessary and as specified hereinafter, and in accordance with the recommendations to the manufacturer of the cable and/or terminating and splicing materials or kit. Such recommendations, accompanied by suitable detail drawings shall be submitted for acceptance. Terminations of cable for service exceeding 600 volts shall be made by personnel having not less than three years experience as a licensed electrician, including adequate experience in the splicing or terminating of PILCP high-voltage insulated cable; the experience shall be certified and accepted and must be acceptable to the Engineer. Cable splicer shall submit his certification and experience record to Engineer for review before commencing any work. Non-compliance or inadequate records shall be grounds to disqualify the proposed splicer. An existing installed sample of the splicers work may be requested by the engineer to verify experience records. Terminations, splices and/or terminating devices shall be capable of withstanding the tests specified for the cable installations, and for service exceeding 600 volts, shall be rated in accordance with the IEEE Standard for potheads, publication No. 48. The Engineer shall be notified prior to the first splice and termination with adequate notice so that he or his representative can be present at his discretion.

B. Terminations: Terminations of cables shall include the securing and sealing of the installation of the cable and cable conductors, stress relief and grouting of cable shields or shielded cable. Cables and cable terminations shall be adequately supported so as to avoid any excessive strain on the termination and the conductor connection.

3.04 POLES FOR AERIAL DISTRIBUTION

A. Installation: In normal firm ground, minimum pole-setting depths shall be as required in ANSI Standard C2. In rocky or swampy ground, pole-setting depths shall be respectively decreased or increased in accordance with published standards and as accepted by the Engineer. In swampy ground, a bog shoe may be used. Poles in straight runs shall be in a straight line. Curved poles shall be placed with the curvature in line with the lead. Poles shall be set to maintain as even a grade as practicable. When the average ground run is level, consecutive poles shall not vary more than 5 feet in height. When the ground is uneven, poles differing in length shall be kept to a minimum by locating poles to avoid the highest and lowest ground points. If it becomes necessary to shorten a pole, a piece shall be sawed off the top end. If poles are set on hilly terrain, along the edge of cuts or embankments, or where the soil may be washed out, special precautions shall be taken to ensure durable foundations, and the setting depth shall be measured from the lower side of the pole. Holes shall be dug large enough to permit the proper use of tampers to the full depth of the hole. Earth shall be thrown into the hole in 6-inch maximum layers, then thoroughly tamped before the next layer is thrown in. Surplus earth shall be placed around the pole in a conical shape and packed tightly to drain water away from the pole.

3.05 TESTS (AERIAL)

A. General: After the installation is completed, and at such time as the Engineer may direct, the Contractor shall conduct an operating test for approval. The equipment shall be demonstrated to operate in accordance with the requirements of this section of the specifications. The Engineer shall be notified prior to the first test with adequate notice so that he or his representative can be present at his discretion. The Contractor shall provide all instruments and personnel required for the test, and the using agency shall provide the necessary electric power. The Contractor shall submit in writing to the Engineer upon completion of the project, the measured ground resistance of each new ground rod, indicating the location of the rod, and the resistance and the soil conditions at the time measurements were made.

END OF SECTION

SECTION 16130

OUTLET BOXES

PART 1 - GENERAL

1.01 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.

1.02 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.

1.03 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

1.04 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.

1.05 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.

1.06 SUBMITTALS

A. Submittals: Submit product data on all different types of outlet boxes and associated trim/plaster rings.

PART 2 - PRODUCTS

2.01 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.

2.02 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, Lexan 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.

D. Accessories: Box trim, service fittings and accessories shall be as required to provide a complete installation.

E. Special Consideration: Flush caps removed to provide service fittings shall be turned over to the Owner. Approved manufacturer is Walkerduct.

F. Manufacturer: Approved manufacturer is Walker, Raco, Steel City or Hubbell.

PART 3 - EXECUTION

3.01 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.

3.02 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.

