DOUGLAS PARK
NEW COMMUNITY CENTER

VOL 2

2795 SW 37TH AVENUE,
MIAMI, FL. 33133

DESIGN SPECIFICATIONS

CITY OF MIAMI / OFFICE OF CAPITAL IMPROVEMENTS

PROJECT NO. B-40581

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11/19/2018

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DOUGLAS PARK NEW COMMUNITY CENTER
PROJECT SPECIFICATION MANUAL

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01011
SUMMARY OF WORK

1.1 SCOPE

The work of this Contract comprises the New Construction of a new +/- 6000 square foot single story Community Building.

A. Description:
   1. Assembly GROUP A (FBC 303) AND NFPA 101 CHAPTER 6
   2. 1 story
   3. Type IIIB Construction
   4. +/-6000 SF (air-conditioned space)
   5. General Systems contained in work: Architecture, Structure, Plumbing, Mechanical, Electrical and Fire Alarm.

B. Type of Contract: Lump Sum

C. The Architect / Engineer for this Contract is: Robert E. Chisholm, FAIA at R.E. Chisholm Architects, Inc., Zvonimir T. Belfranin, P.E., Structural Engineer., and Vincent Mcnish, P.E., CPD, LEED AP BD+C, CxA of TLC Engineering for Architecture.

1.2 SCHEDULING AND CONCURRENT WORK

A. Staging Area: The City of Miami will designate an exterior on-site area for the Contractor's use, located adjacent to the project site. Maintain in a clean and organized manner.

B. Selective Demolition: See demolition and removal extent shown on the Drawings.

C. Safety of Occupants and Public: Provide a "safety plan" which delineates areas of construction and construction traffic during phases of the project, maintains required exits, and provides for barriers to separate construction areas from pedestrians and staff.

D. Other concurrent work may be identified by the City of Miami during the course of the work.

1.3 DELIVERY AND STORAGE

A. The times of delivery and storage of construction products and equipment shall permit, and be coordinated with, necessary school operations, such as bus traffic and food deliveries.

B. The storage of construction products and equipment and the parking of workers' vehicles shall fit within limits of the staging area. (see Section 01700 – Execution and Coordination, for details)

1.4 SITE CONDITIONS

A. Contractor's Use of Premises:
   1. City of Miami will designate a staging area on-site or in building for Contractor's use. Keep the area clean, secure, and organized.
   2. Handle waste and clean areas affected by the work following the "Waste Removal and Cleaning" section of these Specifications.

3. Remove debris such as construction material, debris, and spills from site each day. Dispose of lawfully using covered rubbish containers, recycling where possible.
4. Provide security for products and equipment stored on-site. Maintain the safety of persons in and surrounding the project site.
5. Before date of Substantial Completion, repair and return all area(s) affected by the construction to the original condition or as needed for the new use, to the satisfaction of the City of Miami. When work is performed subsequent to Substantial Completion, immediately at the completion of such work, repair and return the affected areas to the original condition or as needed for the new use, to the satisfaction of the City of Miami.

1.5 SCHEDULING AND WORK RESTRICTIONS

A. Schedule New Work with A/E and the City of Miami:
   1. Additional work may be ordered and paid for as directed and approved by the City of Miami.
   2. Coordinate with A/E and City of Miami work that will interfere with park activities.
   3. Do not interfere or disrupt the use of the occupied facility during work on electrical, fire alarm, security, intercommunication systems or any other systems essential to life safety. Provide temporary life safety systems for (24/7) full-time coverage for occupants and property at no additional cost to the City.

B. Demolition: Perform selective demolition within or outside the facility in ways that minimize noise, dust, time of disruption, and hazard to occupants and public.
   1. Perform selective demolition during hours agreed to by the City.
   2. Drill concrete and masonry, when necessary, in a manner to avoid reducing load-bearing capacities of structure and to avoid mechanical and electrical lines that may be concealed or built in.

1.6 CONSTRUCTION DOCUMENTS

A. The Drawings listed on cover sheet of permit documents Index of Drawings are a part of the Construction Documents.

END OF SECTION

01150
MECHANICAL AND ELECTRICAL COORDINATION

PART 1 GENERAL

1.1 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 CITY.
   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 CITY, if any, and by other trades.

B. Work Not Included: Equipment and wiring provided by local telephone and power utilities and by the City of Miami separate contractors and vendors.

1.2 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.
   3. Confirm exact location and arrangement of floor outlets and Instructor's Technology Center outlets.

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

1.3 SHOP DRAWINGS, PRODUCT DATA AND SAMPLE SUBMITTALS

A. Submit shop drawings, edited catalog cuts of components, product data, and/or samples for, but not necessarily limited to, 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, 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.

B. Submit catalog cuts and related shop drawings at the same time.

1.4 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. Contractor shall coordinate with the appropriate City of Miami Departments Staff the installation of all infrastructures serving the ITS Telephone and Data System, and the Security Camera System, to ensure proper sizing and placement of all in-contract items for these systems.
B. Correct without extra charge to THE CITY, mechanical, electrical work causing interference, unacceptable clearances, or accessibility problems among the work of mechanical, electrical, and other trades.

1.5 SUPERVISION

A. Require each subcontracted trade to provide services of an experienced superintendent in charge of installation of the work and skilled workers required to unload, transfer, erect, install, 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.

1.6 INSPECTIONS BEFORE THE CITY'S SUBSTANTIAL COMPLETION INSPECTION

A. Arrange and schedule as many inspections of the work as necessary.
B. During the entire period scheduled for these inspections, Contractor and Contractor's superintendents 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 GC's contracted test and balance agency.
2. Completion of necessary corrective work.
3. Final test and balance work has been performed by GC's test and balance agency.
4. Balance report has been completed.

1.7 CERTIFICATES

A. Upon completion of the Work, when applicable, obtain certification of compliance or completion from authorities having jurisdiction over the Work and deliver certification to the A/E.
B. See Section on Closeout of the Work for additional certification requirements.

1.8 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 acceptable in lieu of the manufacturers'.

1.9 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, operations and maintenance manuals and warranty documents.

PART 2 PRODUCTS

2.1 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 specification.
C. Use the same manufacturer of equipment for replacement parts and maintenance.
D. Equipment, materials and components shall be new and current products of manufacturers engaged in production of such equipment and shall be manufacturers latest design conforming to Construction Documents. Components by the same manufacturer shall be mechanically and electrically consistent with ratings of installed apparatus. 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 atmosphere in which the item is installed.
F. Equipment of a similar nature shall be by the same manufacturer.
G. Coordinate space requirements, mounting arrangements, and service connections when

approved substitute equipment is furnished.

H. Before ordering, verify that equipment fits assigned spaces and can be moved into position without interference from door clearances, ceiling heights, crane access, and other equipment and construction.
I. Be responsible for expenses caused by substitution of equipment used as a basis for design.
J. Maintain clearances for electrical equipment as required by the edition of the National Electrical Code (NEC) edition referenced in the FBC designated for the project.
K. Provide UL listings for all applicable components and equipment.

PART 3 EXECUTION

3.1 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 ensure 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 CITY.
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.
E. Field assembly of equipment or apparatuses shall not be grounds for extra compensation.

3.2 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:
    1. All welding shall be performed by certified welders.
    2. All electric arc welding shall conform to American Welding Society standards.
    3. Clean each weld layer.
    4. Chip out trapped slag and unfused areas before applying nest bead.
    5. Visually inspect finished weld for cracks, porosity, or imperfections.
    6. 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, or other exposed equipment or accessories shall be factory painted or finished, unless otherwise indicated. 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, fire stats, 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.

3.3 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.

3.4 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 the –"Excavating, Backfilling, and Compaction for Utilities" section of these Specifications.

3.5 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, fire rated walls and partitions, and fire rated floors, ceilings, floor/ceiling assemblies and roof/ceiling assemblies shall be firestopped according to U.L. or other tested, accepted firestopping/sealing assemblies that will maintain the required fire-rating at the penetration. The annular space between the pipe or pipe covering in sleeves set in walls and partitions, floors, ceilings, floor/ceiling assemblies and roof/ceiling assemblies that are required to be smoketight shall be packed with a noncombustible material that will maintain the smoketight condition at the penetration.

B. Blockouts:
   1. Blockout areas of concrete or masonry to allow passage of ducts or installation of boxes.
   2. Provide, as directed by A/E, 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 that might impair the strength of building construction. Get directions from A/E prior to cutting through or into structural components (such as beams, joists, trusses, slabs, concrete and masonry wall and columns) when such cutting is not indicated on the construction drawings.
   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.
   5. See additional requirements under the “Cutting and Patching” section of these Specifications.

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.
   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 in. 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. Patch as directed by A/E.
      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.
   5. See additional requirements under the “Cutting and Patching” section of these

Specifications.

3.6 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 and authority having jurisdiction.

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

3.7 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.

3.8 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 CITY.

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

3.9 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.

3.10 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.

3.11 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.

3.12 PIPING, DUCTWORK, AND RACEWAY INSTALLATION

A. Provide clearances under beams and over windows in order to achieve 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.

3.13 WATERPROOFING AND ROOFING

A. Where mechanical or electrical work penetrates building envelope, roofing membrane 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 and penetrations watertight.

3.14 PAINTING AND COATINGS

A. Except for pipe and pipe fittings, equipment that is not galvanized, copper, bronze, or that has a factory applied final finish, shall be delivered 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. Coat insides of drip pans with 2 coats of asphaltum.

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

3.15 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 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.

3.16 EXISTING CONDITIONS

A. Work shall be according to the specifications and drawings and to the complete satisfaction of THE CITY and A/E. Materials and patching required to make project complete shall match existing where applicable.

B. Items to be reused according to Construction Documents, temporarily removed, or de-energized shall be handled without causing damage. Removed 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 CITY. This includes removal, rerouting, etc. of electrical items required to complete installation.

D. Patch or replace damaged floors, walls, ceilings, and other finished surfaces cut into or altered to accommodate the new construction. Patched surfaces shall match existing adjacent surfaces. When repainting is required, repaint the entire affected wall or ceiling plane – spot repainting shall not be accepted.

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 CITY.

H. Reroute conduits in the way of new equipment and construction and extend or replace circuits as required.

I. Execute Work to avoid interference with the use of and 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 construction operations. Repair or replace any damages at the direction of A/E at no additional cost to THE CITY.

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

END OF SECTION.

01510
TEMPORARY UTILITIES

PART 1 GENERAL

1.1 SUMMARY

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

B. Related Sections:

1. 01011 - Summary of Work.
2. Division 15 - Mechanical.
3. Division 16 - Electrical.

1.2 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:

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

1.3 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

2.1 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.

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

E. Temporary Sanitary Facilities:
   1. Provide sanitary facilities according to authorities having jurisdiction.
   2. Service, clean, and maintain facilities and enclosures.

PART 3 EXECUTION

3.1 GENERAL

A. Maintain and operate systems to ensure continuous services.
B. Modify and extend systems as work progress requires.

3.2 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

01520
CONSTRUCTION AIDS

PART 1 GENERAL

1.1 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.

1.2 QUALITY ASSURANCE

A. Comply with Federal, State and Local codes and standards.

PART 2 PRODUCTS

2.1 MATERIALS

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

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

PART 3 EXECUTION

3.1 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 City of Miami 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

01600
PRODUCTS

PART 1 GENERAL

1.1 SUMMARY

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

1.2 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. 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.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Arrange deliveries of products according to construction schedules. Avoid conflicts with work, site conditions, and school operations, if applicable.

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.

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

1.4 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 City of Miami 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

2.1 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

3.1 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.

3.2 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

01712
SURVEY AND LAYOUT

1.1 PROJECT SURVEY AND LAYOUT REQUIREMENTS

A. Benchmarks: Contractor's surveyor shall establish at least 2 permanent benchmarks on the site, referenced to data established by survey control points, and shall record the benchmark locations, with horizontal and vertical data, on the Record Documents.
B. Lines and Levels: Locate, lay out, and periodically verify the following:
   1. Site improvements, such as stakes for grading, fill, roads, walks, play areas, and topsoil placement; outbuildings, site structures, utility runs, slopes, and invert elevations.
   2. Batter boards for foundations of buildings and columns; also floor and roof levels.
   3. Controlling lines and levels needed for mechanical, electrical, and site work.

C. Maintain a complete and accurate log of control points and survey work for buildings and site as Work progresses.

1.2 SUBMITTALS

A. Submit before start of Work: Name and address of a Florida registered professional engineer or Florida registered land surveyor acceptable to A/E and THE CITY who will perform the survey work.
B. Provide certification in writing, signed by Florida registered professional engineer or Florida registered land surveyor verifying that elevations and locations of improvements are in conformance or non-conformance with Construction Documents:
   1. On request of A/E, submit documents verifying accuracy of survey and layout work.

C. Certified Survey and Elevation Certificate: Upon completion of foundation walls or slabs, roads, walks, and major site improvements, prepare a certified survey showing dimensions, locations, angles, and elevations of the Work, including subsurface lines and utilities. At time of Contract closeout provide the following:
   1. Three (3) signed and sealed originals of the Certified Survey indicating all items referenced above.
   2. Three (3) signed and sealed originals, fully executed and properly completed, Federal Emergency Management Agency (FEMA) Elevation Certificate, FEMA Form 81-31 (OMB No 1660-0008) latest edition.

1.3 SURVEY REFERENCE POINTS

A. Existing horizontal and vertical control points for the Work are designated on the Construction Drawings.
B. Notify the A/E, in writing, of discrepancies between actual measurements and dimensions shown in Construction Documents:
   1. Do not proceed with work until written instructions for resolving discrepancies come from A/E and THE CITY. Contractor is responsible for its own losses and damage to the Work if it proceeds with work before obtaining instructions from A/E and THE CITY.
C. Locate and protect control points before starting sitework, and preserve permanent reference points during construction:
   1. The control points are not to be changed or relocated without prior written notice to the A/E.
   2. Notify A/E when a reference point is lost or destroyed.
   3. Notify A/E when a reference point needs relocation due to grade or location changes.
   4. The Contractor's surveyor shall replace lost or destroyed control points and establish replacement monuments based on original survey control points at no additional cost to THE CITY.

END OF SECTION.

01732
CUTTING AND PATCHING

1.1 GENERAL

Section includes: Cutting, fitting, patching, refinishing, excavation and backfill as required to complete the work.

1.2 SUBMITTALS

Written request:

1. Submit a written request to A/E before any cutting or alteration affecting:
   a. Work of another general contractor hired by the City of Miami.
   b. Structural value or integrity of any element of the Work.
   c. Integrity of weather-exposed or moisture-resistant elements or systems.
   d. Fire rating, resistance or interior finish class of the affected elements.
   e. Efficiency, operational life, maintenance, or safety of building elements.
   f. Visual qualities of sight-exposed elements.
   g. Security of facility.
2. Written request shall include:
   a. Location 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 existing construction affected.
   d. The reason 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.

1.3 INSPECTION

Contractor shall 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 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.

Cutting and patching work must be inspected by the project's Building Code Inspector as part of their required periodic code compliance inspections.

1.4 PREPARATION

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

Provide protection for the structural, fire resistive and weather-tight qualities of the facility.

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

Provide protection from elements for portions of the Work exposed by cutting and patching work.

Employ qualified mechanics skilled in performing each kind of cutting and patching work.

Protect and cover all fire alarm devices from dust during cutting and patching.

Protect and cover all HVAC air handlers, ductwork and grilles from dust during cutting and patching.

1.5 PERFORMANCE

Execute cutting and demolition by methods that will not damage other work and will provide proper surfaces to receive installation of new work:

1. Removal of any millwork installed using plaster grounds also requires removal of plaster grounds. Patch and paint to match adjacent wall surfaces.
2. 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.
   c. Spot repainting will not be accepted.

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

Restore temporarily cut or removed work.

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

Excavate and backfill using methods that will not cause settlement or damage to other work. Maintain excavations free from water.

Restore work in a timely manner coordinated with the A/E and the City of Miami.

END OF SECTION

02011
SOIL BORING DATA

02011
SOIL BORING DATA

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GEOTECHNICAL ENGINEERIN G I FOUNDATION ENGINEERING I GEOIECil\ CAL TESTING I SOIL BORINGS/MONITORING WELLS I CONSTRUCTION MATERIALS TESTING

December 17, 2015

Mr. Peter Duena, P.E.
SCS Engineers
7700 N. Kendall Drive, Suite 300
Miami, Florida 33156

Re: Final Report of Subsurface Exploration & Geotechnical Engineering Study
Proposed Douglas Park Improvements
2795 SW 37th Avenue
Miami, Florida
Project No. 14774

Dear Mr. Duena:

NV5, Inc. (formerly KACO), submits this report in fulfillment of the scope of services described in our Proposal No. 15-0583REV4 dated November 13, 2015. The work was authorized by acceptance of our Professional Services Agreement. This report describes our understanding of the project, presents our evaluations, and provides our professional opinions and recommendations for foundation design and construction for the project.

Sincerely,
NV5, INC.

Richard Fesdjia
Proj ct Enginee
Flonda License

Garfield L. Wray, P.E., D.GE.
Director of Geotechnical Engineering
Florida License No. 49734

Distribution: 2 Copies to Addressee via U.S. Mail
1 Copy to Addressee via Email
1 Copy to NV5 File

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NIV15

1.0 SITE AND PROJECT INFORMATION

The project site is a park located at 2795 SW 37th Avenue in Miami, Florida. The site is roughly square with average dimensions of 625 feet by 635 feet. It is bounded by SW 28th Street to the south, SW 37th Avenue to the west, single-story school structures to the east and residential structures to the north. A site vicinity map is presented on Drawing 1. Currently the park houses a baseball field in the NW quadrant, tennis and basketball courts and paved parking on the southern portion, and a single-story building, playground areas and miscellaneous shelter structures in the western portion of the site. A March 20, 2015 boundary and topographic survey prepared by Keith and Schnars, P.A. which we reviewed indicates ground surface elevations of +9.5 to +15.7 feet with respect to the 1929 National Geodetic Vertical Datum (NGVD).

We were provided with a *Solid Waste Delineation Report* prepared by URS dated January 31, 2014. Based on the information included in this report it appears the project site was previously used for dumping of solid waste. The report delineates the horizontal and vertical extents of the solid waste materials. We are unaware of the past development history of the site beyond its current condition and the information we received regarding previous dumping at the site.

NV5 prepared a report for the project titled *Report of Subsurface Exploration & Geotechnical Engineering Study for the Douglas Park Improvements dated* July 15, 2015. At that time, we understood the improvements to comprise the rehabilitation of the parking lot on the west and south boundaries of the park, new walkways around the field, and new bleachers at the southeastern corner of the baseball field.

Based on an email provided by Mr. Peter Dueno from SCS Engineers dated September 10, 2015, we understand the project will be expanded to include demolition of the existing structure located on the western portion of the site and construction of a one-story structure. Details of the proposed structure have not been provided however we anticipate the construction will be reinforced masonry. We estimate column loads for the proposed structure will be 50 to 100 kips, and wall loads will be around 1.5 kips per lineal foot. We anticipate ground floor slabs will be loaded to less than 200 pounds per square foot (psf).