Switches & Dimmers	4 foot 0 inches to centerline
Receptacles	1 foot 6 inches to centerline
Branch Panelboards	6 foot 6 inches top of panel trim
Telephone & Data Outlets	1 foot 6 inches to centerline

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.

3.03 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 16140

WIRING DEVICES

PART 1 - GENERAL

1.01 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.

1.02 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.

1.03 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 rotary.

B. 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.

C. 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.

D. Standards: Voltage and ampere rating of dimmer controls shall be marked on dimmer, and shall conform to voltage of system to which applied.

1. WD-2-1970 for dimmers.
2. ANSI/IEEE Standard C62.41-1980
   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

1.04 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.

1.05 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

4. FEDERAL SPECIFICATIONS UL HOSPITAL GRADE ABRUPT REMOVAL TEST

   a. Using cable and 10 pound weight.

5. ANSI/IEEE Standard C62.41-1980 (Formerly IEEE 587)

   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.

1.06 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.

1.07 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

2.01 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. 1-5/16 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 1-11/16 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 rotary type.

K. Type: Dimmers shall be slide type.

2.02 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.

2.03 FLUORESCENT DIMMING

A. Lamps: Dimmers shall be rated at 120 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 <u>standard</u> 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.

2.04 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.

2.05 CONVENIENCE RECEPTACLES

A. Fifteen Ampere Receptacles: Provide hospital 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, 15 ampere, 120 volts, with metal plaster ears, side wiring, NEMA configuration 5-15R unless otherwise indicated.

B. Twenty Ampere Receptacles: Provide hospital 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.

C. Fifteen Ampere Receptacles: Provide premium 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, 15 ampere, 120 volts, with metal plaster ears, side wiring, NEMA configuration 5-15R unless otherwise indicated.

D. Twenty Ampere Receptacles: Provide premium 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.

E. Fifteen 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, 15 ampere, 120 volts, with metal plaster ears, side wiring, NEMA configuration 5-15R unless otherwise indicated.

F. 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.

G. Color: Devices connected to the normal system shall be ivory in color, unless otherwise noted.

H. Color: Devices connected to the normal system shall be grey in color, unless otherwise noted.

I. Color: Devices connected to the normal system shall be brown in color, unless otherwise noted.

J. Color: Devices connected to the normal system shall be white in color, unless otherwise noted.

K. Emergency Color: Devices connected to the emergency system shall be red in color unless otherwise noted.

L. 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.

M. 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.

N. 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 exterior receptacles (weatherproof) shall be duplex GFI type. Interrupter shall resist tripping from the effects of radio frequency (RF) signals from 10 to 450 MHz.

O. Ground Fault Circuit Interrupter: Provide commercial specification grade, duplex, ground fault circuit interrupter receptacles, grounding type, UL rated Class A, Group 1, 15 ampere ratings, 125 volts, 60 Hz; with solid state ground fault sensing and signalling; with 5 milliampere ground fault trip level; equipped with 15 ampere receptacle configuration, NEMA 5-15R. 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.

P. Ground Fault Circuit Interrupter: Provide hospital 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.

Q. Clock Receptacles: Provide Simplex receptacle, 2 pole, 3 wire grounding, 15 ampere, 125 volts, with recessed female receptacle which permits an appliance (or clock) to be mounted flush against the wall and cover the outlet. Unit to include metal hook to support clock.

R. Isolated Ground Receptacle: Provide a duplex receptacle, 2 pole, 3 wire grounding, 20 ampere, 125 volts, with the equipment ground terminal separated electrically from the mounting strap, and isolated from the conduit system. Provide positive isolated ground device identification by the use of an orange color on the entire device face, or an orange triangle located in the upper left hand corner of the device.

2.06 TRANSIENT VOLTAGE SURGE SUPPRESSOR RECEPTACLE

A. Modes of Protection: Surge suppression devices shall supervise Line to Neutral, Line to Ground, and Neutral to Ground conditions.

B. Energy Capacities: The surge suppression device shall have equal surge protection of not more than 140 Joules of energy absorption in each mode, 3,000 amperes current handing in each mode, and 6000 volts protection in each mode.

C. Noise Reduction: Provide device with EMI and RFI noise filters at an average of 7:1 noise reduction from 500 KHz to 30 MHz.

D. Modular: Construct as a modular, heavy duty, Hospital Grade device.

E. Identification: Each device shall have a long life LED diode covered by a wide angle viewing lens for positive identification of surge protection. Provide a zig-zag symbol on the face of the device.

F. Response Time: Response time shall be not more than 5 Nanoseconds.

G. Attenuation: Common mode noise attenuation shall be 500 KHz to 30 MHz; up to 35 db (50 ohm source impedance).

H. Operating Temperature: Operating temperature shall be -20 to 55 degree C. (-4 to 131 degrees F.)

I. Color: Match the color of other devices listed elsewhere in this Specification.

J. Manufacturer: Manufacturer shall be Pass & Seymour, Leviton or Hubbell.

Pass & Seymour		**Leviton**		**Hubbell**	
P/S 15A	P/S 20A	15A	20A	15A	20A
6262-ISP	6362-ISP	8280-I	8380-I	8200 HIS	8300-HIS

2.07 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 ivory; red for emergency system.

B. Toggle Switches: Provide commercial specification grade, fast-make positive-break, flush single-pole three and four way as indicated; 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 ivory; red for emergency system.

C. Two Pole Switches: Provide two pole switches where drawings indicate the switching of 208 volt systems consisting of two phase conductors.

D. Life Safety Key Switches: Provide key switches where drawings indicate, for switching of life safety lighting circuits.

E. Security Key Switches: Provide key switches where drawings indicate, where a degree of security requires limited access to control of the lighting system.

F. Pilot Light Handle: Handle glows when switch is on. Handle color shall be clear, unless otherwise indicated.

G. 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.

H. Color: Provide red switches for emergency circuits. Match receptacle devices for normal circuits.

2.08 PLUGS AND CONNECTORS

A. Standard: Comply with NEMA Standards Pub. No. WD1.

2.09 WIRING DEVICE ACCESSORIES

A. Faceplates: Unless otherwise noted, provide smooth faced nylon, single and ganged switch, receptacle, telephone, blank and other outlet wall plates for wiring devices, with ganging and cutouts as required

B. Faceplates: Faceplates for interior outlets in "Medical Facilities", connected to normal or essential power supply system shall have type 302 stainless steel, 0.032 inch thick, non-magnetic, satin finish. Cover plates shall be colored to match devices elsewhere in specification, screws to match coverplate color.

C. Multigang: Provide all necessary hardware and frames to properly mount various devices in combinations.

D. 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.

E. Color: Unless otherwise noted, provide colored faceplates to match devices listed elsewhere in these specifications.

2.10 PRODUCT DESIGN SELECTION

A. Standard Premium Specification Grade Receptacles: Provide standard premium specification grade receptacles as follows;

Description	Leviton	Hubbell	P & S
15 amp Simplex	#5261	#5261	#5261
15 amp Duplex	#5262	#5362	#5262
20 amp Simplex	#5361	#5361	#5361
20 amp Duplex	#5362	#5362	#5362
15 amp Duplex GFCI	#6598	#GF-5262	#1591-S
20 amp Duplex GFCI	#6898	#GF-5362	#2091-S
20 amp Duplex Isolated Gnd.	#5362 IG	#IG-5362	#IG-6300
20 amp Duplex TVSS	#5380	#5352-IS	#6362-SP

B. Decora Premium Specification Grade Receptacles: Provide extra heavy duty specification grade receptacles as follows;

Description	Leviton	Hubbell	P & S
15 amp Simplex	#16251	#2151	#26261
15 amp Duplex	#16262	#2152	#26262
20 amp Simplex	#16351	#2161	#26361
20 amp Duplex	#16362	#2162	#26362
15 amp Duplex GFCI	#6598	#GF-5262	#1591-S
20 amp Duplex GFCI	#6898	#GF-5362	#2091-S
20 amp Duplex Isolated Gnd.	#16362-IG	#IG-2162	#IG-26362
20 amp Duplex TVSS	#5380	#5352-IS	#6362-SP