Additionally, we have been requested to review and update our previous geotechnical recommendations to address the following improvements to the park:

- Lowering grades of general areas within the park by 14 inches
- Raising grades of the baseball field by one foot
- Grouting of voids reportedly encountered underneath the tennis courts
- Proposed asphalt walkway around perimeter of the park
- Proposed bleachers near baseball field

2.0 PURPOSE AND SCOPE OF WORK

The purpose of NV5's services on this project is to perform a subsurface exploration and engineering analyses to provide recommendations for design and construction of the proposed project. Specifically, this report provides:

+ Drawings showing boring locations, a graphic summary of the generalized subsurface conditions, and boring logs with detailed descriptions of the materials encountered.
+ Discussion of generalized subsurface conditions at the site including groundwater levels.
+ Discussion of feasible foundation type(s) for the proposed construction and improvements.
+ Design parameters for the recommended foundation types, including vertical and lateral load resistance.
+ Estimates of foundation settlements.
+ Recommendations for site preparation and grading, including the re-use of site-excavated materials for fill, fill placement and compaction, pavement and slab subgrade preparation.
+ Construction considerations including excavation support and dewatering and impacts for adjacent structures.

3.1 FIELD EXPLORATION

3.2 BORINGS

The subsurface conditions were explored with fifteen (15) engineering test borings drilled to depths ranging between 8 and 2'5 feet below existing grade at the approximate locations shown on Drawing 1. Borings B-1 through B-11 were drilled for the July 2015 study, while borings B-12 through B-15 were drilled for the current effort. The test locations were marked and identified in the field by NV5. The borings were drilled in accessible locations with a truck-mounted drill rig utilizing the rotary wash method.

Samples of the subsurface materials were recovered at roughly 2-foot intervals within the upper 10 feet of the boring and at approximately 5-foot intervals thereafter using a Standard Penetration Test split-spoon sampter (SPT) in substantial accordance with ASTM D-1586, "Standard Test Method for Standard Penetration Test and Split- Barrel Sampling of Soils." This test procedure drives a 1.4-inch I.D. split-tube sampler into the subsurface profile using a 140-pound hammer falling 30 inches. The total number of blows required to drive the sampler the second and third six-inch increments is the SPT N-value, in blows per foot, and is an indication of material strength. Upon completion of the borings, the boreholes were backfilled to the ground surface with soil cuttings and the upper few feet with cement grout.

The soil/rock samples recovered from the borings were classified by a geotechnical engineer. The collected samples were later re-examined to confirm field classifications. Visual soil classifications were made in accordance with ASTM D2487 and ASTM D2488. The results of the classification and consequent generalized stratification are shown in Drawing 2, and in the records of test borings in Appendix A (sheets A-1 through A-17). Strata contacts shown on these drawings are approximate. The boring data reflect conditions at the specific test locations only, and at the time the borings were drilled.

3.2 TEST EXCAVATIONS

NV5 performed also eleven (11) test excavations (TEs) at the locations shown on Drawing 1. The TEs were performed using a rubber-tired backhoe and extended to depths of about 8 to 10 feet below the existing grade. The TE logs are presented on sheets B-1 through B-6 in Appendix B.

4.0 LOCAL GEOLOGY

Miami-Dade County is located on the southern flank of a stable carbonate platform on which thick deposits of limestones, dolomites and evaporites have accumulated. The upper two hundred feet of the subsurface profile is composed predominantly of limestone and quartz sand. These sediments were deposited during several glacial and interglacial stages when the ocean was at elevations higher than present.

In many portions of Miami-Dade County, surface sand deposits of the Pamlico Formation are encountered. The Pamlico sands overlie the Miami Limestone. In western Miami-Dade County, portions of the Everglades Region interfinger with the Pamlico sand. The Everglades soil consists of peat and calcareous silt (marl).

The Miami Limestone is a soft to moderately hard, white, porous to very porous, sometimes sandy, oolitic calcareous cemented grainstone. The formation outcrops in portions of Miami-Dade County. The Miami Limestone has a maximum thickness of about 35 feet along the Atlantic Coastal Ridge and thins sharply near the coastline arid more gradually in a westerly direction. The Miami Limestone was formed about 130,000 years ago at a time when the sea level was twenty-five feet higher than it is today. This environment facilitated formation of concentrically layered sand sized carbonate grains called oolites. These grains formed by repeated precipitation of calcium carbonate around the nucleus of a sand or shell grain.

The Miami Limestone can be separated into two facies: the barrier bar oolitic facies and the tidal shoal limestone facies. The barrier bar facies is characterized by lenses of oolitic limestone separated by intermittent, 1-inch thick or less, uncemented sand layers (cross-bedded limestone). Zones of higher porosity are characteristic and parallel the bedding planes of the cross-bedded limestone. The tidal shoal limestone

facies is characterized by a distinct lack of bedding planes. In addition, burrowing organisms have churned previously deposited sediments, which have resulted in high porosity channels in the rock. These ancient channels give the rock an appearance of a hardened sponge in some areas.

The Fort Thompson Formation underlies the Miami Limestone, and includes sand, sandstone, and limestone. The upper zones of the Fort Thompson Formation consist of sand having a thickness ranging from 5 to 35 feet. The remainder of the formation consists of coralline limestone, quartz sandstone, sandy limestone and freshwater limestone. The type of soils within the formation and the degree of cementation vary with lateral extent and depth.

The Fort Thompson Formation is underlain by the Tamiami Formation. The Tamiami Formation consists of sands, silts, clays, and sometime fossiliferous limestone. The upper portions of the Tamiami Formation are permeable and make up the lower reaches of the Biscayne Aquifer. This formation ranges in thickness from zero to 300 feet in South Florida.

5.0 SUBSURFACE CONDITIONS

In general, the subsurface conditions encountered below a depth of about 9 feet in our borings and test excavations are consistent with the geology described above. However, the upper 9 or so feet of the site subsurface appear to have been modified with solid waste materials and other fill components. The detailed subsurface conditions are presented in detail on the records of test boring sheets in Appendix A. The subsurface conditions disclosed by the boring can be generalized as described below.

Layer 1 – Surficial Fill and Sand (Fill)

This layer consists of fine sand and sand with limestone fragments that is about four to twelve feet thick in the borings. The layer is fill and contains varying amounts of construction debris including glass, wood, tires, brick, metal, plastic, and concrete. Construction debris was found in sizes up to 3 inches. SPT N-values recorded in the layer range from less than one to greater than 50 blows per foot (bpf), with an average value of 21 bpf, indicating the layer is typically medium dense. The higher blow counts encountered may indicate that drilling was performed through concrete fragments or hard fill materials.

Layer 2 – Peat:

This layer comprises of peat and was encountered in only in boring B-2. The layer is about 2 feet thick. The stratum is firm with a recorded SPT N-value of six bpf.

Layer 3 – Limestone:

This layer comprises limestone and extends to the maximum boring termination depths of 8 to 25 feet below grade in every boring except for borings B-1 and B-4 where it was not encountered. The stratum is very soft to hard with recorded SPT N-values ranging from four to greater than 50 bpf. The average SPT N-value in the stratum is at least 16 bpf.

For the layers described above, the Table 1 below summarizes our estimates of engineering parameters considered pertinent to the design of foundations for the proposed bleachers and pavements.

TABLE 1 -SUMMARY OF ESTIMATED PERTINENT ENGINEERING PARAMETERS

Layer ID	Description	Thickness (ft)	SPT N-values		Modulus of Elasticity (ksf)	Unconfined Compressive Strength (ksf)	Allowable Side Shear (ksf)
			Range	Avg			
1	Surficial Fill	4-12	<1-50+	21	400	-	-
2	Peat	2±	2	6	<200	-	-
5	Limestone	1-11+	4-50+	16	10,000	300	3

We note that the values of allowable side shear estimated in Table 1 above are based on our experience and laboratory data from similar rock that we have tested.

Groundwater

Groundwater was encountered in the borings at depths between 7.5 and 10.5 feet below the existing ground surface. These depths correspond approximately to elevations between about +0.9 and +3.9 feet NGVD. On average, stabilized groundwater levels in the general vicinity of the project are expected to vary between elevations +0 to **+4** feet NGVD, the variations being primarily as a result of seasonal rainfall. Storm and hurricane events and construction activities also result in variations in the groundwater levels. Notwithstanding the variations acknowledged, we anticipate that groundwater at the site will generally be encountered within the upper 10 to 15 feet of.the existing ground surface.

6.1 EVALUATION AND DISCUSSION

6.2 FOUNDATION SUPPORT

Based on the results of the field exploration and our engineering analyses, we consider the site poses some challenges for development of the project from a geotechnical perspective. These are further discussed in the paragraphs below. Detailed recommendations for the proposed building, miscellaneous improvements such as paved asphalt for roadways/walkways, grouting voids reportedly existing underneath tennis courts, and grading adjustments are presented in Section 7 of this

report.

6.1.1 Proposed 1-Level Building

The primary concern for foundation design and construction include support of the proposed new structure loads without unacceptable settlement. The fill with debris material encountered in the upper 9 or so feet of the site subsurface was likely placed in an uncontrolled fashion. As such, we cannot be certain of its density/consistency throughout the site.

Nonetheless, we judge that from the standpoint of economy, removing or improving the fill might be cost-prohibitive given the scope of the project and the risk involved in leaving the fill in place as is might be worth it.

Our initial consideration for supporting the proposed structure was shallow foundations. The SPT N-values recorded in the borings indicate an average value of 13 bpf in Layer 1 suggesting the material is medium dense and should be capable of supporting the proposed construction loads after normal site preparation and grading activities. However, because of the uncertainty associated with the composition of the fill, there is always a possibility for settlement over the long term if the fill contains compressible materials within the zone of influence of the new construction loads or organic matter than can decompose over time. This is particularly of concern considering tree trunks up to 4 inches in diameter were observed in the TEs. Additionally, while decomposition is not a concern for inert materials such as concrete and metal, the washout of fines from around these materials could cause them to shift within the body of the fill and thereby result in settlement.

Based on the above considerations we conclude that deep foundation support is appropriate for the proposed structure.

Consistent with current practice in the South Florida area we consider augered, cast-in-place (ACIP) piles to be the most feasible foundation type for this project. Other deep foundation systems such as driven piles and drilled shafts are not considered feasible. In addition to the noise nuisance, vibrations from driven pile foundations could adversely impact existing buildings on the site as well as those on adjacent properties. Drilled shafts are typically economically feasible and attractive only where they are used to carry very large loads that sufficiently justify the slower installation rates and other installation difficulties attendant with such foundations.

The proposed structure can be supported on ACIP piles 14 inches in diameter and tipped at 18 to 20 feet below the existing grade.

It is noteworthy however, that installation of ACIP piles in the uncontrolled fill could be subject to higher than normal grout takes, as well as delays caused by obstructions.

An alternative to pile foundation support would be to improve the ground beneath the proposed structure by either 1) excavating the fill and replacing it with acceptable fill material, or 2) installing vibro-replacement stone columns (VSC) to transfer the structure loads down to the Layer 2 limestone. VSC is a method where a large vibrating probe is inserted into the ground to the desired depth to density the insitu soils. The probe hole is backfilled with No. 57 stone is used as the backfill material to create a dense aggregate column that provides relatively higher bearing pressures.

For the excavation and replacement option consideration would have to be given to the fact that portions of the excavation would occur beneath the water table and so backfilling of these areas would require either dewatering so that the backfill can be performed in the dry, or use of No. 57 stone to accomplish backfilling below water.

Project ownership would have to evaluate the economic viability of either of these methods as compared to supporting the structure on piles.

6.1.2 Bleachers, Tennis Courts and Pavements/Walkways

The proposed bleachers can be supported with shallow foundations after preparing the site as recommended in Section 7 of this report. Bleachers generally have a higher tolerance for differential settlement than other traditional buildings. The tennis courts, and pavements/walkways can be constructed at grade after customary site preparation. It will likely not be economically justifiable to perform any special site improvement or use deep foundations to accommodate these structures. However the project ownership must accept that there will always be a risk of settlement from the uncontrolled fill and as such these structures could require a maintenance schedule that is more rigorous than usual.

6.2 ESTIMATED SETTLEMENT

We estimate that maximum foundations settlement for the proposed new structures will be less than one (1) inch, with maximum differential settlements on the order of ½ inch. Given the cohesionless nature of the soils present at this site, we predict settlements will occur coincidental with the application of the building dead and live load. The above settlement estimates are for foundations that are designed and constructed as recommended herein. However, due to the uncertainty of the components of the fill materials, long term settlements exceeding one (1) inch should be expected throughout the site. The only solutions to prevent these long term settlements are removing and replacing the fill material or supporting the structures directly on the limestone layer.

6.3 VOIDS UNDERNEATH TENNIS COURTS

Based on the information provided by SCS Engineers, the existing tennis courts may have voids underneath the slab. This may have been caused by differential settlements, decomposition of some of the underlying solid waste materials, or soils

washing away due to heavy rain events. We are not aware of the construction date of the tennis courts. If the subsurface conditions beneath the courts are similar to the conditions encountered throughout the site, we recommend as a temporary solution to pump high viscosity, low strength grout. This however does not represent a permanent fix to the settlement and voids underneath the tennis courts. In order to provide a permanent solution to the settlement and cracking, the slabs should be either pile supported, or the deleterious materials should be excavated and replaced with clean fill.

The spacing and frequency of the grouting shall be determined after additional field exploration is performed.

6.4 MISCELLANEOUS ENVIRONMENTAL IMPACTS

Environmental forces consist of sinkholes, freeze thaw damage, shrinking and swelling soils, and hurricane scour can affect the performance of a foundation system. Sinkholes, freeze-thaw, and shrinking/swelling soils are generally not of concern in the South Florida area. While a detailed study of hurricane scour was outside the scope of this study, it is nonetheless our opinion that the foundation systems recommended herein when properly designed and constructed, will resist hurricane scour forces. It is therefore our opinion that these specific environmental forces have a low risk (on a scale of low, moderate, high) of adversely affecting foundation performance at this site provided the foundation system is designed and constructed as recommended herein.

7.1 RECOMMENDATIONS

Our recommendations for geotechnical design and construction of the proposed project are provided below in the following sections.

7.2 SITE PREPARATION AND GRADING

1. Geotechnical site preparation for construction should consist of removal of all existing structures, foundations, pavements, underground utilities, and other deleterious materials within the upper 6 to 12 inches of the proposed foundation footprints plus a five-foot perimeter where possible. Any voids created by the removal of these deleterious materials should be properly backfilled as described in the paragraphs below.

   No information has been provided about ex_isting foundations at the site and we are not aware of the site development history beyond its current condition and the reported historical dumping activities. Where old spread foundations are encountered, they should be removed and replaced with compacted fill if they interfere with new foundations. If the old foundations do not interfere with new construction they should be left in place. Backfilling of old foundation excavations should be performed in accordance with the recommendations provided in this report.

2. After site preparation as described above, areas for structures that will have slabs on grade or pavements (including the walkways) should be proof rolled with at least 10 overlapping passes of a 20-ton roller as it operates at its maximum vibrational frequency and travel at a speed of no more than two feet per second. The proof rolling should be observed by NV5 to identify and mitigate any weak subgrade conditions evidenced by yielding or rutting at the wheels of the roller. Proof-rolling should include planned development footprints plus a five-foot perimeter. To avoid damage to existing foundations, pavements, or utilities, portions of the proof-rolling may have to be performed with a smaller roller or walk-behind compaction equipment.

3. In general fill soils should consist of either inorganic, non-plastic sand having less than 10 percent material passing the No. 200 sieve, or crushed limestone with a maximum rock size of six (6) inches. In particular, fill soils placed within the upper 12 inches of the subgrade of building slabs on grade should consist of either sand with less than 10 percent passing the number 200 sieve, or crushed limestone with a maximum particle size of three inches.

   Based on our boring data portions of the near-surface sandy materials could satisfy the fill criteria. However, given the debris found in the U.wer 1 soils, we anticipate that significant sorting and possibly moisture-conditioning will be required prior to re-use. Such sorting could render it uneconomical to use the material for fill. In any event, representative samples of the fill soils should be collected for classification and compaction testing. The maximum dry density, optimum moisture content, gradation, and plasticity should be determined. These tests are needed for quality control of the compacted fill.

4. Fill soils should be placed with loose lift thicknesses of not more than 12-inches, moisture-conditioned to within two (2) percent of the optimum moisture content based on ASTM D-1557, and compacted to a minimum 95 percent relative compaction[1]. One test should be performed for each 2,500 square feet of fill area per lift of fill soils. If during the compaction process fill shows evidence of yielding under the weight of the roller, it should be removed and replaced with properly compacted granul-ar fill as described herein. Fill particles exceeding one (1) inch in size should not be allowed to nest within the fill.

   The vibrations produced bv the operation of the roller/compactor should be monitored for potential adverse effect on adjacent existing structures, pavements, and utilities. -Lf existing footing and nearby structures will be affected by the vibration of the compactor, the compaction procedure may require modification as approved by the geotechnical engineer.

Relative compaction refers to the in-place dry unit weight of a material expressed as a percentage of the maximum dry unit weight of the same material as determined in the laboratory using the Modified Proctor procedure (ASTM 01557).

7.2 FOUNDATION SUPPORT

7.2.1 One-Story Structure

1. Our recommended pile tip elevations, allowable pile axial capacities, and grout strengths for foundation support are presented in the table below.

TABLE 3- SUMMARY OF PILE ALLOWABLE AXIAL CAPACITIES

Pile Diameter (in)	Min. Pile Tip Elevation (ft. NGVD)	Allowable Compression (kips)	Allowable Tension (kips)	Allowable Lateral (kips)	Minimum Grout Strength (ksi)
14	-7	70	30	4	5

Notes:
1. *Minimum pile tip length based on an estimated site grade of +11 feet NGVD at the time of the borings.*
2. *Required grout strength is for* a *28-day test.*

2. For computer structural modeling of the building, an initial vertical spring constant of 70 kips per inch (kpi) may be used for the 14-inch-diameter piles. The vertical spring constant is the working pile load divided by the estimated pile settlement and is based on our experience and a review of available pile load test data in similar subsurface conditions. The initial spring constant value should be refined as the structural model is developed. The design value used should match the settlement estimates.

3. Resistance to lateral loads can be provided by passive pressure acting on the pile caps and grade beams or the lateral resistance of the piles. Both lateral resistance modes should not be used together, as the larger deflections required to mobilize the passive resistance on foundation elements might not be consistent with those used for the pile lateral capacities presented below. Equivalent fluid densities of 180 and 80 pounds per cubic foot may be used to compute the passive pressures acting against the sides of the pile caps and grade beams above and below the groundwater table respectively. Passive resistance of the upper one foot of soil should be neglected, unless it is confined by a slab or pavement. Frictional resistance between the soil and bottom of footings should be ignored. The above values include a factor of safety of at least 1.5. These values of resistance assume that the foundations are: 1) in-situ soil densified by compaction, or clean sand fill which is compacted to 95 percent relative c9mpaction, and 2) able to withstand horizontal m_q ement on the order of% to *3)8* inch.

4. Pile reinforcing should be designed by the structural engineer to resist the tension and lateral forces applied to the pile systems. We recommend that piles resisting tension loads be reinforced over their entire length. The reinforcement for piles subjected to lateral loads may be designed based on a maximum unfactored bending moment of 150 in-kips. If the pile is not reinforced over the

entire length, we recommend as a minimum, a single No. 7 bar be installed the full length of the pile to verify pile cross-section continuity.