C. Standard Commercial Specification Grade Receptacles: Provide standard commercial specification grade receptacles as follows;

Description	Leviton	Hubbell	P & S
15 amp Simplex	#5015	#5251	#5251
15 amp Duplex	#CR15	#CR15	#5242
20 amp Simplex	#5801	#5351	#5351
20 amp Duplex	#CR20	#CR20	#5342
15 amp Duplex GFCI	#6598	#GF-5252	#1591-S
20 amp Duplex GFCI	#6898	#GF-5352	#2091-S
20 amp Duplex Isolated Gnd.	#5362-IG	#IG-5362	#IG-6300
20 amp Duplex TVSS	#5380	#5352-IS	#6362-SP

D. Commercial Specification Grade Receptacles: Provide commercial specification grade receptacles as follows;

Description	Leviton	Hubbell	P & S
15 amp Simplex	#16251	#2151	#5261
15 amp Duplex	#16252	#2132	#26252
20 amp Simplex	#16351	#2161	#5361
20 amp Duplex	#16352	#2142	#26352
15 amp Duplex GFCI	#6598	#GF-5252	#1591-S
20 amp Duplex GFCI	#6898	#GF-5352	#2091-S
20 amp Duplex Isolated Gnd.	#16362-IG	#IG-2162	#IG-26362
20 amp Duplex TVSS	#5380	#5352-IS	#6362-SP

E. Clock Receptacle: Provide clock receptacles as follows;

Description	Leviton	Hubbell	P & S
15 amp Simplex - Clock	#5261-CH	#5235	#S3733-SS

F. Premium Standard Specification Grade Switches: Provide premium standard specification grade switches as follows;

Description	Leviton	Hubbell	P & S
20 amp Single	#1221-2	#1221	#20AC1
20 amp 3-way	#1223-2	#1223	#20AC3
20 amp 4-way	#1224-2	#1224	#20AC4
20 amp Single-Locking	#1221-2L	#1221-L	#20AC1-L
20 amp 3-way-Locking	#1223-2L	#1223-L	#20AC3-L
20 amp 4-way-Locking	#1224-2L	#1224-L	#20AC4-L
20 amp Single-Pilot	#1221-2PL	#1221-PL	#20AC1-CPL
20 amp 3-way-Pilot	#1223-2PL	#1223-PL	#20AC3-CPL

G. Standard Commercial Grade Switches: Provide standard commercial grade switches as follows;

Description	Leviton	Hubbell	P & S
20 amp Single	#CS 120-2	#CS120	#521
20 amp 3-way	#CS 320-2	#CS320	#523
20 amp 4-way	#CS 420-2	#1224	#524
20 amp Single-Locking	#1221-2L	#1221-L	#521-L
20 amp 3-way-Locking	#1223-2L	#1223-L	#523-L
20 amp 4-way-Locking	#1224-2L	#1224-L	#524-L
20 amp Single-Pilot	#1221-2PL	#1221-PL	#20AC1-CPL
20 amp 3-way-Pilot	#1223-2PL	#1223-PL	#20AC3-CPL

H. Decora Commercial Specification Grade Switches: Provide commercial specification standard commercial grade switches as follows;

Description	Leviton	Hubbell	P & S
20 amp Single	#2121	#2121	#56021
20 amp 3-way	#2123	#2123	#56023
20 amp 4-way	#2124	#2124	#56024
20 amp Single-Locking	#1221-L	#1221-L	#521-L
20 amp 3-way-Locking	#1223-L	#1223-L	#523-L
20 amp 4-way-Locking	#1224-L	#1224-L	#524-L
20 amp Single-Pilot	#1221-2PL	#1221-2PL	#20AC1-CPL
20 amp 3-way-Pilot	#1223-2PL	#1223-2PL	#20AC3-CPL

I. Dimmers: Provide dimmers as follows *per wattage requirements:

Description	Lutron	Leviton	Hubbell
Linear Slide	Nova T Star	80,000 series	AS series
Fluorescent	Nova T Star	86,000 series	AS series
Rotary	Centurion	60,000 series	AR series

J. Motor Starter Switches: Provide motor starter type switches as follows;

Description	Square D
Manual motor starter switch with overloads	Class 2510
Manual motor starter switch with overloads and pilot light	Class 2510

K. Device Covers: Provide device covers as follows;

Description	Leviton	Hubbell	P & S
Stainless steel coverplate	#302 S/S	#302	#302
Thermoplastic nylon coverplate	807--series 804--N series	----	RP series
Weatherproof stainless steel coverplate	----	#5221-5222	WP-8
Weatherproof stainless steel coverplate locking type	----	----	SP-26L

L. Multi-outlet Assembly: Provide a multi-outlet assembly with 20 ampere single devices at 6 inches on center. Assembly shall be Wiremold 2400 Series.

M. Multi-outlet Assembly: Provide a multi-outlet assembly with 20 ampere single devices at 12 inches on center. Assembly shall be wiremold 2400 Series.

N. Multi-outlet Assembly: Provide a multi-outlet assembly with 20 ampere single devices at 18 inches on center. Assembly shall be wiremold 2400 Series.

O. Multi-outlet Assembly: Provide a multi-outlet assembly with 15 ampere single devices at 6 inches on center. Assembly shall be wiremold 2000 Series.

P. Multi-outlet Assembly: Provide a multi-outlet assembly with 15 ampere single devices at 12 inches on center. Assembly shall be wiremold 2000 Series.

Q. Multi-outlet Assembly: Provide a multi-outlet assembly with 15 ampere single devices at 18 inches on center. Assembly shall be Wiremold 2000 Series.

PART 3 - EXECUTION

3.01 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.

3.02 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.

3.03 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.

3.04 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.

3.05 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.

END OF SECTION

SECTION 16450

GROUNDING

PART 1 - GENERAL

1.01 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 in this section

1.02 GROUNDING ELECTRODES

A. General: Provide a grounding electrode system, as described in NEC 250, as specified herein and as indicated on plans.

B. 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.

C. 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.

D. 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.

E. Rebar: In concrete buildings, provide bond to rebar in concrete.

F. 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 16020 for testing requirements.

1.03 GROUNDING ELECTRODE CONDUCTOR

A. 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:

1. Telecommunications service ground within 20' of the electrical service
2. Lightning protection system.
3. Gas and other interior metal piping – refer to NEC.

1.04 SEPARATELY DERIVED GROUNDING SYSTEMS

A. Description: Provide a separately derived grounding system where indicated herein and as required by the National Electrical Code. Bond neutral and ground busses together.

B. Services: Provide a separately derived grounding system for all building electrical services and step-down transformers.

C. Emergency Generator: Provide a separately derived grounding system for the emergency system where 4-pole transfer switches are used (neutral and phase conductors switched).

D. 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.

1.05 BONDING AND EQUIPMENT GROUNDING

A. 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.

B. 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.

C. Redundant Grounding: In general all branch circuits shall be provided with a redundant grounding system through the use of grounding conductors and metallic conduit.

D. Bonding: Provide bonding of the equipment grounding terminal busses of normal and essential branch circuit panelboards serving the same patient area with a continuous #10 AWG copper green insulated conductor, in compliance with NEC 517-14.

E. 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.

F. 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.

G. 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.

H. Connection to Other Systems: Provide all required grounding and bonding connections as specified herein and as required by the National Electrical Code.

1.06 SUBMITTALS

A. General: Submit product data on ground rods, ground wire, ground connectors, ground bars, and data on exothermic welds.

1.07 QUALITY ASSURANCE

A. Compliance: The entire ground system shall meet or exceed the minimum requirements NEC 250 and IEEE Std. 142 (green book).

PART 2 - PRODUCTS

2.01 GROUNDING ELECTRODE AND BONDING CONDUCTORS

A. 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.

B. 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.

C. Insulation: Conductors above ground shall be insulated, conductors run below grade shall be bare.

2.02 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.