5. Foundations should be designed so that a minimum center-to-center pile spacing of three pile diameters is maintained.

6. Piles should be installed within three inches of specified plan location, and within two percent of vertical line.

7. During grouting of the pile excavation, the auger should be raised at a rate consistent with the capacity of the pump to ensure the entire pile shaft is uniformly grouted and to prevent caving of soils into the pile excavation. The actual grout volume for each ACIP pile should be at least 15 percent greater than the theoretical pile volume. A grout head of at least five feet should be maintained throughout the grouting of the pile shaft. Production piles should be installed in a manner similar to the successfully tested pile.

8. If during pile grouting any abnormalities such as sudden pressure drop or low grout take for a given interval of pile length are observed, the auger should be re- advanced to about five feet below the elevation where the anomaly was observed and the pile shaft properly re-grouted. Pumping should continue while the auger is rotated back down to the required remedial depth.

9. New piles should not be installed close to previously installed piles before the exist ing pile grout has started to set. As a guideline, the closest distance for installing adjacent piles within six hours should be the greater of eight feet or three pile diameters.

10. Grout should be sampled during piling installation at a m1n1mum frequency corresponding to the greater of one set of at least six cubes each morning and afternoon during production or one set of at least six cubes for each 50 cubic yards of grout placed. Cubes should be tested for compressive strength at intervals of three, 7, 14, and 28 days. At least two cubes should be tested at 28 days. Any remaining cubes should be retained for subsequent intermediate or 56-day breaks if required.

11. The steel reinforcement should be installed into the pile shaft immediately upon withdrawal of the grouting auger. Spacers should be fitted to the reinforcing cages to assure that they remain centered within the grouted shaft and maintain the required side cover. If obstructions are encountered during insertion of the steel cage, the cage should be extracted, the pile shaft re-drilled to at least five feet below the elevation of the obstruction and re-grouted to the ground surface, and the reinforcement re-installed.

12. An NV5 inspector should provide full-time quality control inspection to document the excavation and grouting of each pile and to provide, in conjunction with a

licensed office engineer, any necessary field adjustments of pile tip elevations.

7.2.2 Bleachers and Miscellaneous Structures

1. After preparing the site as described in Section 7.1 the proposed bleachers and miscellaneous structures may be supported on shallow spread foundations bearing on properly compacted granular fill or the near surface limestone and designed for a maximum allowable bearing pressure of 2,500 pounds per square foot (psf). The bottoms of footings should be embedded at least 18 inches below lowest adjacent grade.

2. To assure an adequate factor-of-safety against a general shearing failure, strip and continuous footings should be at least 16 inches wide, and isolated footings should be no less than 24 inches wide.

3. Lateral forces may be resisted by passive earth pressure acting on the vertical foundation. We recommend using an equivalent fluid weight of 180 pounds per cubic foot (pcf) to compute passive resistance for moist soil above the water table, and 80 pcf to compute passive resistance in submerged soil. Passive resistance in the upper 12 inches of soil should be neglected unless it is confined by a slab or pavement. Frictional resistance between the subgrade and bottom of foundations should be ignored. The above values include a factor of safety of at least 1.5. These values of resistance assume that the foundations are: 1) in- situ soil densified by compaction, or clean sand fill which is compacted to 95 percent relative compaction, and 2) able to withstand horizontal movement on the order of % to 3/8 inch.

4. The bottoms of footing excavations should be compacted to 95 percent relative compaction prior to placement of steel reinforcement and concrete. If the rock formation is exposed at the bottom of the footing, compaction is not necessary.

7.3 PRELIMINARY ASPHALT PAVEMENT THICKNESS DESIGN

7.3.1 Roadway Areas

1. This section presents preliminary recommendations for flexible asphalt pavement thickness design. Final pavement thickness design should be provided by the project civil engineer based on anticipated traffic loadings. Pavements should be designed and constructed in accordance with the current editions of the appropriate Florida Department of Transportation's pavement design manuals.

2. As a minimum, flexible pavement subgrade should be prepared as described under Section 7.1, *Site Preparation and Grading.* It is also recommended to strip at least one foot of the surficial material prior to proof-rolling the footprint of the pavement areas. The owner should be aware even after preparation of the site as described under Section 7.1, localized distress in the pavement should be anticipated due to the debris and deleterious materials encountered in the top

nine feet of the borings.

3. We recommend the following preliminary minimum flexible asphalt pavement section:

   - 2 inches of S-1 or S-3 surface course
   - 8 inches of limerock base course compacted to at least 98 percent relative compaction. The limerock base should have a minimum Limerock Bearing Ratio (LBR) of 100 percent. The base course can also be an asphaltic concrete material (FOOT specified ABC-3 or equivalent with a minimum Marshall Stability of 1,000 lbs).
   - 12 inches of stabilized subgrade compacted *to* at least 95 percent relative compaction. The subgrade should have a minimum with a minimum LBR of 40 percent as specified by Florida Department of Transportation (FOOT) requirements for Type B or Type C Stabilized Subgrade.

   Limerock or asphaltic concrete should be tested for compliance at a frequency of one test per 10,000 square feet, or at a minimum of two test locations, whichever is greater.

   To reduce the potential for differential settlement beneath the pavement a geotextile fabric such as Tensar TX-160 can be placed atop the subgrade prior to constructing the pavement section.

7.3.2 Perimeter Walkway Areas

1. As a minimum, flexible pavement subgrade should be prepared as described under Section 7.1, *Site Preparation and Grading.*

2. We recommend the following preliminary minimum flexible asphalt pavement section:

   - 1 inch of S-1 or S-3 surface course
   - 4 inches of limerock base course compacted to at least 98 percent relative compaction. The limerock base should have a minimum Limerock Bearing Ratio (LBR) of 100 percent. The base course can also be an asphaltic concrete material (FOOT specified ABC-3 or equivalent with a minimum Marshall Stability of 1,000 lbs).
   - 8 inches of stabilized subgrade compacted to at least 95 percent relative compaction. The subgrade should have a minimum with a minimum LBR of 40 percent as specified by Florida Department of Transportation (FOOT) requirements for Type B or Type C Stabilized Subgrade.

   Limerock or asphaltic concrete should be tested for compliance at a frequency of one test per 10,000 square feet, or at a minimum of two test locations, whichever is greater.

7.4 GROUND FLOOR SLABS

1. Ground floor slabs may be supported on grade assuming the site is prepared as recommended in Section 7.1 above. However the Owner must accept the risk for potential cracking associated with settlement of the uncontrolled fill at the site. IF such risk is not acceptable, slabs should be structural! supported.

2. Slabs on grade may be designed using a modulus of subgrade reaction of 150 pounds per cubic inch (pci).

3. Slabs should be reinforced for the loads that they will sustain and construction joints should be provided at frequent intervals.

4. Slabs in contact with soil are subject to movement of moisture from the soil upward through the slab. To prevent such moisture vapor transmission, a moisture barrier should be placed on the slab subgrade, and should be protected from damage during construction. Construction joints should be provided with water stops in any permanently submerged areas.

7.5 EXCAVATION AND DEWATERING

1. Shallow excavations into the near-surface materials will likely stand vertical for short periods of time only. The excavation sides will unravel over time as they are exposed to weather and construction traffic. In general, the Layer 2 limestone is expected to stand vertically unsupported if excavated. However localized weaker sandy zones within this layer could become loose if unsupported. Deeper excavations, especially those that extend below the groundwater table, as well as excavations that will remain open for longer periods of time will require support in the form of temporary shoring or sliding trench boxes to prevent instability of excavation walls and to protect workers from injury. All excavations should comply with Occupational Safety and Health Administration (OSHA) design and safety requirements. Shoring designs should be signed and sealed by a Florida-licensed professional engineer, and should be provided for the Owner's review.

2. Particular attention should be paid to anv deep excavations and the potential impacts these could have on adjacent structures. especially where such excavations are close to project property lines.

   Average groundwater elevation is expected to be between about Elevation +0 and +4 feet NGVD for this site. Excavation is unlikely to encounter groundwater. If needed, we judge that localized dewatering if required can be accomplished using pumps and sumps. Dewatering of larger excavations and larger volumes could require the installation of well points or other dewatering systems.

   It should be noted there are two components to the dewatering process. The first is extracting the water from the subsurface and the requirement of the

project to maintain a dry excavation to allow construction to proceed. The other component is the ability to discharge the volume of water extracted. The contractor must ensure this capability exists for the site such that all dewatering and consequent effluent discharge will meet the requirements of the local jurisdictional agencies including Miami-Dade County, Florida Department of Environmental Protection (FDEP), Florida Department of Transportation, and South Florida Water Management District (SFWMD) as appropriate. This study did not include specific testing or analysis to determine if dewatering is feasible or if adequate discharge is available. This is the responsibility of the subcontractor.

During dewatering the adjacent properties must be monitored for adverse impacts from dewatering drawdown. The potential for adverse impacts from dewatering is especially heightened where the peaty layer exists. Drawdown of the water table above or within the peaty layer can result in consolidation of this material.

The dewatering subcontractor should submit a proposed design for dewatering operations to the owner for review and approval prior to commencing work.

7.6 OTHER RECOMMENDATIONS

1. With new construction there is always a risk of adversely impacting adjacent structures and utilities. We recommend that pre- and post-construction surveys of adjacent structures and utilities of concern be conducted to document conditions.

2. NV5 should participate in the design development phases of this project in order to modify the .recommendations provided above as changes occur during the design development process.

3. NV5 should participate in the evaluation of field problems as they arise and recommend solutions. We should also be involved with site work activities so we can address needed changes to the foundation recommendations if site conditions different from those described herein are encountered.

4. NV5 should observe the foundation installation to satisfy the requirements of the Florida Building Code and municipal agencies.

8.0 REPORT LIMITATIONS

This report has been prepared for the exclusive use of the Owner and other members of the design/construction team for the specific projects discussed in this report. This report has been prepared in accordance with generally accepted local geotechnical engineering practices; no other warranty is expressed or implied.

The evaluation and recommendations submitted in this report are based in part upon the data collected from the field exploration. The nature or extent of variations throughout the subsurface profile may not become evident until the time of construction. If variations then appear evident, it may be necessary to evaluate our recommendations as provided in this report. In the event changes are made in the nature, design or locations of the proposed project construction, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions modified or verified in writing by NV5.

The scope of services did not include any environmental assessment or investigation for the presence or absence of wetlands, sinkholes, chemically hazardous or toxic materials in the soil, surface water, groundwater or air, on or below or around the site.

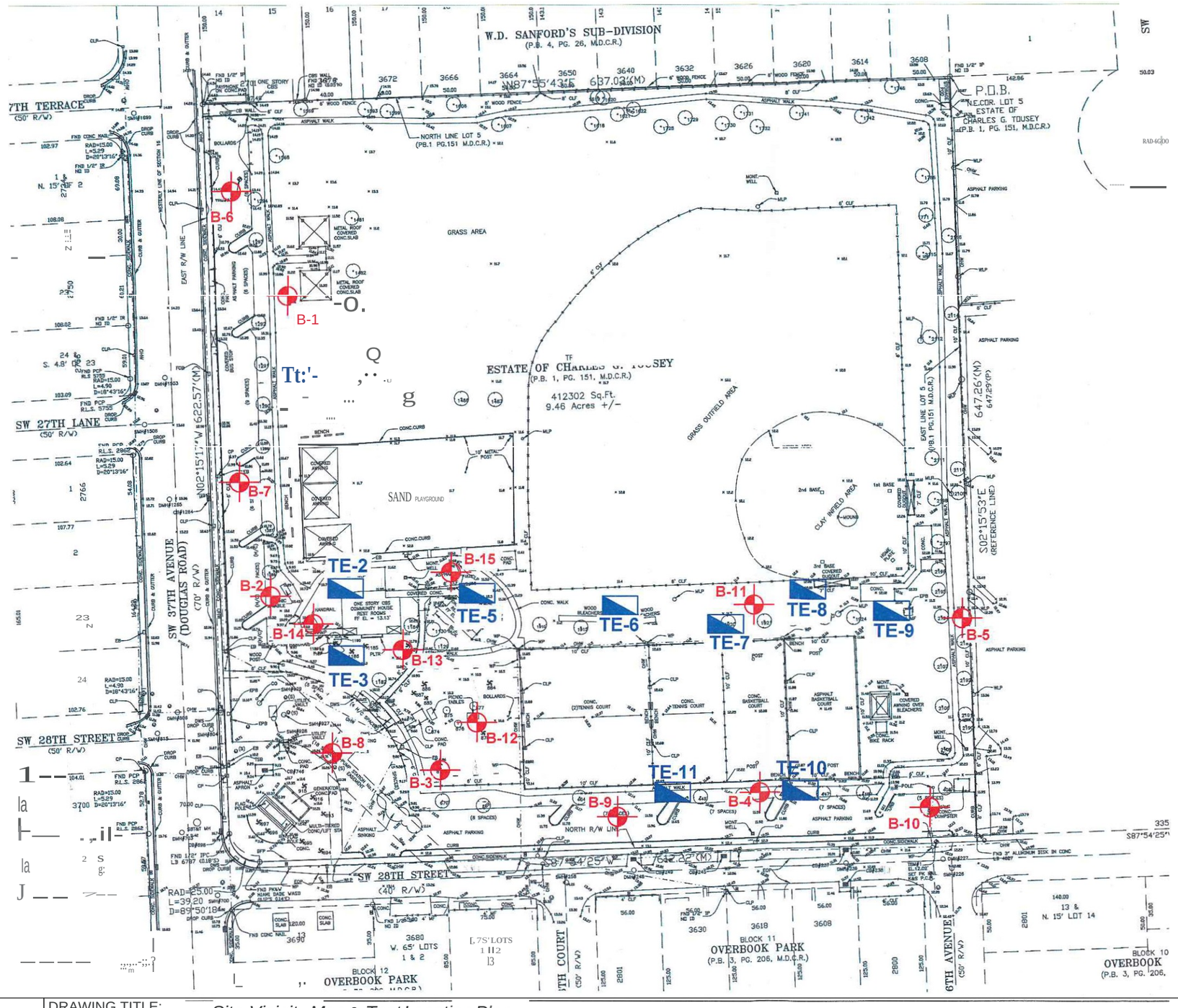
We should be provided the opportunity to review final foundation specifications and review foundation design drawings, in order to ascertain whether our recommendations have been properly interpreted and implemented. If NV5. is not afforded the opportunity to participate in construction related aspects of foundation installation as recommended in this report, we can accept no responsibility for the interpretation of our recommendations made in this report or for foundation performance .

9.0 CLOSURE

We appreciate the opportunity to provide specialized engineering services on this project and look forward to an opportunity to participate in construction related aspects of the development. If you have questions about information contained in this report contact the writer at 305.901-1921 .

****

DRAWINGS



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SW 37th A

Site Vicinity Map

N

0 95

Approximate Scale in Feet

LEGEND:

T-1 - Soil Boring Test Location

iiii;J TE-1 - Test Excavation Location

NOTES:

1. Test locations shown are approximate.
2. Test location symbols are not to scale.
3. Base for this drawing was taken from Sheet No. 2, "Boundary and Topographic Survey Douglas Park, prepared by Keith and Schnars, P.A., dated 03/20/2015.

NVS

DRAWING TITLE: *Site Vicinity Map & Test Location Plan*

PROJECT NAME: *Douglas Park Improvements*

PROJECT LOCATION: *2795 SW 37th Avenue, Miami, Florida*

PROJECT NO: *14774*

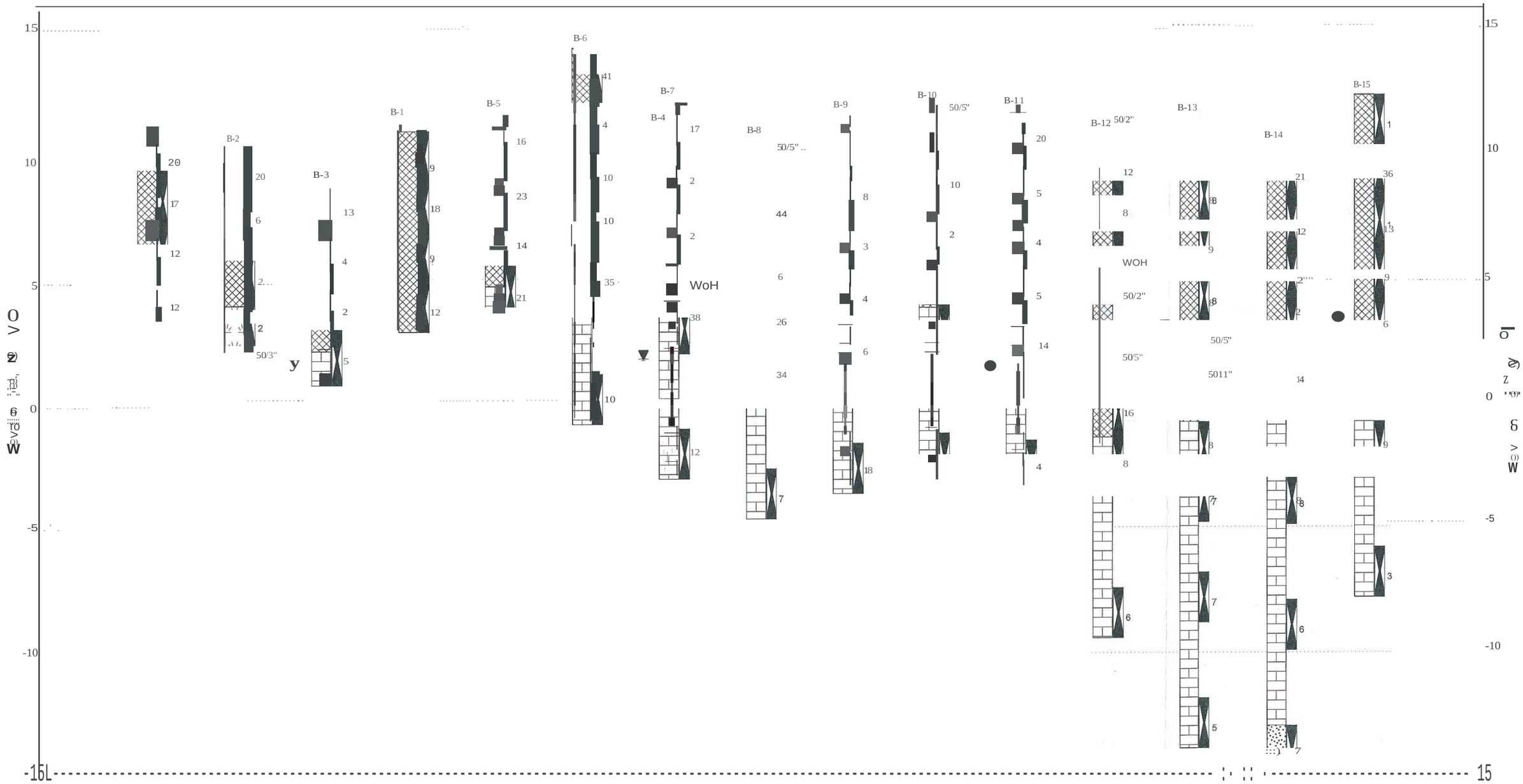
DATE: *12/17/15*

DWG NO: *1*

OWN BY: *::R::f*

CKD BY: ,t'W

APDBY



GENERALIZED SUBSURFACE PROFILE

PROJECT NAME: Douglas Park Improvements

PROJECT LOCATION: 2795 SW 37th Avenue, Miami, Florida

PROJECT NUMBER: 14774

DATE: 12/17/15

DRAWN BY: RS

CHECKED BY: GLW

DRAWING NO: 2

LEGEND

Fill

Limestone

Peat

Sand

LA.I Standard Penetration Test

y Water Level

APPENDIX A

BORING LOG DATA

BORING NUMBER B 1

NIVIS

PROJECT NAME Douglas Park Improvements

PROJECT NUMBER _1_,_4'-7_,_74 _____ PROJECT LOCATION 2795 SW 37th Avenue Miami Florida

DATE STARTED _6/2-'7-'--/1_,_,5-------- COMPLETED _6""/2,_,7.!..../1,5:...._ _____ GROUND ELEVATION _1,_1 -'-'.2'-'ft''----- HOLE SIZE _3--in''c''''he''-'s''---------

DRILLING CONTRACTOR _,N_,_V,_,5''----- ---------- GROUND WATER LEVELS: _-_-_,N-''o''''t''E,_.n,..c''o,.,un,tc--e''e._...d_____

DRILLING METHOD Rotary drill with wash, mud & casing

LOGGED BY D. Correa CHECKED BY S. Becca

NOTES

				MATERIAL DESCRIPTION	ELEVATION (ft., NGVD)
	SPT	2-9-11-20 (20)		SAND, medium dense, dark brown with trace of glass and vegetation (FILL)	
	SPT	16-10-7-7 (17)		SAND, medium dense, brown with trace of limestone fragments (FILL)	
	SPT	7-9-3-8 (12)		SAND, medium dense, brown with trace of limestone fragments (FILL)	
	SPT	6-4-8-8 (12)		SAND, medium dense, brown with trace of limestone fragments and wood (FILL)	

Boring terminated at 8.0 feet.

BORING NUMBER B-2

NIV15

PROJECT NAME Douglas Park Improvements

PROJECT NUMBER _1'-"4[illegible]_ PROJECT LOCATION 2795 SW 37th Avenue Miami Florida

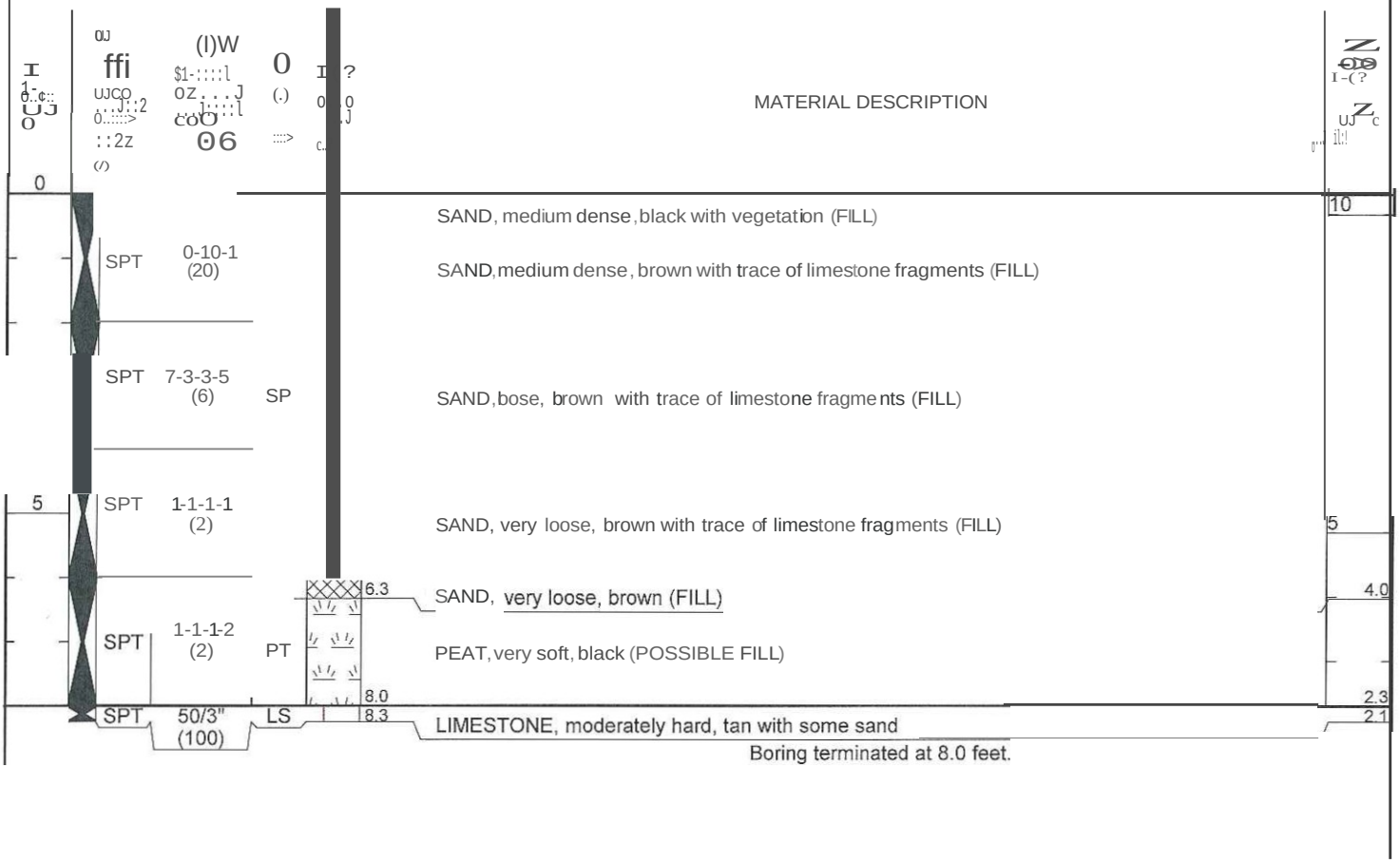
DATESTARTED 6/27/15 COMPLETED 6/27/15 GROUND ELEVATION 1'-'03-ft HOLE SIZE 3 in

DRILLING CONTRACTOR [illegible] GROUNDWATERLEVELS: Not Encountered

DRILLING METHOD Rotary drill with wash, mud & casing

LOGGED BY D. Correa CHECKED BY S. Becca

NOTES



BORING NUMBER B-3

PROJECT NAME Douglas Park Improvements

PROJECT NUMBER 1477, 4, PROJECT LOCATION 2795 SW 37th Avenue Miami Florida

DATE STARTED 6-/2-7-/1-5 COMPLETED 6-12-7-/15 GROUND ELEVATION 8 ft HOLE SIZE 3 in

DRILLING CONTRACTOR N-V- GROUND WATER LEVELS: 7.5 ft

DRILLING METHOD Rotary drill with wash, mud & casing

LOGGED BY D. Correa CHECKED BY S. Becca

NOTES

					MATERIAL DESCRIPTION
	SPT	4-7-6-4 (13)			SAND, medium dense, dark brown with vegetation and trace of limestone fragments (FILL)
					SAND, medium dense, brown with trace of limestone fragments (FILL)
	SPT	2-2-2-1 (4)	SP		SAND, very loose, brown with trace of glass and wood (FILL)
	SPT	2-1-1-2 (2)			SAND, very loose, brown with trace of glass and wood (FILL)
		2-1-4-6		16.7	SAND, loose dark brown with trace of glass (FILL)
		(5)	LS		LIMESTONE, very soft, tan
				8.0	Boring terminated at 8.0 feet.

BORING NUMBER B-4

NIVI5

PROJECT NAME Douglas Park Improvements

PROJECT NUMBER _1,_4'-'-7_7_4'------ **PROJECT LOCATION** 2795 SW 37th Avenue Miami Florida

DATE STARTED ---'6'"-/""27'-'-/-'-'15"-------- **COMPLETED** ....6-:.../2'"7'-'-/-'--15..._____ **GROUND ELEVATION** _1,_.0=.9-.....ft,_._____ **HOLE SIZE** -'3-.....i"-'n=ch..-e=s_____

DRILLING CONTRACTOR _,N'-'-V-'--'5"-------- **GROUNDWATER LEVELS:** _-_-_,_N_,_,o'-'t-"E"-'n""co,_,u"-'n'-'Ote""re,_,d,_____

DRILLING METHOD Rotary drill with wash, mud & casing

LOGGED BY D. Correa **CHECKED BY** S. Becca

NOTES_____

		MATERIAL DESCRIPTION	
SPT 3-4-5-11 (9)		SAND, bose, dark brown with organics (FILL)	
SPT 13-9-9-11 (18)		SAND, medium dense, brown (FILL)	
	1	SP	
SPT 4-6-3-5 (9)		SAND, loose, with trace of limestone (FILL)	
SPT 3-2-10-39 (12)		SAND, medium dense, dark brown with some wood (FILL)	
	8.0		2.9

Boring terminated at 8.0 feet.

BORING NUMBER B-5

N|V|5

PROJECT NAME Douglas Park Improvements

PROJECT NUMBER 1477-4 PROJECT LOCATION 2795 SW 37th Avenue Miami Florida

DATE STARTED 6/27/15 COMPLETED 6/27/15 GROUND ELEVATION 11.5 ft HOLE SIZE 3 inches

DRILLING CONTRACTOR NV5 GROUNDWATER LEVELS: Not Encountered

DRILLING METHOD Rotary drill with wash, mud & casing

LOGGED BY D. Correa CHECKED BY S. Becca

NOTES

			MATERIAL DESCRIPTION	
SPT 6-6-10-12 (16)			SAND, medium dense, brown with limestone fragments (FILL)	
SPT 12-12-11-9 (23)	SP		SAND, medium dense, brown with brick (FILL)	
SPT 10-8-6-8 (14)			SAND, medium dense, brown with limestone fragments and brick (FILL)	
SPT 9-11-10-7	LS		SAND, medium dense, brown with limestone fragments and brick (FILL)	3.5
(21)			LIMESTONE, soft, tan with sand Boring terminated at 8.0 feet.	

BORING NUMBER B-6

NIV5

PROJECT NAME Douglas Park Improvements

PROJECT NUMBER _1'-4-'-7-'-'74"---------- PROJECT LOCATION 2795 SW 37th Avenue Miami Florida

DATE STARTED ,6"-/2,_6_/1,5.._____ COMPLETED _6-/2,_,6,_/15----- GROUND ELEVATION 14.2 ft HOLE SIZE ....3-=n=ch=e=s____

DRILLING CONTRACTOR __N.!CV"-'5---------- GROUNDWATER LEVELS: 10.3 ft ± Elev 3.9 ft - - - - - - - - - - - -

DRILLING METHOD Rotary drill with wash, mud & casing

CHECKED BY S. Becca

		MATERIAL DESCRIPTION	ELEVATION (ft., NGVD)
		SAND, dense, brown with some limestone fragments and trace of brick (FILL)	
		SAND, very loose, brown with trace of limestone fragments (FILL)	
		SAND, loose, tan with some limestone fragments (FILL)	
SPT 6-5-5-8 (10)		SAND, loose, tan with some limestone fragments (FILL)	
	8.0		6.2
13-23-12- SPT 15 (35)		LIMESTONE, medium hard, tan with some sand	
LS			
SPT 9-6-4-8 (10)		LIMESTONE, very soft, tan	Q___
	5..0		1..8

Boring terminated at 15.0 feet.

BORING NUMBER B-7

NIV5

PROJECT NAME Douglas Park Improvements

PROJECT NUMBER _14_._7_._74_. **PROJECT LOCATION** 2795 SW 37th Avenue Miami Florida

DATE STARTED _,6""/2_6/1'-"5---- **COMPLETED** _,6"'-/2,.6"'-/_,_,15,. **GROUND ELEVATION** _1,_,2, ,ft"----- **HOLE SIZE** --3--in""c._..he""s.

DRILLING CONTRACTOR _NV_5 **GROUND WATER LEVELS:** _1,_,0'.2'--'ft-'-'/'-'E"-'le"-'V'---'1'-.8"--'-'-ft

DRILLING METHOD Rotary drill with wash, mud & casing

LOGGED BY D.Correa **CHECKED BY** S. Becca

NOTES

DEPTH (ft)	SAMPLE TYPE	BLOW COUNTS (N VALUE)	U.S.C.S.	MATERIAL DESCRIPTION	ELEVATION (ft)
0	SPT	10-9-8-5 (17)		SAND, medium dense, dark brown with limestone fragments (FILL)	
	SPT	2-1-1-1 (2)	SP	SAND, very loose, dark brown (FILL)	
	SPT	1-1-1-1 (2)		SAND, very loose, brown with trace of wood (FILL)	
	SPT	1-WOH-WOH-2 (WOH)		SAND, very loose, black with trace of limestone fragments {FILL)	
				8.0	4.0
	SPT	17-14-24-21 (38)		LIMESTONE, medium hard, tan with some sand	
10			LS		
	SPT	14-5-7-7 (12)		LIMESTONE, very soft, tan	
				15.0	-3

Boring terminated at 15.0 feet.

BORING NUMBER B-8

NIVIS

PROJECT NAME Douglas Park Improvements

PROJECT NUMBER _1:.....47 74-'--------- PROJECT LOCATION 2795 SW 37th Avenue Miami Florida

DATE STARTED ...6/2,_7-/1_,_5 COMPLETED _6,_/27_,_/1,_5-------- GROUND ELEVATION 1...:0:..:.....4'--'ft ---- HOLE SIZE -3"--"-'in=c'-"hes

DRILLING CONTRACTOR --N-V''-'5------ GROUND WATER LEVELS: -9-5-_,_,_ft..:E.:::le:-'-v-"-0''''.9_f t

DRILLING METHOD Rotary drill with wash, mud & casing

LOGGED BY D.Correa CHECKED BY S. Becca

NOTES

DEPTH (ft)	SAMPLE TYPE	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (ft., NGVD)
0	SPT	50/5" (100)	SP		SAND, very dense, tan with trace of limestone fragments (FILL)	10
	SPT	49-24-20-7 (44)			SAND, dense, dark brown to tan (FILL)	
5	SPT	3-3-3-2 (6)			SAND, loose, tan (FILL)	5
	SPT	14-1 (26)	LS		LIMESTONE, soft, tan with sand	
10	SPT	15-16-18-24 (34)			LIMESTONE, medium hard, tan	
15	SPT	5-4-3-7 (7)		15.0	LIMESTONE, very soft, tan	

Boring terminated at 15.0 feet.

BORING NUMBER B 9

NIV I5

PROJECT NAME Douglas Park Improvements

PROJECT NUMBER _1'---4,_,_7_,_74-'--------- PROJECT LOCATION 2795 SW 37th Avenue Miami Florida

DATE STARTED --'6,_/-=-26,_/_,_15=------ COMPLETED --'6""/2=6≠'--15=------- GROUND ELEVATION _11-'-.4_,_ft,_____ HOLE SIZE ---3-i,_n""ch, e...,s_____

DRILLING CONTRACTOR --'N'-'-V-'---5=---------- ,Y GROUND WATER LEVELS: 9.0ft / E/ev 2.4 ft

DRILLING METHOD Rotary drill with wash, mud & casing

LOGGED BY D. Correa CHECKED BY S. Becca

NOTES

					MATERIAL DESCRIPTION	ELEVATION (ft., NGVD)
0						
	IJsPT 4 1)2'					
					SAND, very dense, tan with limestone fragments (FILL)	
	SPT	14-4-4-4 (8)			SAND, loose, brown with trace of limestone fragments (FILL)	
			SP			
§	SPT	1-2-1-3 (3)			SAND, very loose, brown with trace of limestone fragments (FILL)	
	SPT	1-1-3-3 (4)			SAND, very loose, brown with trace of limestone fragments (FILL)	
				ls.0		3.4
	SPT	6-3-3-3 (6)		:y	LIMESTONE, very soft, tan	
10						
			LS			
	SPT	8-7-11-10 (18)			LIMESTONE, very soft, tan	
15				115.0		-3.6

Boring terminated at 15.0 feet.

BORING NUMBER B-10

NV5

PROJECT NAME Douglas Park Improvements

PROJECT NUMBER _1'-"4'-'--77.'-.::4'------ — —— —

PROJECT LOCATION 2795 SW 37th Avenue Miami Florida

DATE STARTED ,6""/2=6"--/1'-"5'-------- COMPLETED _6 /2,_,6/15. GROUND ELEVATION _1-1,..8- ft.. HOLE SIZE _3 i..,n...,ch,e""s

DRILLING CONTRACTOR _N_,V,_5"- GROUND WATER LEVELS: _10'.5-ft-/'--E'-'t"'y_1-'-'."'-3_,_,ft

DRILLING METHOD Rotary drill with wash, mud & casing

LOGGED BY D.Correa CHECKED BY S. Becca

NOTES

Depth (ft)	Sample Type	Blow Counts (N Value)	U.S.C.S.	Material Description	Elevation (ft)
0	SPT	(1°6g		SAND, very dense, tan with limestone fragments (FILL)	
	SPT	22-7-3-2 (10)		SAND, loose, brown with trace of limestone fragments (FILL)	
	SPT	3-1-1-1 (2)	SP	SAND, very loose, dark brown with trace of limestone fragments (FILL)	
	SPT	2-2-2-2 (4)		SAND, very loose, dark brown with trace of limestone fragments (FILL)	
8.0					3.&
		3-13-17-12 (30)	LS	LIMESTONE, very soft, tan	
	SPT	5-4-2-3 (6)		LIMESTONE, very soft, tan	
15.0				Boring terminated at 15.0 feet.	3.. 2

BORING NUMBER B-11

PROJECT NAME Douglas Park Improvements

PROJECT NUMBER 14774 PROJECT LOCATION 2795 SW 37th Ave Miami FL

DATE STARTED 6/2/60 COMPLETED 6/1/5 GROUND ELEVATION 11.5 ft HOLE SIZE

DRILLING CONTRACTOR N-V-5

GROUND WATER LEVELS: 10.0 ft / Elev 1.5 ft

DRILLING METHOD Rotary drill with wash, mud & casing

LOGGED BY D. Correa CHECKED BY S. Becca

NOTES

				MATERIAL DESCRIPTION
	SPT	10-11-9-9 (20)		SAND, medium dense, dark brown (FILL)
	SPT	4-3-2-4 (5)		SAND, loose, dark brown with trace of limestone fragments (FILL)
	SPT	3-2-2-3 (4)	SP	SAND, very loose, black with trace of glass (FILL)
	SPT	4-3-2-3 (5)		SAND, loose, brown with trace of rock, glass (FILL)
8.6	SPT	14-10-4-4 (14)		SAND, brown with trace of limestone fragments (FILL)
				LIMESTONE, very soft, tan with some sand
			LS	
	SPT	5-2-2-1 (4)		LIMESTONE, very soft, tan
15			11 5.0	-3.5

Boring terminated at 15.0 feet.