2.03 CONNECTIONS

A. 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.

B. Underground: All connections and bonds made underground and to building steel shall be exothermic weld type-connections.

2.04 INSPECTION WELLS

A. Location: Provide inspection wells for all ground rods covered by concrete, paving, or other permanent materials that prevent access to ground rods.

B. 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.

2.05 GROUND BAR

A. 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 and in all

communications rooms, or rooms with telephone distribution equipment or network electronics equipment.

B. 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.

C. 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.

PART 3 - INSTALLATION

3.01 EXTERIOR

A. Connection: The main grounding electrode conductor shall be exothermically welded to ground rods and other main system electrodes.

3.02 INTERIOR

A. Installation: Equipment grounding conductors shall be installed as follows:

1. Where installed in metal conduit, both conductor and conduit shall be bonded at each end.

2. Have connections accessible for inspection and made with approved solderless connectors brazed (or bolted) to the equipment or structure to be grounded.

3. Shall in NO case be a current carrying conductor.

4. Have green insulation, except that grounding electrode conductors may be bare.

B. Water Meter: Provide properly sized bonding shunt around water meter and/or dielectric unions in the water pipe.

C. Cable Tray: Provide a #10 bond from all metallic system conduits to the cable tray.

D. 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.

3.03 TESTING

A. Testing: Provide testing as required in other sections of this specification, including but not limited to sections 16010 and 16020.

B. Reports: Submit impedance test reports for all separately derived services to the Engineer prior to project completion.

3.04 CONNECTIONS

A. Preparation: All contact surfaces shall be thoroughly cleaned before connections are made, to ensure good metal to metal contact.

3.05 ISOLATED GROUNDING SYSTEM

A. Locations: Where specified and/or indicated on drawings, provide an isolated ground system. Devices indicated as isolated ground shall be provided with an additional grounding conductor to an isolated ground bar in panel.

B. Isolated Ground Bar: Provide a ground bar in panels serving isolated ground devices electrically and mechanically isolated from panel enclosure and equipment grounding system. Where a single isolated ground circuit is required, use of mechanical connections is acceptable in lieu of ground bar.

C. Continuity: Isolated grounding conductors shall be continuous back to grounding electrode or separately derived service ground. Isolated ground conductor in feeders shall be run in addition to equipment grounding conductor. Raceway sizes shall be increased as necessary to accommodate additional conductor.

END OF SECTION

SECTION 16470

PANELBOARDS

PART 1 - GENERAL

1.01 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.

1.02 DESCRIPTION

A. 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.

1.03 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.
2. ANSI Z55.1 - (R1973) Gray finishes for Industrial Apparatus and Equipment.

B. NEMA: National Electrical Manufacturers Association shall apply as follows;

1. NEMA PB1-1984 Panelboards
2. NEMA PB1-57 Gutter space

C. NFPA: The latest edition of the National Fire Protection Association shall apply as follows;

1. NFPA 70, National Electrical Code (NEC).

D. UL: The latest edition of the Underwriters' Laboratories, Incorporated shall apply as follows;

1. UL Electrical Construction Materials List, panelboards-dead front type.
2. UL 67 Panelboard wiring gutter space, bus heat rise test.
3. UL 50 Cabinets - Rigidity and gauge of steel.

E. 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.

1.04 SUBMITTALS

A. Shop drawings:

1. Product data shall be submitted on:

a. Panel
b. Cabinet
c. Bus
d. Construction
e. Dimensions

2. Shop drawings shall be submitted for every panel, and shall clearly indicate all of the following information:

a. U.L. Label
b. Each circuit breaker amperage rating, circuit number and position/location in panel
c. Electrical characteristics of panel
d. Main bus rating
e. Main device rating
f. Mounting type
g. Dimensions, (width, depth, height, weight)
h. Bus material
i. Interrupting capacity of minimum rated breaker
j. Panelboard classification
k. Submit coordination curves on log-log paper for all breakers, fuses, transformers, etc.
l. 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.

3. 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.

1.05 OVERCURRENT PROTECTIVE DEVICES - DESCRIPTION

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.

1.06 OVERCURRENT PROTECTIVE DEVICES - SUBMITTALS

A. Shop drawings and product data: 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

2.01 PANELBOARDS

A. 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.

B. 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.

SPEC-WRITER-NOTE: PLUG-IN OR BOLT-ON.

C. Molded Case Circuit Breakers: All panelboard branch circuit breakers shall be plug-in or 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. Plug-in circuit breakers shall be able to be installed in the panelboard without requiring additional mounting hardware.

D. 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.

SPEC-WRITER-NOTE: SELECT AMPERAGE FOR SOLID STATE BREAKERS.

E. 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.

F. 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.

G. 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.

H. 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.

I. Directories: A typed panelboard directory shall be provided for each panelboard and shall 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.

J. 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.

K. 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.

L. 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.

M. Design Selection:

120/208V	480/277V
Square "D", NQOD	Square "D", NF Series
Cutler-Hammer: Pow-R-Line 1	Cutler-Hammer: Pow-R-Line 2
General Electric: A-Series	General Electric: A-Series
Siemans: S1 Series	Siemans: SL/SE Series

600A	thru	1200A
Square "D": I-Line		Square "D": I-line
Cutler-Hammer: Pow-R-Line 4		Cutler-Hammer: Pow-R-Line 4
General Electric: Spectra Series		General Electric: Spectra Series
Siemans: S4/S5 Series		Siemans: S4/S5 Series

2.02 OVERCURRENT PROTECTIVE DEVICES - FUSES

A. General: All fuses shall be of the same manufacture to retain selectability as designed. No fuse shall be installed until equipment is ready to be energized and after tightening of all electrical connections, inspection of all ground and grounding conductors and a megger test of adequate insulation to ground of all circuits. All fuses shall be current-limiting with 200,000 amperes interrupting capacity. Fuses rated 601 amperes and larger shall be UL Class L and have a minimum time-delay of 45 seconds at 300 percent rating and have O-ring gas seals at the end bells. Fuses rated 600 amperes or less, installed ahead of circuit breakers or circuit breaker panels, shall be UL Class K-1. Fuses rated 600 amperes or less for all general power circuits shall be dual-element, UL Class K-5 time-delay type. They shall be self protecting from extraneous heat. Fuses installed in individual motor circuits shall be dual element time-delay type, UL Class K-5. Use fuse

reducers when fuse clip spacing is larger than the fuse dimension. Fuses called for to be rejection type shall have rejection fuse holders.

B. Spare Fuse Cabinet: Ten percent (minimum of three) of each size and type of fuse shall be placed in a spare fuse cabinet, wall mounted near the electric service. Cabinet shall be sized as required to store all fuses neatly. Cabinet shall contain shelves and/or slots as required to separate types of fuses. Cabinet door shall be hinged with latch.

C. Identification Label: A fuse identification label, showing type and size, shall be placed inside the door of each fused switch. Labeling for rejection type fused switches shall read "Warning-Use Only Current Limiting Fuses Class____, Type____, MFR____," engraved in red laminated plastic.

D. Design Selection: Bussman.

2.03 OVERCURRENT PROTECTIVE DEVICES - INTEGRALLY FUSED CIRCUIT BREAKRS

A. 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.

B. 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.

C. 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.

D. Fuse Limiters: Fuse limiters shall be individually removable from the molded case housing.

E. 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.

F. 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.

G. Standards: Ratings, clearances and performance of the integrally fused circuit breaker shall be in accordance with applicable standards of NEMA, IEEE and ASA.

H. 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.

2.04 OVERCURRENT PROTECTIVE DEVICES - CURRENT LIMITING BREAKERS

A. 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

3.01 INSPECTION

A. General: Examine area to receive panelboard and assure that there is adequate clearances to meet NEC requirements and normal maintenance issues.