BORING NUMBER B-12

NIVIS

PROJECT NAME Douglas Park Improvements

PROJECT NUMBER _1_,_4"-'-7_,_74_,_____ PROJECT LOCATION 2795 SW 37th Avenue Miami Florida

DATE STARTED _1_,_1_,_,/2=5'--'/1=5_____ COMPLETED 11/25/15 GROUND ELEVATION _1_,_..0._...6-_ft.,_____ HOLE SIZE --3--'"in'"ch'-'-'e,_,_.s._____

DRILLING CONTRACTOR _.N'-'-V,_,5,_____ GROUNDWATER LEVELS:_-_--_____

DRILLING METHOD Rotary drill with wash, mud & casing

LOGGED BY D. Correa CHECKED BY A. Sarsour

NOTES

					MATERIAL DESCRIPTION
	SPT	1-6-6-10 (12)			SAND, medium dense, brown with topsoil and trace of roots and limestone fragments (FILL)
	SPT	9-5-3-2 (8)			SAND, loose, dark brown with light gray concrete rubble (FILL)
	SPT	WOH-WOH-WOH-1 (WOH)			SAND, very loose, brown with pieces of wood (FILL)
	SPT	1-50/2" (100)	SP		SAND, dense, brown with pieces of wood (FILL)
	SPT	30-34-50/5" (100)			SAND, dense, brown with pieces of wood (FILL)
10	SPT	4-8-8-10 (16)			SAND, medium dense, brown with wood (FILL)
				112.0	-1.4
	SPT	11-4-4-4 (8)	LS		LIMESTONE, very soft, tan
	SPT	3-3-3-5 (6}			LIMESTONE, very soft, tan
				120.0	-9.4

Bonng termmated at 20.0 feet.

BORING NUMBER B-13

NIVIS

PROJECT NAME Douglas Park Improvements

PROJECT NUMBER 147-7741c... PROJECT LOCATION 2795 SW 37th Avenue Miami Florida

DATE STARTED 11/25/15 COMPLETED 11/25/15 GROUND ELEVATION 11.1 ft HOLE SIZE 3 inches

DRILLING CONTRACTOR NIVIS GROUNDWATER LEVELS: 8" 3 ft 2.9 ft

DRILLING METHOD Rotary drill with wash, mud & casing

LOGGED BY D. Correa CHECKED BY A.Sarsour

NOTES

				MATERIAL DESCRIPTION
0	SPT	1-5-4-3 (9)		SAND, loose, brown with top soils and a trace of limestone fragments (FILL)
	SPT	2-3-5-9 (8)		SAND, loose, gray to brown with trace of limestone fragments (FILL)
	SPT	3-5-4-5 (9)	SP	SAND, loose, brown with limestone fragments (FILL)
	SPT	2-4-4-5 (8)		SAND, loose, brown with pieces of wood (FILL)
	SPT	5-14-50/5" (100)		SAND, dense, brown with wood and trace of limestone fragments (FILL)
10		50/1" (100)		SAND, dense, brown wood with limestone fragments (FILL)
				-0.8
	SPT	8-5-3-4 (8)		LIMESTONE, very soft, tan
15	SPT	5-4-3-2 (7)		LIMESTONE, very soft, tan
	SPT	5-4-3-3 (7)	LS	LIMESTONE, very soft, tan
20				
	SPT	3-3-2-3 (5)		LIMESTONE, very soft, tan
25				-13.8

Bonng terrmated at 25.0 feet.

BORING NUMBER B 14

NIVI5

PROJECT NAME Douglas Park Improvements

PROJECT NUMBER _1,_4,_,_7_,_74-'---------- PROJECT LOCATION 2795 SW 37th Avenue Miami Florida

DATE STARTED _1'--'1_,_/2=5'--'/1-'5_____ COMPLETED 11/25/15 GROUND ELEVATION _10.1 ft,____ HOLE SIZE _3-_in,""ch,_es_____

DRILLING CONTRACTOR _,N'-'-V-'-'5=---------- Y GROUND WATER LEVELS: 8.8 ft / Elev 1.4 ft

DRILLING METHOD Rotary drill with wash, mud & casing

LOGGED BY D. Correa CHECKED BY A.Sarsour

NOTES

			MATERIAL DESCRIPTION	
0	SPT 2-10-11-1 (21)		SAND, medium dense, dark gray with trace of limestone fragments, topsoil, and roots (FILL)	
	SPT 7-7-5-4 (12)		SAND, medium dense, gray with limestone fragments (FILL)	
		SP		
	SPT 1-1-1-1 (2)		SAND, very loose, gray with limestone fragments (FILL)	
	WOH-1-1-SPT 13 (2)		SAND, very loose, brown with limestone fragments and wood (FILL)	
				2.1
10	SPT 12-7-7-15 (14)		LIMESTONE, very soft, tan with trace of sand	
	SPT 10-5-3-2 (8)		LIMESTONE, very soft, tan	
15		LS		
	SPT 8-3-3-4 (6)		LIMESTONE, very soft, tan	
20				
				23.0 -12.9
	SPT 8-5-2-3 (7)	SP	SAND, loose, tan	
25				25.0 -14.9

Bonng terminated at 25.0 feet.

BORING NUMBER B-15

NIV5

PROJECT NAME Douglas Park Improvements

PROJECTNUMBER _1474 PROJECT LOCATION 2795 SW 37th Avenue Miami Florida

DATESTARTED 11/25/15 COMPLETED 11/25/15 GROUND ELEVATION 122 ft HOLESIZE _3::....::..in""c"""he,s------

DRILLING CONTRACTOR _dV.!..!5:!..._.. GROUND WATER LEVELS: 9 .6 ft!..../ =.E.l...v .=,2 6....!:ft .

DRILLING METHOD Rotary drill with wash, mud & casing

LOGGED BY D_,_Corre a!... CHECKED BY A.Sarsour

NOTES

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (ft., NGVD)
0	SPT	5-7-7-9 (14)	SP		SAND, medium dense, brown with top soil and a trace of limestone fragments (FILL)	
	SPT	14-16-20-13 (36)			SAND, dense, brown with trace of limestone fragments and concrete rubble (FILL)	10
5	SPT	11-6-7-10 (13)			SAND, medium dense, brown with concrete rubble (FILL)	
	SPT	7-5-4-5 (9)			SAND, loose, gray with limestone fragments and trace of wood (FILL)	5
	SPT	4-3-3-5 (6)			SAND, loose, dark gray trace of peat and wood (FILL)	
10				13.0		0 / -0.8
15	SPT	7-5-4-7 (9)	LS		LIMESTONE, very soft, tan	
						-5
20	SPT	3-2-1-2 (3)		20.0	LIMESTONE, very soft, tan	

Boring terminated at 20.0 feet.

KEY TO SYMBOLS

Symbol Description

Strata symbols

	Fill		Concrete
	Silty sand		Asphalt
	Limestone		Sandstone
	Sand		
	Peat		

Misc. Symbols

	Groundwater level measured at boring completion. The date checked is indicated.	WOH	Weight of Hammer
	Boring continues		
	End of Boring		

Soil Samplers

	Standard penetration test. 140 lb. hammer dropped 30"

Notes:

1. Exploratory borings were drilled between 06/26/2015 and 11/25/2015 using a 3-inch diameter rotary drill with mud, wash & casing.
2. Groundwater was encountered at depths ranging from 7.5 to 10.5 feet below grade upon boring completion.
3. Boring locations were taped from existing features.
4. These logs are subject to the limitations, conclusions, and recommendations in this report.
5. Results of tests conducted on samples recovered are reported on the logs.

NVS

NOTES RELATED TO RECORDS OF TEST BORING AND GENERALIZED SUBSURFACE PROFILE

1. Groundwater level was encountered and recorded (if shown) following the completion of the soil test boring on the date indicated. Fluctuations in groundwater levels are common; consult report text for a discussion.

2. The boring location was identified in the field by offsetting from existing reference marks and using a cloth tape and survey wheel.

3. The borehole was backfilled to site grade following boring completion, and patched with asphalt cold patch mix when pavement was encountered.

4. The Record of Test Boring represents our interpretation of field conditions based on engineering examination of the soil samples.

5. The Record of Test Boring is subject to the limitations, conclusions and recommendations presented in the report text.

6. "Field Test Data" shown on the Record of Test Boring indicated as 11/6 refers to the Standard Penetration Test (SPT) and means 11 hammer blows drove the samplerS inches. SPT uses a 140-pound hammer falling 30 inches.

7. The N-value from the SPT is the sum of the hammer blows required to drive the sampler the second and third 6-inch increments.

8. The soil/rock strata interfaces shown on the Record of Test Boring are approximate and may vary from those shown. The soil/rock conditions shown on the Record of Test Boring refer to conditions at the specific location tested; soil/rock conditions may vary between test locations.

9. Relative density for sands/gravels and consistency for silts/clays and limestone are described as follows:

SPT Blows/ Foot	Sands/Gravels Relative Density	SPT Blows/Foot	Silt/Clay Relative Consistency	SPT Blows/ Foot	Limestone Relative Consistency
0-4	Very loose	0-2	Very Soft	0-20	Very Soft
5-10	Loose	3-4	Soft	21-30	Soft
11-30	Medium Dense	5-8	Firm	31-45	Medium Hard
31-50	Dense	9-15	Stiff	46-60	Moderately Hard
Over 50	Very Dense	16-30	Very Stiff	61-50/2"	Hard
		Over 30	Hard	Over 50/2"	Very Hard

10. Grain size descriptions are as follows:

NAME	SIZE LIMITS
Boulder	12 inches or more
Cobbles	3 to 12 inches
Coarse Gravel	3/4 to 3 inches
Fine Gravel	No. 4 sieve to 3/4 inch
Coarse Sand	No. 10 to No.4 sieve
Medium Sand	No. 40 to No. 10 sieve
Fine Sand	No. 200 to No. 40 sieve
Fines	Smaller than No. 200 sieve

11. Definitions related to adjectives used in soil/rock descriptions:

PROPORTION	ADJECTIVE
About 10%	with a trace
About 25%	with some
About 50%	and

APPROXIMATE ROOT DIAMETER	ADJECTIVE
Less than 1/32"	Fine roots
1/32" to 1/4"	Small roots
1/4"to1"	Medium roots
Greater than 1"	Large roots

APPENDIX 8

TEST EXCAVATION LOGS

RECORD OF TEST EXCAVATION
Douglas Park Improvements
NV5 PROJECT NO. 14774

TEST EXCAVATION NUMBER:	**TE-1**
DATE OF EXCAVATION:	November 25, 2015
OBSERVED BY:	G.Curioni
SURFACE ELEVATION, FEET NGVD:	10.6
DEPTH TO GROUNDWATER, FEET:	8.0
TERMINATION DEPTH, FEET:	8.0

DEPTH BELOW GROUND SURFACE, FEET	SOIL/ROCK DESCRIPTION
0.0-2.0	Dark Brown Sand with traces of Peat and some roots. (Top 1" Grass)- FILL
2,0--,4.0	Brown SAND with Limestone Fragments- FILL
4.0- 8.0	Dark Brown Sand & Debris (Wood, glass, tires & concrete fragments)- FILL

TEST EXCAVATION NUMBER:	**TE-2**
DATE OF EXCAVATION:	November 25, 2015
OBSERVED BY:	G.Curioni
SURFACE ELEVATION, FEET NGVD:	10.7
DEPTH TO GROUNDWATER, FEET:	9.0
TERMINATION DEPTH, FEET:	9.0

DEPTH BELOW GROUND SURFACE, FEET	SOIL/ROCK DESCRIPTION
0.0 – 2.0	Dark Brown Sand with traces of Peat and Roots. (Top 1" Grass) -FILL
2.0 -3.0	Grey Sand - FILL
3.0- 9.0	Dark Gray Sand with traces of Limestone fragments & Debris (Wood, glass and concrete fragments)- FILL

RECORD OF TEST EXCAVATION
Douglas Park Improvements
NV5 PROJECT NO. 14774

TEST EXCAVATION NUMBER:	**TE-3**
DATE OF EXCAVATION:	November 25, 2015
OBSERVED BY:	G. Curioni
SURFACE ELEVATION, FEET NGVD:	9.8
DEPTH TO GROUNDWATER, FEET:	9.0
TERMINATION DEPTH, FEET:	9.0

DEPTH BELOW GROUND SURFACE FEET	SOIL/ROCK DESCRIPTION
0.0-2.0	Dark Brown Soil with traces of Peat and some roots (Top 1" Grass)- FILL
2.0-4.0	Brown SAND with Limestone Fragments- FILL
4.0-9.0	Dark Brown Sand with Debris (wood, plastic & concrete fragments)- FILL

TEST EXCAVATION NUMBER:	**TE-4**
DATE OF EXCAVATION:	November 25, 2015
OBSERVED BY:	G. Curioni
SURFACE ELEVATION, FEET NGVD:	9.9
DEPTH TO GROUNDWATER, FEET:	9.0
TERMINATION DEPTH, FEET:	9.0

DEPTH BELOW GROUND SURFACE. FEET	SOIL/ROCK DESCRIPTION
0.0 – 2.0	Dark Brown Sand & roots (Top 1" Grass)- FILL
2.0-5.0	Dark Brown Sand & Debris (Wood, cans and glass)- FILL
5.0 – 9.0	Tan Sand with Limestone Fragments- FILL

RECORD OF TEST EXCAVATION
Douglas Park Improvements
NV5 PROJECT NO. 14774

TEST EXCAVATION NUMBER:	**TE-5**
DATE OF EXCAVATION: OBSERVED	November 25, 2015
BY:	G. Curioni
SURFACE ELEVATION, FEET NGVD:	11.2
DEPTH TO GROUNDWATER, FEET:	10.0
TERMINATION DEPTH, FEET:	10.0

DEPTH BELOW GROUND SURFACE, FEET	SOIL/ROCK DESCRIPTION
0.0-2.0	Dark Brown to Gray Sand with traces of Peat and roots (Top 1" Grass)- FILL
2.0- 4.0	Grey SAND- FILL
4.0 – 6.0	Tan Sand with Limestone Fragments- FILL
6.0- 10.0	Dark Brown Sand with Debris (Concrete Fragments)- FILL

TEST EXCAVATION NUMBER:	**TE-6**
DATE OF EXCAVATION:	November 25, 2015
OBSERVED BY:	G Curioni
SURFACE ELEVATION, FEET NGVD:	11.2
DEPTH TO GROUNDWATER, FEET:	9.0
TERMINATION DEPTH, FEET:	9.0

DEPTH BELOW GROUND SURFACE, FEET	SOIL/ROCK DESCRIPTION
0.0-2.0	Dark Brown Sand & roots (Top 1" Grass)- FILL
2.0-4.0	Brown Sand with Limestone Fragments- FILL
4.0- 9.0	Dark Brown Sand with Debris (Plastic, Wood and Metal) - FILL

RECORD OF TEST EXCAVATION
Douglas Park Improvements
NV5 PROJECT NO. 14774

TEST EXCAVATION NUMBER:	**TE-7**
DATE OF EXCAVATION:	November 25, 2015
OBSERVED BY:	G. Curioni
SURFACE ELEVATION, FEET NGVD:	11.7
DEPTH TO GROUNDWATER, FEET:	10.0
TERMINATION DEPTH, FEET:	10.0

DEPTH BELOW GROUND SURFACE, FEET	SOIL/ROCK DESCRIPTION
0.0-1.0	Dark Brown Sand with traces of Peat. (Top 1" Grass)- FILL
1.0-3.0	Brown Sand with brick fragments- FILL
3.0- 5.0	Grey Sand with Limestone fragments- FILL
5.0-10.0	Dar Brown Sand with debris (Wood, and concrete fragments) - FILL

TEST EXCAVATION NUMBER:	**TE-8**
DATE OF EXCAVATION:	November 25, 2015
OBSERVED BY:	G. Curioni
SURFACE ELEVATION, FEET NGVD:	11.3
DEPTH TO GROUNDWATER, FEET:	10.5
TERMINATION DEPTH, FEET:	10.5

DEPTH BELOW GROUND SURFACE, FEET	SOIL/ROCK DESCRIPTION
0.0-2.0	Dark Brown Sand with roots (Top 1" Grass) - FILL TAN
2.0-3.0	SAND with Limestone Fragments- FILL
3.0-4.0	Dark Brown Sand with trace of peat, wood & glass fragments. -FILL
4.0- 10.5	Brown Sand with traces of limestone fragments.- FILL

RECORD OF TEST EXCAVATION
Douglas Park Improvements
NVS PROJECT NO. 14774

TEST EXCAVATION NUMBER:	**TE-9**
DATE OF EXCAVATION:	November 25, 2015
OBSERVED BY:	G. Curioni
SURFACE ELEVATION, FEET NGVD:	11.9
DEPTH TO GROUNDWATER, FEET:	10.0
TERMINATION DEPTH, FEET:	10.0

DEPTH BELOW GROUND SURFACE, FEET	SOIL/ROCK DESCRIPTION
0.0 – 2.0	Dark Brown Sand with traces of Peat. (Top 1" Grass)- FILL
2.0- 5.0	Brown Sand with roots and Limestone Fragments.- **FILL** Dark
5.0- 10.0	Brown Sand with concrete fragments- FILL

TEST EXCAVATION NUMBER:	**TE-10**
DATE OF EXCAVATION:	November 25, 2015
OBSERVED BY:	G. Curioni
SURFACE ELEVATION, FEET NGVD:	10.8
DEPTH TO GROUNDWATER, FEET:	10.0
TERMINATION DEPTH, FEET:	10.0

DEPTH BELOW GROUND SURFACE, FEET	SOIL/ROCK DESCRIPTION
0.0- 1.0	Dark Brown Sand and roots. (Top 1" Grass) - FILL
1.0-3.0	Brown and with Limestone fragments- FILL
3.0-4.0	Dark Brown Sand- FILL
4.0 – 8.0	Grey Sand- FILL
8.0- 10.0	Dark Sand with Limestone fragments, wood and glass- FILL

RECORD OF TEST EXCAVATION
Douglas Park Improvements
NV5 PROJECT NO. 14774

TEST EXCAVATION NUMBER: DATE OF EXCAVATION: OBSERVED BY:

SURFACE ELEVATION, FEET NGVD:

DEPTH TO GROUNDWATER, FEET: TERMINATION DEPTH, FEET: DEPTH BELOW GROUND SURFACE FEET 0.0-1.0

1.0-4.0

4.0- 9.0

TE-11

November 25,2015

G. Curioni 11.35

9.0

9.0

SOIL/ROCK DESCRIPTION

Light tan to Gray Sand with roots (Top 1" Grass)- FILL Tan Sand- FILL

Dark Brown sand with Limestone Fragments and wood.- FILL

END OF SECTION

02011
SOIL BORING DATA

02011
SOIL BORING DATA

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GEOTECHNICAL ENGINEERIN G I FOUNDATION ENGINEERING I GEOIECil\ CAL TESTING I SOIL BORINGS/MONITORING WELLS I CONSTRUCTION MATERIALS TESTING

December 17, 2015

Mr. Peter Duena, P.E.
SCS Engineers
7700 N. Kendall Drive, Suite 300
Miami, Florida 33156

Re: Final Report of Subsurface Exploration & Geotechnical Engineering Study
Proposed Douglas Park Improvements
2795 SW 37th Avenue
Miami, Florida
Project No. 14774

Dear Mr. Duena:

NV5, Inc. (formerly KACO), submits this report in fulfillment of the scope of services described in our Proposal No. 15-0583REV4 dated November 13, 2015. The work was authorized by acceptance of our Professional Services Agreement. This report describes our understanding of the project, presents our evaluations, and provides our professional opinions and recommendations for foundation design and construction for the project.

Sincerely,
NV5, INC.

Richard Fesdjia
Proj ct Enginee
Flonda License

Garfield L. Wray, P.E., D.GE.
Director of Geotechnical Engineering
Florida License No. 49734

Distribution: 2 Copies to Addressee via U.S. Mail
1 Copy to Addressee via Email
1 Copy to NV5 File

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FIGURES

APPENDICES

NIV15

1.0 SITE AND PROJECT INFORMATION

The project site is a park located at 2795 SW 37th Avenue in Miami, Florida. The site is roughly square with average dimensions of 625 feet by 635 feet. It is bounded by SW 28th Street to the south, SW 37th Avenue to the west, single-story school structures to the east and residential structures to the north. A site vicinity map is presented on Drawing 1. Currently the park houses a baseball field in the NW quadrant, tennis and basketball courts and paved parking on the southern portion, and a single-story building, playground areas and miscellaneous shelter structures in the western portion of the site. A March 20, 2015 boundary and topographic survey prepared by Keith and Schnars, P.A. which we reviewed indicates ground surface elevations of +9.5 to +15.7 feet with respect to the 1929 National Geodetic Vertical Datum (NGVD).

We were provided with a *Solid Waste Delineation Report* prepared by URS dated January 31, 2014. Based on the information included in this report it appears the project site was previously used for dumping of solid waste. The report delineates the horizontal and vertical extents of the solid waste materials. We are unaware of the past development history of the site beyond its current condition and the information we received regarding previous dumping at the site.

NV5 prepared a report for the project titled *Report of Subsurface Exploration & Geotechnical Engineering Study for the Douglas Park Improvements dated* July 15, 2015. At that time, we understood the improvements to comprise the rehabilitation of the parking lot on the west and south boundaries of the park, new walkways around the field, and new bleachers at the southeastern corner of the baseball field.

Based on an email provided by Mr. Peter Dueno from SCS Engineers dated September 10, 2015, we understand the project will be expanded to include demolition of the existing structure located on the western portion of the site and construction of a one-story structure. Details of the proposed structure have not been provided however we anticipate the construction will be reinforced masonry. We estimate column loads for the proposed structure will be 50 to 100 kips, and wall loads will be around 1.5 kips per lineal foot. We anticipate ground floor slabs will be loaded to less than 200 pounds per square foot (psf).

Additionally, we have been requested to review and update our previous geotechnical recommendations to address the following improvements to the park:

- Lowering grades of general areas within the park by 14 inches
- Raising grades of the baseball field by one foot
- Grouting of voids reportedly encountered underneath the tennis courts
- Proposed asphalt walkway around perimeter of the park
- Proposed bleachers near baseball field

2.0 PURPOSE AND SCOPE OF WORK

The purpose of NV5's services on this project is to perform a subsurface exploration and engineering analyses to provide recommendations for design and construction of the proposed project. Specifically, this report provides:

+ Drawings showing boring locations, a graphic summary of the generalized subsurface conditions, and boring logs with detailed descriptions of the materials encountered.
+ Discussion of generalized subsurface conditions at the site including groundwater levels.
+ Discussion of feasible foundation type(s) for the proposed construction and improvements.
+ Design parameters for the recommended foundation types, including vertical and lateral load resistance.
+ Estimates of foundation settlements.
+ Recommendations for site preparation and grading, including the re-use of site-excavated materials for fill, fill placement and compaction, pavement and slab subgrade preparation.
+ Construction considerations including excavation support and dewatering and impacts for adjacent structures.

3.1 FIELD EXPLORATION

3.2 BORINGS

The subsurface conditions were explored with fifteen (15) engineering test borings drilled to depths ranging between 8 and 2'5 feet below existing grade at the approximate locations shown on Drawing 1. Borings B-1 through B-11 were drilled for the July 2015 study, while borings B-12 through B-15 were drilled for the current effort. The test locations were marked and identified in the field by NV5. The borings were drilled in accessible locations with a truck-mounted drill rig utilizing the rotary wash method.

Samples of the subsurface materials were recovered at roughly 2-foot intervals within the upper 10 feet of the boring and at approximately 5-foot intervals thereafter using a Standard Penetration Test split-spoon sampter (SPT) in substantial accordance with ASTM D-1586, "Standard Test Method for Standard Penetration Test and Split- Barrel Sampling of Soils." This test procedure drives a 1.4-inch I.D. split-tube sampler into the subsurface profile using a 140-pound hammer falling 30 inches. The total number of blows required to drive the sampler the second and third six-inch increments is the SPT N-value, in blows per foot, and is an indication of material strength. Upon completion of the borings, the boreholes were backfilled to the ground surface with soil cuttings and the upper few feet with cement grout.

The soil/rock samples recovered from the borings were classified by a geotechnical engineer. The collected samples were later re-examined to confirm field classifications. Visual soil classifications were made in accordance with ASTM D2487 and ASTM D2488. The results of the classification and consequent generalized stratification are shown in Drawing 2, and in the records of test borings in Appendix A (sheets A-1 through A-17). Strata contacts shown on these drawings are approximate. The boring data reflect conditions at the specific test locations only, and at the time the borings were drilled.

3.2 TEST EXCAVATIONS

NV5 performed also eleven (11) test excavations (TEs) at the locations shown on Drawing 1. The TEs were performed using a rubber-tired backhoe and extended to depths of about 8 to 10 feet below the existing grade. The TE logs are presented on sheets B-1 through B-6 in Appendix B.

4.0 LOCAL GEOLOGY

Miami-Dade County is located on the southern flank of a stable carbonate platform on which thick deposits of limestones, dolomites and evaporites have accumulated. The upper two hundred feet of the subsurface profile is composed predominantly of limestone and quartz sand. These sediments were deposited during several glacial and interglacial stages when the ocean was at elevations higher than present.

In many portions of Miami-Dade County, surface sand deposits of the Pamlico Formation are encountered. The Pamlico sands overlie the Miami Limestone. In western Miami-Dade County, portions of the Everglades Region interfinger with the Pamlico sand. The Everglades soil consists of peat and calcareous silt (marl).

The Miami Limestone is a soft to moderately hard, white, porous to very porous, sometimes sandy, oolitic calcareous cemented grainstone. The formation outcrops in portions of Miami-Dade County. The Miami Limestone has a maximum thickness of about 35 feet along the Atlantic Coastal Ridge and thins sharply near the coastline arid more gradually in a westerly direction. The Miami Limestone was formed about 130,000 years ago at a time when the sea level was twenty-five feet higher than it is today. This environment facilitated formation of concentrically layered sand sized carbonate grains called oolites. These grains formed by repeated precipitation of calcium carbonate around the nucleus of a sand or shell grain.

The Miami Limestone can be separated into two facies: the barrier bar oolitic facies and the tidal shoal limestone facies. The barrier bar facies is characterized by lenses of oolitic limestone separated by intermittent, 1-inch thick or less, uncemented sand layers (cross-bedded limestone). Zones of higher porosity are characteristic and parallel the bedding planes of the cross-bedded limestone. The tidal shoal limestone

facies is characterized by a distinct lack of bedding planes. In addition, burrowing organisms have churned previously deposited sediments, which have resulted in high porosity channels in the rock. These ancient channels give the rock an appearance of a hardened sponge in some areas.

The Fort Thompson Formation underlies the Miami Limestone, and includes sand, sandstone, and limestone. The upper zones of the Fort Thompson Formation consist of sand having a thickness ranging from 5 to 35 feet. The remainder of the formation consists of coralline limestone, quartz sandstone, sandy limestone and freshwater limestone. The type of soils within the formation and the degree of cementation vary with lateral extent and depth.

The Fort Thompson Formation is underlain by the Tamiami Formation. The Tamiami Formation consists of sands, silts, clays, and sometime fossiliferous limestone. The upper portions of the Tamiami Formation are permeable and make up the lower reaches of the Biscayne Aquifer. This formation ranges in thickness from zero to 300 feet in South Florida.

5.0 SUBSURFACE CONDITIONS

In general, the subsurface conditions encountered below a depth of about 9 feet in our borings and test excavations are consistent with the geology described above. However, the upper 9 or so feet of the site subsurface appear to have been modified with solid waste materials and other fill components. The detailed subsurface conditions are presented in detail on the records of test boring sheets in Appendix A. The subsurface conditions disclosed by the boring can be generalized as described below.

Layer 1 – Surficial Fill and Sand (Fill)

This layer consists of fine sand and sand with limestone fragments that is about four to twelve feet thick in the borings. The layer is fill and contains varying amounts of construction debris including glass, wood, tires, brick, metal, plastic, and concrete. Construction debris was found in sizes up to 3 inches. SPT N-values recorded in the layer range from less than one to greater than 50 blows per foot (bpf), with an average value of 21 bpf, indicating the layer is typically medium dense. The higher blow counts encountered may indicate that drilling was performed through concrete fragments or hard fill materials.

Layer 2 – Peat:

This layer comprises of peat and was encountered in only in boring B-2. The layer is about 2 feet thick. The stratum is firm with a recorded SPT N-value of six bpf.

Layer 3 – Limestone:

This layer comprises limestone and extends to the maximum boring termination depths of 8 to 25 feet below grade in every boring except for borings B-1 and B-4 where it was not encountered. The stratum is very soft to hard with recorded SPT N-values ranging from four to greater than 50 bpf. The average SPT N-value in the stratum is at least 16 bpf.

For the layers described above, the Table 1 below summarizes our estimates of engineering parameters considered pertinent to the design of foundations for the proposed bleachers and pavements.

TABLE 1 -SUMMARY OF ESTIMATED PERTINENT ENGINEERING PARAMETERS

Layer ID	Description	Thickness (ft)	SPT N-values		Modulus of Elasticity (ksf)	Unconfined Compressive Strength (ksf)	Allowable Side Shear (ksf)
			Range	Avg			
1	Surficial Fill	4-12	<1-50+	21	400	-	-
2	Peat	2±	2	6	<200	-	-
5	Limestone	1-11+	4-50+	16	10,000	300	3

We note that the values of allowable side shear estimated in Table 1 above are based on our experience and laboratory data from similar rock that we have tested.

Groundwater

Groundwater was encountered in the borings at depths between 7.5 and 10.5 feet below the existing ground surface. These depths correspond approximately to elevations between about +0.9 and +3.9 feet NGVD. On average, stabilized groundwater levels in the general vicinity of the project are expected to vary between elevations +0 to **+4** feet NGVD, the variations being primarily as a result of seasonal rainfall. Storm and hurricane events and construction activities also result in variations in the groundwater levels. Notwithstanding the variations acknowledged, we anticipate that groundwater at the site will generally be encountered within the upper 10 to 15 feet of.the existing ground surface.

6.1 EVALUATION AND DISCUSSION

6.2 FOUNDATION SUPPORT

Based on the results of the field exploration and our engineering analyses, we consider the site poses some challenges for development of the project from a geotechnical perspective. These are further discussed in the paragraphs below. Detailed recommendations for the proposed building, miscellaneous improvements such as paved asphalt for roadways/walkways, grouting voids reportedly existing underneath tennis courts, and grading adjustments are presented in Section 7 of this

report.

6.1.1 Proposed 1-Level Building

The primary concern for foundation design and construction include support of the proposed new structure loads without unacceptable settlement. The fill with debris material encountered in the upper 9 or so feet of the site subsurface was likely placed in an uncontrolled fashion. As such, we cannot be certain of its density/consistency throughout the site.

Nonetheless, we judge that from the standpoint of economy, removing or improving the fill might be cost-prohibitive given the scope of the project and the risk involved in leaving the fill in place as is might be worth it.

Our initial consideration for supporting the proposed structure was shallow foundations. The SPT N-values recorded in the borings indicate an average value of 13 bpf in Layer 1 suggesting the material is medium dense and should be capable of supporting the proposed construction loads after normal site preparation and grading activities. However, because of the uncertainty associated with the composition of the fill, there is always a possibility for settlement over the long term if the fill contains compressible materials within the zone of influence of the new construction loads or organic matter than can decompose over time. This is particularly of concern considering tree trunks up to 4 inches in diameter were observed in the TEs. Additionally, while decomposition is not a concern for inert materials such as concrete and metal, the washout of fines from around these materials could cause them to shift within the body of the fill and thereby result in settlement.

Based on the above considerations we conclude that deep foundation support is appropriate for the proposed structure.

Consistent with current practice in the South Florida area we consider augered, cast-in-place (ACIP) piles to be the most feasible foundation type for this project. Other deep foundation systems such as driven piles and drilled shafts are not considered feasible. In addition to the noise nuisance, vibrations from driven pile foundations could adversely impact existing buildings on the site as well as those on adjacent properties. Drilled shafts are typically economically feasible and attractive only where they are used to carry very large loads that sufficiently justify the slower installation rates and other installation difficulties attendant with such foundations.

The proposed structure can be supported on ACIP piles 14 inches in diameter and tipped at 18 to 20 feet below the existing grade.

It is noteworthy however, that installation of ACIP piles in the uncontrolled fill could be subject to higher than normal grout takes, as well as delays caused by obstructions.

An alternative to pile foundation support would be to improve the ground beneath the proposed structure by either 1) excavating the fill and replacing it with acceptable fill material, or 2) installing vibro-replacement stone columns (VSC) to transfer the structure loads down to the Layer 2 limestone. VSC is a method where a large vibrating probe is inserted into the ground to the desired depth to density the insitu soils. The probe hole is backfilled with No. 57 stone is used as the backfill material to create a dense aggregate column that provides relatively higher bearing pressures.

For the excavation and replacement option consideration would have to be given to the fact that portions of the excavation would occur beneath the water table and so backfilling of these areas would require either dewatering so that the backfill can be performed in the dry, or use of No. 57 stone to accomplish backfilling below water.

Project ownership would have to evaluate the economic viability of either of these methods as compared to supporting the structure on piles.

6.1.2 Bleachers, Tennis Courts and Pavements/Walkways

The proposed bleachers can be supported with shallow foundations after preparing the site as recommended in Section 7 of this report. Bleachers generally have a higher tolerance for differential settlement than other traditional buildings. The tennis courts, and pavements/walkways can be constructed at grade after customary site preparation. It will likely not be economically justifiable to perform any special site improvement or use deep foundations to accommodate these structures. However the project ownership must accept that there will always be a risk of settlement from the uncontrolled fill and as such these structures could require a maintenance schedule that is more rigorous than usual.

6.2 ESTIMATED SETTLEMENT

We estimate that maximum foundations settlement for the proposed new structures will be less than one (1) inch, with maximum differential settlements on the order of ½ inch. Given the cohesionless nature of the soils present at this site, we predict settlements will occur coincidental with the application of the building dead and live load. The above settlement estimates are for foundations that are designed and constructed as recommended herein. However, due to the uncertainty of the components of the fill materials, long term settlements exceeding one (1) inch should be expected throughout the site. The only solutions to prevent these long term settlements are removing and replacing the fill material or supporting the structures directly on the limestone layer.

6.3 VOIDS UNDERNEATH TENNIS COURTS

Based on the information provided by SCS Engineers, the existing tennis courts may have voids underneath the slab. This may have been caused by differential settlements, decomposition of some of the underlying solid waste materials, or soils

washing away due to heavy rain events. We are not aware of the construction date of the tennis courts. If the subsurface conditions beneath the courts are similar to the conditions encountered throughout the site, we recommend as a temporary solution to pump high viscosity, low strength grout. This however does not represent a permanent fix to the settlement and voids underneath the tennis courts. In order to provide a permanent solution to the settlement and cracking, the slabs should be either pile supported, or the deleterious materials should be excavated and replaced with clean fill.

The spacing and frequency of the grouting shall be determined after additional field exploration is performed.

6.4 MISCELLANEOUS ENVIRONMENTAL IMPACTS

Environmental forces consist of sinkholes, freeze thaw damage, shrinking and swelling soils, and hurricane scour can affect the performance of a foundation system. Sinkholes, freeze-thaw, and shrinking/swelling soils are generally not of concern in the South Florida area. While a detailed study of hurricane scour was outside the scope of this study, it is nonetheless our opinion that the foundation systems recommended herein when properly designed and constructed, will resist hurricane scour forces. It is therefore our opinion that these specific environmental forces have a low risk (on a scale of low, moderate, high) of adversely affecting foundation performance at this site provided the foundation system is designed and constructed as recommended herein.

7.1 RECOMMENDATIONS

Our recommendations for geotechnical design and construction of the proposed project are provided below in the following sections.

7.2 SITE PREPARATION AND GRADING

1. Geotechnical site preparation for construction should consist of removal of all existing structures, foundations, pavements, underground utilities, and other deleterious materials within the upper 6 to 12 inches of the proposed foundation footprints plus a five-foot perimeter where possible. Any voids created by the removal of these deleterious materials should be properly backfilled as described in the paragraphs below.

   No information has been provided about ex_isting foundations at the site and we are not aware of the site development history beyond its current condition and the reported historical dumping activities. Where old spread foundations are encountered, they should be removed and replaced with compacted fill if they interfere with new foundations. If the old foundations do not interfere with new construction they should be left in place. Backfilling of old foundation excavations should be performed in accordance with the recommendations provided in this report.

2. After site preparation as described above, areas for structures that will have slabs on grade or pavements (including the walkways) should be proof rolled with at least 10 overlapping passes of a 20-ton roller as it operates at its maximum vibrational frequency and travel at a speed of no more than two feet per second. The proof rolling should be observed by NV5 to identify and mitigate any weak subgrade conditions evidenced by yielding or rutting at the wheels of the roller. Proof-rolling should include planned development footprints plus a five-foot perimeter. To avoid damage to existing foundations, pavements, or utilities, portions of the proof-rolling may have to be performed with a smaller roller or walk-behind compaction equipment.

3. In general fill soils should consist of either inorganic, non-plastic sand having less than 10 percent material passing the No. 200 sieve, or crushed limestone with a maximum rock size of six (6) inches. In particular, fill soils placed within the upper 12 inches of the subgrade of building slabs on grade should consist of either sand with less than 10 percent passing the number 200 sieve, or crushed limestone with a maximum particle size of three inches.

   Based on our boring data portions of the near-surface sandy materials could satisfy the fill criteria. However, given the debris found in the U.wer 1 soils, we anticipate that significant sorting and possibly moisture-conditioning will be required prior to re-use. Such sorting could render it uneconomical to use the material for fill. In any event, representative samples of the fill soils should be collected for classification and compaction testing. The maximum dry density, optimum moisture content, gradation, and plasticity should be determined. These tests are needed for quality control of the compacted fill.

4. Fill soils should be placed with loose lift thicknesses of not more than 12-inches, moisture-conditioned to within two (2) percent of the optimum moisture content based on ASTM D-1557, and compacted to a minimum 95 percent relative compaction[1]. One test should be performed for each 2,500 square feet of fill area per lift of fill soils. If during the compaction process fill shows evidence of yielding under the weight of the roller, it should be removed and replaced with properly compacted granul-ar fill as described herein. Fill particles exceeding one (1) inch in size should not be allowed to nest within the fill.

   The vibrations produced bv the operation of the roller/compactor should be monitored for potential adverse effect on adjacent existing structures, pavements, and utilities. -Lf existing footing and nearby structures will be affected by the vibration of the compactor, the compaction procedure may require modification as approved by the geotechnical engineer.

Relative compaction refers to the in-place dry unit weight of a material expressed as a percentage of the maximum dry unit weight of the same material as determined in the laboratory using the Modified Proctor procedure (ASTM 01557).

7.2 FOUNDATION SUPPORT

7.2.1 One-Story Structure

1. Our recommended pile tip elevations, allowable pile axial capacities, and grout strengths for foundation support are presented in the table below.