B. Correction: Start work only after any unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General: Provide panelboards in complete accordance with manufacturer's written instructions and all applicable codes.

B. 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.

C. 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.

D. Mounting: Do not mount equipment directly to masonry or concrete walls. Provide two uni-strut spacers between wall and panelboard.

E. Operations and Maintenance Data: Manufacturer's instructions for tightening bus connections, cleaning, operation and maintenance.

3.03 QUALITY CONTROL

A. General: Field test prior to energization;

1. Megger check, and record all data, of phase to phase and phase to ground insulation levels.

2. Continuity.

3. Proper phase relationship.

3.04 CHECK-OUT MEMO

A. General: Submit check-out memo from panelboard representative.

END OF SECTION

SECTION 16500

LIGHTING

PART 1 - GENERAL

1.01 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.

1.02 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.

1.03 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.

1. Shop drawings shall be complete showing all dimensions and installation instructions required for this project’s architectural/field conditions.

2. 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:

1. dimensions
2. U.L. Label
3. fusing
4. metal gauge
5. lens/louver thickness
6. finish
7. voltage
8. lamps
9. ballasts

C. Product data shall be submitted showing manufacturer's written recommendations for storage and protection, and installation instructions.

1.04 PRODUCT STORAGE AND HANDLING

A. Protection: Physically protect fixtures against damage as recommended by manufacturer.

PART 2 - PRODUCTS

2.01 GENERAL

A. Fusing: All fluorescent fixtures provided under this Division which do not have electronic 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 shall 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.

2.02 MAGNETIC BALLASTS

A. General: Ballast shall have internal regulation of power consumption and light output under input line voltage fluctuations. Ballast shall be minimum "A" sound rated and operate quiet. Ballast case temperature shall not exceed 90 degrees C. All ballasts shall be high power factor rated at 95 percent power factor. Ballast shall be rated for voltage system to which applied.

B. Interior Construction: Ballast shall have a thermo-setting, fire retardant partial filler to serve as a conformal coating and protective insulator against both internal and external damage.

C. Warranty: Ballast shall carry the manufacturers written warranty, for a period of 3 years after factory code production date against defects in material and workmanship under normal conditions of use. Warranty shall include up to $10.00 per ballast replacement labor allowance.

D. Compatibility: All ballasts shall be compatible to lamps provided. Ballasts shall be manufactured by one of the following. No substitutions are allowed:

1. MagneTek
2. Valmont
3. Advance
4. Motorola

2.03 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 voltage 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.
9. Ballast shall not cause RFI interference.
10. Ballast shall have total harmonic distortion of less than 20 percent.
11. Ballasts (including compact fluorescent ballasts) shall be Instant Start Type

B. Manufacturers: All ballasts shall be compatible to lamps provided. Ballasts shall be provided by one of the following manufacturers. No substitutions are allowed:

1. MagneTek
2. Advance
3. Valmont
4. Motorola

2.04 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. 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. Ballasts: All ballasts shall be compatible with lamps provided. Ballast shall be manufactured by one of the following:

1. Valmont
2. Advance
3. MagneTek

2.05 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.

2.06 T-12 FLUORESCENT LAMPS:

A. General: 4 foot lamps shall be 34 watt, 3500 degrees K, CRI of 80 minimum, 2800 lumens minimum, 20,000 average rated hours.

B. Design Selection: OSRAM-Sylvania, GE or Philips.

2.07 2 FOOT BIAX LAMPS

A. General: Lamps shall be 40 watts, 3500 degrees K, CRI of 82 minimum, 3150 lumens, 20,000 average rated hours.

B. Design Selection: GE, OSRAM or Philips.

2.08 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

2.09 INCANDESCENT LAMPS

A. General: Incandescent lamps shall be rated 130 volts. Average minimum rated lamp life shall be 2500 hours.

B. Design Selection: SuperSaver by OSRAM-Sylvania, Watt-miser by GE, or Econo-watt by Philips.

2.10 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

3.01 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.

3.02 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.

3.03 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