TABLE 3- SUMMARY OF PILE ALLOWABLE AXIAL CAPACITIES

Pile Diameter (in)	Min. Pile Tip Elevation (ft. NGVD)	Allowable Compression (kips)	Allowable Tension (kips)	Allowable Lateral (kips)	Minimum Grout Strength (ksi)
14	-7	70	30	4	5

Notes:
1. *Minimum pile tip length based on an estimated site grade of +11 feet NGVD at the time of the borings.*
2. *Required grout strength is for* a *28-day test.*

2. For computer structural modeling of the building, an initial vertical spring constant of 70 kips per inch (kpi) may be used for the 14-inch-diameter piles. The vertical spring constant is the working pile load divided by the estimated pile settlement and is based on our experience and a review of available pile load test data in similar subsurface conditions. The initial spring constant value should be refined as the structural model is developed. The design value used should match the settlement estimates.

3. Resistance to lateral loads can be provided by passive pressure acting on the pile caps and grade beams or the lateral resistance of the piles. Both lateral resistance modes should not be used together, as the larger deflections required to mobilize the passive resistance on foundation elements might not be consistent with those used for the pile lateral capacities presented below. Equivalent fluid densities of 180 and 80 pounds per cubic foot may be used to compute the passive pressures acting against the sides of the pile caps and grade beams above and below the groundwater table respectively. Passive resistance of the upper one foot of soil should be neglected, unless it is confined by a slab or pavement. Frictional resistance between the soil and bottom of footings should be ignored. The above values include a factor of safety of at least 1.5. These values of resistance assume that the foundations are: 1) in-situ soil densified by compaction, or clean sand fill which is compacted to 95 percent relative c9mpaction, and 2) able to withstand horizontal m_q ement on the order of% to *3)8* inch.

4. Pile reinforcing should be designed by the structural engineer to resist the tension and lateral forces applied to the pile systems. We recommend that piles resisting tension loads be reinforced over their entire length. The reinforcement for piles subjected to lateral loads may be designed based on a maximum unfactored bending moment of 150 in-kips. If the pile is not reinforced over the

entire length, we recommend as a minimum, a single No. 7 bar be installed the full length of the pile to verify pile cross-section continuity.

5. Foundations should be designed so that a minimum center-to-center pile spacing of three pile diameters is maintained.

6. Piles should be installed within three inches of specified plan location, and within two percent of vertical line.

7. During grouting of the pile excavation, the auger should be raised at a rate consistent with the capacity of the pump to ensure the entire pile shaft is uniformly grouted and to prevent caving of soils into the pile excavation. The actual grout volume for each ACIP pile should be at least 15 percent greater than the theoretical pile volume. A grout head of at least five feet should be maintained throughout the grouting of the pile shaft. Production piles should be installed in a manner similar to the successfully tested pile.

8. If during pile grouting any abnormalities such as sudden pressure drop or low grout take for a given interval of pile length are observed, the auger should be re- advanced to about five feet below the elevation where the anomaly was observed and the pile shaft properly re-grouted. Pumping should continue while the auger is rotated back down to the required remedial depth.

9. New piles should not be installed close to previously installed piles before the exist ing pile grout has started to set. As a guideline, the closest distance for installing adjacent piles within six hours should be the greater of eight feet or three pile diameters.

10. Grout should be sampled during piling installation at a m1n1mum frequency corresponding to the greater of one set of at least six cubes each morning and afternoon during production or one set of at least six cubes for each 50 cubic yards of grout placed. Cubes should be tested for compressive strength at intervals of three, 7, 14, and 28 days. At least two cubes should be tested at 28 days. Any remaining cubes should be retained for subsequent intermediate or 56-day breaks if required.

11. The steel reinforcement should be installed into the pile shaft immediately upon withdrawal of the grouting auger. Spacers should be fitted to the reinforcing cages to assure that they remain centered within the grouted shaft and maintain the required side cover. If obstructions are encountered during insertion of the steel cage, the cage should be extracted, the pile shaft re-drilled to at least five feet below the elevation of the obstruction and re-grouted to the ground surface, and the reinforcement re-installed.

12. An NV5 inspector should provide full-time quality control inspection to document the excavation and grouting of each pile and to provide, in conjunction with a

licensed office engineer, any necessary field adjustments of pile tip elevations.

7.2.2 Bleachers and Miscellaneous Structures

1. After preparing the site as described in Section 7.1 the proposed bleachers and miscellaneous structures may be supported on shallow spread foundations bearing on properly compacted granular fill or the near surface limestone and designed for a maximum allowable bearing pressure of 2,500 pounds per square foot (psf). The bottoms of footings should be embedded at least 18 inches below lowest adjacent grade.

2. To assure an adequate factor-of-safety against a general shearing failure, strip and continuous footings should be at least 16 inches wide, and isolated footings should be no less than 24 inches wide.

3. Lateral forces may be resisted by passive earth pressure acting on the vertical foundation. We recommend using an equivalent fluid weight of 180 pounds per cubic foot (pcf) to compute passive resistance for moist soil above the water table, and 80 pcf to compute passive resistance in submerged soil. Passive resistance in the upper 12 inches of soil should be neglected unless it is confined by a slab or pavement. Frictional resistance between the subgrade and bottom of foundations should be ignored. The above values include a factor of safety of at least 1.5. These values of resistance assume that the foundations are: 1) in- situ soil densified by compaction, or clean sand fill which is compacted to 95 percent relative compaction, and 2) able to withstand horizontal movement on the order of % to 3/8 inch.

4. The bottoms of footing excavations should be compacted to 95 percent relative compaction prior to placement of steel reinforcement and concrete. If the rock formation is exposed at the bottom of the footing, compaction is not necessary.

7.3 PRELIMINARY ASPHALT PAVEMENT THICKNESS DESIGN

7.3.1 Roadway Areas

1. This section presents preliminary recommendations for flexible asphalt pavement thickness design. Final pavement thickness design should be provided by the project civil engineer based on anticipated traffic loadings. Pavements should be designed and constructed in accordance with the current editions of the appropriate Florida Department of Transportation's pavement design manuals.

2. As a minimum, flexible pavement subgrade should be prepared as described under Section 7.1, *Site Preparation and Grading.* It is also recommended to strip at least one foot of the surficial material prior to proof-rolling the footprint of the pavement areas. The owner should be aware even after preparation of the site as described under Section 7.1, localized distress in the pavement should be anticipated due to the debris and deleterious materials encountered in the top

nine feet of the borings.

3. We recommend the following preliminary minimum flexible asphalt pavement section:

   - 2 inches of S-1 or S-3 surface course
   - 8 inches of limerock base course compacted to at least 98 percent relative compaction. The limerock base should have a minimum Limerock Bearing Ratio (LBR) of 100 percent. The base course can also be an asphaltic concrete material (FOOT specified ABC-3 or equivalent with a minimum Marshall Stability of 1,000 lbs).
   - 12 inches of stabilized subgrade compacted *to* at least 95 percent relative compaction. The subgrade should have a minimum with a minimum LBR of 40 percent as specified by Florida Department of Transportation (FOOT) requirements for Type B or Type C Stabilized Subgrade.

   Limerock or asphaltic concrete should be tested for compliance at a frequency of one test per 10,000 square feet, or at a minimum of two test locations, whichever is greater.

   To reduce the potential for differential settlement beneath the pavement a geotextile fabric such as Tensar TX-160 can be placed atop the subgrade prior to constructing the pavement section.

7.3.2 Perimeter Walkway Areas

1. As a minimum, flexible pavement subgrade should be prepared as described under Section 7.1, *Site Preparation and Grading.*

2. We recommend the following preliminary minimum flexible asphalt pavement section:

   - 1 inch of S-1 or S-3 surface course
   - 4 inches of limerock base course compacted to at least 98 percent relative compaction. The limerock base should have a minimum Limerock Bearing Ratio (LBR) of 100 percent. The base course can also be an asphaltic concrete material (FOOT specified ABC-3 or equivalent with a minimum Marshall Stability of 1,000 lbs).
   - 8 inches of stabilized subgrade compacted to at least 95 percent relative compaction. The subgrade should have a minimum with a minimum LBR of 40 percent as specified by Florida Department of Transportation (FOOT) requirements for Type B or Type C Stabilized Subgrade.

   Limerock or asphaltic concrete should be tested for compliance at a frequency of one test per 10,000 square feet, or at a minimum of two test locations, whichever is greater.

7.4 GROUND FLOOR SLABS

1. Ground floor slabs may be supported on grade assuming the site is prepared as recommended in Section 7.1 above. However the Owner must accept the risk for potential cracking associated with settlement of the uncontrolled fill at the site. IF such risk is not acceptable, slabs should be structural! supported.

2. Slabs on grade may be designed using a modulus of subgrade reaction of 150 pounds per cubic inch (pci).

3. Slabs should be reinforced for the loads that they will sustain and construction joints should be provided at frequent intervals.

4. Slabs in contact with soil are subject to movement of moisture from the soil upward through the slab. To prevent such moisture vapor transmission, a moisture barrier should be placed on the slab subgrade, and should be protected from damage during construction. Construction joints should be provided with water stops in any permanently submerged areas.

7.5 EXCAVATION AND DEWATERING

1. Shallow excavations into the near-surface materials will likely stand vertical for short periods of time only. The excavation sides will unravel over time as they are exposed to weather and construction traffic. In general, the Layer 2 limestone is expected to stand vertically unsupported if excavated. However localized weaker sandy zones within this layer could become loose if unsupported. Deeper excavations, especially those that extend below the groundwater table, as well as excavations that will remain open for longer periods of time will require support in the form of temporary shoring or sliding trench boxes to prevent instability of excavation walls and to protect workers from injury. All excavations should comply with Occupational Safety and Health Administration (OSHA) design and safety requirements. Shoring designs should be signed and sealed by a Florida-licensed professional engineer, and should be provided for the Owner's review.

2. Particular attention should be paid to anv deep excavations and the potential impacts these could have on adjacent structures. especially where such excavations are close to project property lines.

   Average groundwater elevation is expected to be between about Elevation +0 and +4 feet NGVD for this site. Excavation is unlikely to encounter groundwater. If needed, we judge that localized dewatering if required can be accomplished using pumps and sumps. Dewatering of larger excavations and larger volumes could require the installation of well points or other dewatering systems.

   It should be noted there are two components to the dewatering process. The first is extracting the water from the subsurface and the requirement of the

project to maintain a dry excavation to allow construction to proceed. The other component is the ability to discharge the volume of water extracted. The contractor must ensure this capability exists for the site such that all dewatering and consequent effluent discharge will meet the requirements of the local jurisdictional agencies including Miami-Dade County, Florida Department of Environmental Protection (FDEP), Florida Department of Transportation, and South Florida Water Management District (SFWMD) as appropriate. This study did not include specific testing or analysis to determine if dewatering is feasible or if adequate discharge is available. This is the responsibility of the subcontractor.

During dewatering the adjacent properties must be monitored for adverse impacts from dewatering drawdown. The potential for adverse impacts from dewatering is especially heightened where the peaty layer exists. Drawdown of the water table above or within the peaty layer can result in consolidation of this material.

The dewatering subcontractor should submit a proposed design for dewatering operations to the owner for review and approval prior to commencing work.

7.6 OTHER RECOMMENDATIONS

1. With new construction there is always a risk of adversely impacting adjacent structures and utilities. We recommend that pre- and post-construction surveys of adjacent structures and utilities of concern be conducted to document conditions.

2. NV5 should participate in the design development phases of this project in order to modify the .recommendations provided above as changes occur during the design development process.

3. NV5 should participate in the evaluation of field problems as they arise and recommend solutions. We should also be involved with site work activities so we can address needed changes to the foundation recommendations if site conditions different from those described herein are encountered.

4. NV5 should observe the foundation installation to satisfy the requirements of the Florida Building Code and municipal agencies.

8.0 REPORT LIMITATIONS

This report has been prepared for the exclusive use of the Owner and other members of the design/construction team for the specific projects discussed in this report. This report has been prepared in accordance with generally accepted local geotechnical engineering practices; no other warranty is expressed or implied.

The evaluation and recommendations submitted in this report are based in part upon the data collected from the field exploration. The nature or extent of variations throughout the subsurface profile may not become evident until the time of construction. If variations then appear evident, it may be necessary to evaluate our recommendations as provided in this report. In the event changes are made in the nature, design or locations of the proposed project construction, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions modified or verified in writing by NV5.

The scope of services did not include any environmental assessment or investigation for the presence or absence of wetlands, sinkholes, chemically hazardous or toxic materials in the soil, surface water, groundwater or air, on or below or around the site.

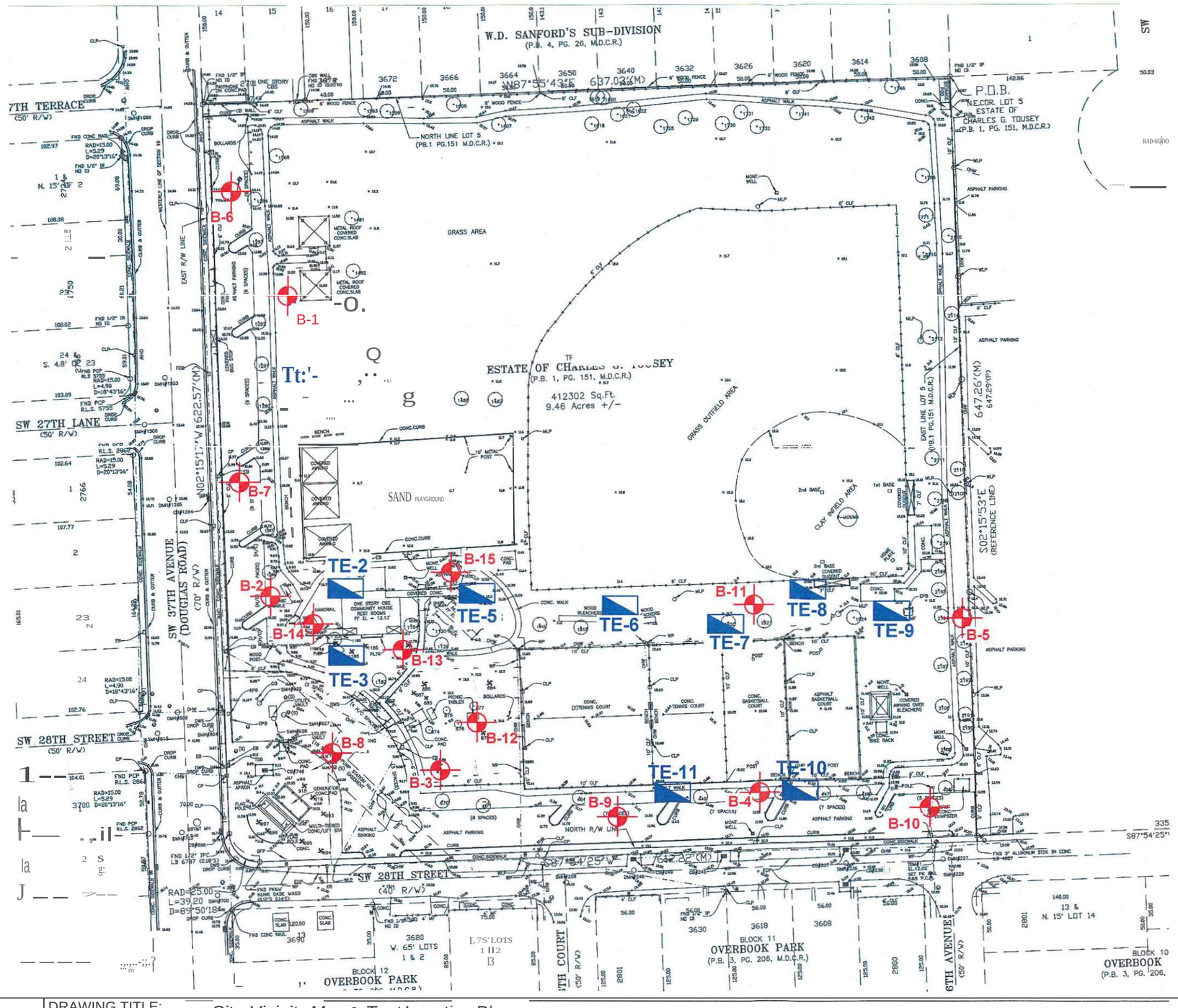
We should be provided the opportunity to review final foundation specifications and review foundation design drawings, in order to ascertain whether our recommendations have been properly interpreted and implemented. If NV5. is not afforded the opportunity to participate in construction related aspects of foundation installation as recommended in this report, we can accept no responsibility for the interpretation of our recommendations made in this report or for foundation performance .

9.0 CLOSURE

We appreciate the opportunity to provide specialized engineering services on this project and look forward to an opportunity to participate in construction related aspects of the development. If you have questions about information contained in this report contact the writer at 305.901-1921 .

****

DRAWINGS



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Site Vicinity Map

N

0 95

Approximate Scale in Feet

LEGEND:

T-1 - Soil Boring Test Location

iiii;J TE-1 - Test Excavation Location

NOTES:

1. Test locations shown are approximate.
2. Test location symbols are not to scale.
3. Base for this drawing was taken from Sheet No. 2, "Boundary and Topographic Survey Douglas Park, prepared by Keith and Schnars, P.A., dated 03/20/2015.

NVS

DRAWING TITLE: *Site Vicinity Map & Test Location Plan*

PROJECT NAME: *Douglas Park Improvements*

PROJECT LOCATION: *2795 SW 37th Avenue, Miami, Florida*

PROJECT NO: *14774*

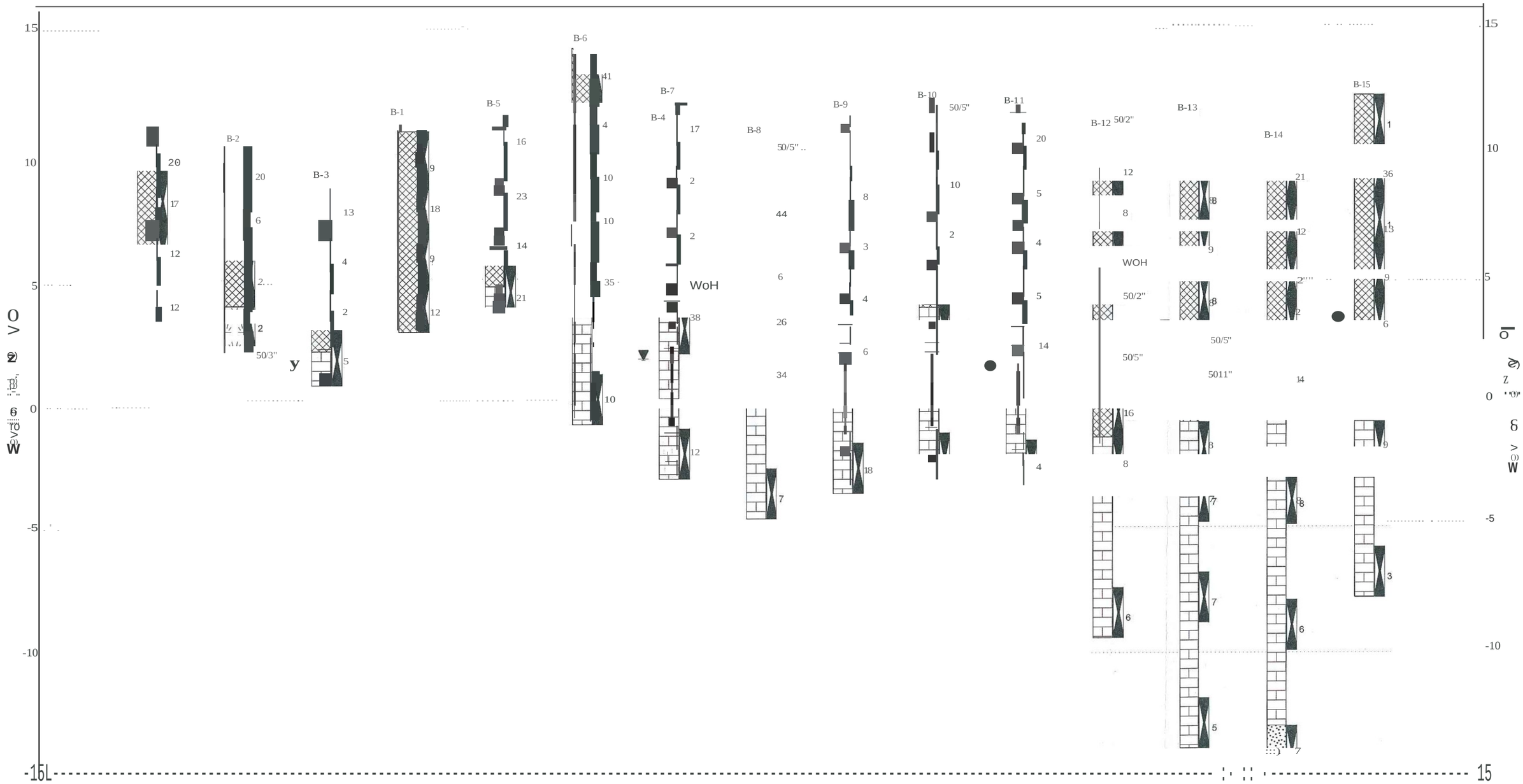
DATE: *12/17/15*

DWG NO: *1*

OWN BY: *::R::f*

CKD BY: ,t'W

APDBY



GENERALIZED SUBSURFACE PROFILE

PROJECT NAME: Douglas Park Improvements

PROJECT LOCATION: 2795 SW 37th Avenue, Miami, Florida

PROJECT NUMBER: 14774

DATE: 12/17/15

DRAWN BY: RS

CHECKED BY: GLW

DRAWING NO: 2

LEGEND

Fill

Limestone

Peat

Sand

LA.I Standard Penetration Test

y Water Level

APPENDIX A

BORING LOG DATA

BORING NUMBER B 1

NIVIS

PROJECT NAME Douglas Park Improvements

PROJECT NUMBER _1_,_4'-7_,_74 _____ PROJECT LOCATION 2795 SW 37th Avenue Miami Florida

DATE STARTED _6/2-'7-'--/1_,_,5-------- COMPLETED _6""/2,_,7.!..../1,5:...._ _____ GROUND ELEVATION _1,_1 -'-'.2'-'ft''----- HOLE SIZE _3--in''c''''he''-'s''---------

DRILLING CONTRACTOR _,N_,_V,_,5''----- ---------- GROUND WATER LEVELS: _-_-_,N-''o''''t''E,_.n,..c''o,.,un,tc--e''e._...d_____

DRILLING METHOD Rotary drill with wash, mud & casing

LOGGED BY D. Correa CHECKED BY S. Becca

NOTES

				MATERIAL DESCRIPTION	ELEVATION (ft., NGVD)
	SPT	2-9-11-20 (20)		SAND, medium dense, dark brown with trace of glass and vegetation (FILL)	
	SPT	16-10-7-7 (17)		SAND, medium dense, brown with trace of limestone fragments (FILL)	
	SPT	7-9-3-8 (12)		SAND, medium dense, brown with trace of limestone fragments (FILL)	
	SPT	6-4-8-8 (12)		SAND, medium dense, brown with trace of limestone fragments and wood (FILL)	

Boring terminated at 8.0 feet.

BORING NUMBER B-2

PROJECT NAME Douglas Park Improvements

PROJECT NUMBER 1'-"477.4!. PROJECT LOCATION 2795 SW 37th Avenue Miami Florida

DATE STARTED 6/27/15 COMPLETED 6"/2,7/15 GROUND ELEVATION 1'-'03 ft HOLE SIZE 3=-.c..in=be=s,

DRILLING CONTRACTOR 'NAY' '5 GROUND WATER LEVELS: Not Encountered

DRILLING METHOD Rotary drill with wash, mud & casing

LOGGED BY D. Correa CHECKED BY S. Becca

NOTES

					MATERIAL DESCRIPTION	
0	SPT	0-10-1 (20)			SAND, medium dense, black with vegetation (FILL) SAND, medium dense, brown with trace of limestone fragments (FILL)	10
	SPT	7-3-3-5 (6)	SP		SAND, bose, brown with trace of limestone fragments (FILL)	
5	SPT	1-1-1-1 (2)			SAND, very loose, brown with trace of limestone fragments (FILL)	5
				6.3	SAND, very loose, brown (FILL)	4.0
	SPT	1-1-1-2 (2)	PT	8.0	PEAT, very soft, black (POSSIBLE FILL)	2.3
	SPT	50/3" (100)	LS	8.3	LIMESTONE, moderately hard, tan with some sand	2.1

Boring terminated at 8.0 feet.

BORING NUMBER B-3

PROJECT NAME Douglas Park Improvements

PROJECT NUMBER 1477, 4, PROJECT LOCATION 2795 SW 37th Avenue Miami Florida

DATE STARTED 6-/2-7-/1-5 COMPLETED 6-12-7-/15 GROUND ELEVATION 8 ft HOLE SIZE 3 in

DRILLING CONTRACTOR N-V- GROUND WATER LEVELS: 7.5 ft

DRILLING METHOD Rotary drill with wash, mud & casing

LOGGED BY D. Correa CHECKED BY S. Becca

NOTES

					MATERIAL DESCRIPTION
	SPT	4-7-6-4 (13)			SAND, medium dense, dark brown with vegetation and trace of limestone fragments (FILL)
					SAND, medium dense, brown with trace of limestone fragments (FILL)
	SPT	2-2-2-1 (4)	SP		SAND, very loose, brown with trace of glass and wood (FILL)
	SPT	2-1-1-2 (2)			SAND, very loose, brown with trace of glass and wood (FILL)
		2-1-4-6		16.7	SAND, loose dark brown with trace of glass (FILL)
		(5)	LS		LIMESTONE, very soft, tan
				8.0	Boring terminated at 8.0 feet.

BORING NUMBER B-4

NIVI5

PROJECT NAME Douglas Park Improvements

PROJECT NUMBER _1,_4'-'-7_7_4'------ **PROJECT LOCATION** 2795 SW 37th Avenue Miami Florida

DATE STARTED ---'6'"-/""27'-'-/-'-'15"-------- **COMPLETED** ....6-:.../2'"7'-'-/-'--15..._____ **GROUND ELEVATION** _1,_.0=.9-.....ft,_._____ **HOLE SIZE** -'3-.....i"-'n=ch..-e=s_____

DRILLING CONTRACTOR _,N'-'-V-'--'5"-------- **GROUNDWATER LEVELS:** _-_-_,_N_,_,o'-'t-"E"-'n""co,_,u"-'n'-'Ote""re,_,d,_____

DRILLING METHOD Rotary drill with wash, mud & casing

LOGGED BY D. Correa **CHECKED BY** S. Becca

NOTES_____

		MATERIAL DESCRIPTION	
SPT 3-4-5-11 (9)		SAND, bose, dark brown with organics (FILL)	
SPT 13-9-9-11 (18)		SAND, medium dense, brown (FILL)	
	1	SP	
SPT 4-6-3-5 (9)		SAND, loose, with trace of limestone (FILL)	
SPT 3-2-10-39 (12)		SAND, medium dense, dark brown with some wood (FILL)	
	8.0		2.9

Boring terminated at 8.0 feet.

BORING NUMBER B-5

N|V|5

PROJECT NAME Douglas Park Improvements

PROJECT NUMBER 1477-4 PROJECT LOCATION 2795 SW 37th Avenue Miami Florida

DATE STARTED 6/27/15 COMPLETED 6/27/15 GROUND ELEVATION 11.5 ft HOLE SIZE 3 inches

DRILLING CONTRACTOR NV5 GROUNDWATER LEVELS: Not Encountered

DRILLING METHOD Rotary drill with wash, mud & casing

LOGGED BY D. Correa CHECKED BY S. Becca

NOTES

			MATERIAL DESCRIPTION	
SPT 6-6-10-12 (16)			SAND, medium dense, brown with limestone fragments (FILL)	
SPT 12-12-11-9 (23)	SP		SAND, medium dense, brown with brick (FILL)	
SPT 10-8-6-8 (14)			SAND, medium dense, brown with limestone fragments and brick (FILL)	
SPT 9-11-10-7	LS		SAND, medium dense, brown with limestone fragments and brick (FILL)	3.5
(21)			LIMESTONE, soft, tan with sand Boring terminated at 8.0 feet.	

BORING NUMBER B-6

NIV5

PROJECT NAME Douglas Park Improvements

PROJECT NUMBER _1'-4-'-7-'-'74"---------- PROJECT LOCATION 2795 SW 37th Avenue Miami Florida

DATE STARTED ,6"-/2,_6_/1,5.._____ COMPLETED _6-/2,_,6,_/15----- GROUND ELEVATION 14.2 ft HOLE SIZE ....3-=n=ch=e=s____

DRILLING CONTRACTOR __N.!CV"-'5---------- GROUNDWATER LEVELS: 10.3 ft ± Elev 3.9 ft - - - - - - - - - - - -

DRILLING METHOD Rotary drill with wash, mud & casing

CHECKED BY S. Becca

	MATERIAL DESCRIPTION	ELEVATION (ft., NGVD)
	SAND, dense, brown with some limestone fragments and trace of brick (FILL)	
	SAND, very loose, brown with trace of limestone fragments (FILL)	
	SAND, loose, tan with some limestone fragments (FILL)	
SPT 6-5-5-8 (10)	SAND, loose, tan with some limestone fragments (FILL)	
8.0		6.2
13-23-12- SPT 15 (35)	LIMESTONE, medium hard, tan with some sand	
LS		
SPT 9-6-4-8 (10)	LIMESTONE, very soft, tan	Q___
5..0		1..8

Boring terminated at 15.0 feet.

BORING NUMBER B-7

NV5

PROJECT NAME Douglas Park Improvements

PROJECT NUMBER _14_,_7_,_74_,___________ **PROJECT LOCATION** 2795 SW 37th Avenue Miami Florida

DATE STARTED _,6""/261'-"5---- **COMPLETED** _,6"'-/2,,6"'-/_,_,15,.______ **GROUND ELEVATION** _1,_,2, ,ft"----- **HOLE SIZE** --3--in"c._..he""s.______________

DRILLING CONTRACTOR _NV, 5_________________________________ **GROUND WATER LEVELS:** _1,_,0'.2'--'ft-'-'/'-'E"-'le"-'V---'1'-.8"--'-'-ft_____________

DRILLING METHOD Rotary drill with wash, mud & casing

LOGGED BY D.Correa **CHECKED BY** S. Becca

NOTES

DEPTH (ft)	SAMPLE TYPE	BLOW COUNTS (N VALUE)	U.S.C.S.	MATERIAL DESCRIPTION	ELEVATION (ft)
0	SPT	10-9-8-5 (17)		SAND, medium dense, dark brown with limestone fragments (FILL)	
	SPT	2-1-1-1 (2)	SP	SAND, very loose, dark brown (FILL)	
	SPT	1-1-1-1 (2)		SAND, very loose, brown with trace of wood (FILL)	
	SPT	1-WOH-WOH-2 (WOH)		SAND, very loose, black with trace of limestone fragments {FILL)	
8.0					4.0
10	SPT	17-14-24-21 (38)	LS	LIMESTONE, medium hard, tan with some sand	
	SPT	14-5-7-7 (12)		LIMESTONE, very soft, tan	
15.0					-3

Boring terminated at 15.0 feet.

BORING NUMBER B-8

NIVIS

PROJECT NAME Douglas Park Improvements

PROJECT NUMBER 1:.....47 74-'---------- PROJECT LOCATION 2795 SW 37th Avenue Miami Florida

DATE STARTED ...6/2,_7-/1_,_5_____ COMPLETED _6_/27_,_/1_,_5-------- GROUND ELEVATION 1_...:0:.....4'--'ft ---- HOLE SIZE 3"--"-'in=c'-"hes_____

DRILLING CONTRACTOR --N-V"'-'5------ — — — — — — — GROUND WATER LEVELS: -9'5_,_,_ft..::Ef.::.le:'-v-"-0""".9_ft_____

DRILLING METHOD Rotary drill with wash, mud & casing

LOGGED BY D.Correa CHECKED BY S. Becca

NOTES

		BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (ft., NGVD)
0	SPT	50/5" (100)			SAND, very dense, tan with trace of limestone fragments (FILL)	10
	SPT	49-24-20-7 (44)	SP		SAND, dense, dark brown to tan (FILL)	
5	SPT	3-3-3-2 (6)			SAND, loose, tan (FILL)	5
	SPT	14-1 (26)			LIMESTONE, soft, tan with sand	
	SPT	15-16-18-24 (34)			LIMESTONE, medium hard, tan	
10			LS			
	SPT	5-4-3-7 (7)			LIMESTONE, very soft, tan	
15				15.0	Boring terminated at 15.0 feet.	

BORING NUMBER B 9

NIV I5

PROJECT NAME Douglas Park Improvements

PROJECT NUMBER _1'---4,_,_7_,_74-'--------- PROJECT LOCATION 2795 SW 37th Avenue Miami Florida

DATE STARTED --'6,_/-=-26,_/_,_15=------ COMPLETED --'6""/2=6≠'--15=------- GROUND ELEVATION _11-'-.4_,_ft,_____ HOLE SIZE ---3-i,_n""ch, e...,s_____

DRILLING CONTRACTOR --'N'-'-V-'---5=---------- ,Y GROUND WATER LEVELS: 9.0ft / E/ev 2.4 ft

DRILLING METHOD Rotary drill with wash, mud & casing

LOGGED BY D. Correa CHECKED BY S. Becca

NOTES

					MATERIAL DESCRIPTION	ELEVATION (ft., NGVD)
0						
	IJsPT 4 1)2'					
					SAND, very dense, tan with limestone fragments (FILL)	
	SPT	14-4-4-4 (8)			SAND, loose, brown with trace of limestone fragments (FILL)	
			SP			
§	SPT	1-2-1-3 (3)			SAND, very loose, brown with trace of limestone fragments (FILL)	
	SPT	1-1-3-3 (4)			SAND, very loose, brown with trace of limestone fragments (FILL)	
				ls.0		3.4
	SPT	6-3-3-3 (6)		:y	LIMESTONE, very soft, tan	
10						
			LS			
	SPT	8-7-11-10 (18)			LIMESTONE, very soft, tan	
15				115.0		-3.6

Boring terminated at 15.0 feet.

NV5

PROJECT NAME Douglas Park Improvements

PROJECT NUMBER _1'-"4'-'--77.'-.::4'------

PROJECT LOCATION 2795 SW 37th Avenue Miami Florida

DATE STARTED ,6""/2=6"--/1'-"5'-------- COMPLETED _6 /2,_,6/15.

GROUND ELEVATION _1-1,..8- ft..

HOLE SIZE _3 i..,n...,ch,e"'s

DRILLING CONTRACTOR _,N_,V,_,5"-

GROUND WATER LEVELS: _10'.5 ft

DRILLING METHOD Rotary drill with wash, mud & casing

LOGGED BY D.Correa CHECKED BY S. Becca

NOTES

Sample Type	Blow Counts (N Value)	Material Description	Elevation (ft)
SPT	(1°6g	SAND, very dense, tan with limestone fragments (FILL)	
SPT	22-7-3-2 (10)	SAND, loose, brown with trace of limestone fragments (FILL)	
SPT	3-1-1-1 (2)	SAND, very loose, dark brown with trace of limestone fragments (FILL)	
SPT	2-2-2-2 (4)	SAND, very loose, dark brown with trace of limestone fragments (FILL)	
		8.0	3.8
	3-13-17-12 (30)	LIMESTONE, very soft, tan	
LS			
SPT	5-4-2-3 (6)	LIMESTONE, very soft, tan	

Boring terminated at 15.0 feet.

BORING NUMBER B-11

NIV15

PROJECT NAME Douglas Park Improvements

PROJECT NUMBER 14774 PROJECT LOCATION 2795 SW 37th Ave Miami FL

DATE STARTED 6/2/60 COMPLETED 6/1/5 GROUND ELEVATION 11.5 ft HOLE SIZE 3 in

DRILLING CONTRACTOR NV5

GROUND WATER LEVELS: 10.0 ft / Elev 1.5 ft

DRILLING METHOD Rotary drill with wash, mud & casing

LOGGED BY D. Correa CHECKED BY S. Becca

NOTES

					MATERIAL DESCRIPTION
	SPT	10-11-9-9 (20)			SAND, medium dense, dark brown (FILL)
	SPT	4-3-2-4 (5)			SAND, loose, dark brown with trace of limestone fragments (FILL)
	SPT	3-2-2-3 (4)	SP		SAND, very loose, black with trace of glass (FILL)
	SPT	4-3-2-3 (5)			SAND, loose, brown with trace of rock, glass (FILL)
				8.6	SAND, brown with trace of limestone fragments (FILL)
	SPT	14-10-4-4 (14)			LIMESTONE, very soft, tan with some sand
			LS		
	SPT	5-2-2-1 (4)			LIMESTONE, very soft, tan
15				11 15.0	-3.5

Boring terminated at 15.0 feet.

BORING NUMBER B-12

NIVIS

PROJECT NAME Douglas Park Improvements

PROJECT NUMBER _1_,_4'-'-7_,_74_,_____ PROJECT LOCATION 2795 SW 37th Avenue Miami Florida

DATE STARTED _1_,_1_,_,/2=5'--'/1=5_____ COMPLETED 11/25/15 GROUND ELEVATION _1_,_..0._...6-_ft.,_____ HOLE SIZE --3--'"in'"ch'-'-'e,_,_.s._____

DRILLING CONTRACTOR _.N'-'-V,_,5,_____ GROUNDWATERLEVELS:_-_--_____

DRILLING METHOD Rotary drill with wash, mud & casing

LOGGED BY D. Correa CHECKED BY A.Sarsour

NOTES

				MATERIAL DESCRIPTION
	SPT	1-6-6-10 (12)		SAND, medium dense, brown with topsoil and trace of roots and limestone fragments (FILL)
	SPT	9-5-3-2 (8)		SAND, loose, dark brown with light gray concrete rubble (FILL)
§	SPT	WOH-WOH-WOH-1 (WOH)		SAND, very loose, brown with pieces of wood (FILL)
	!SPT	1-50/2" (100)	SP	
				SAND, dense, brown with pieces of wood (FILL)
	SPT	30-34-50/5" (100)		SAND, dense, brown with pieces of wood (FILL)
10	SPT	4-8-8-10 (16)		SAND, medium dense, brown with wood (FILL)
				112.0 -1.4
	SPT	11-4-4-4 (8)		LIMESTONE, very soft, tan
			LS	
	SPT	3-3-3-5 (6}		LIMESTONE, very soft, tan
				120.0 -9.4

Bonng termmated at 20.0 feet.

BORING NUMBER B-13

NIVIS

PROJECT NAME Douglas Park Improvements

PROJECT NUMBER 147-7741c... PROJECT LOCATION 2795 SW 37th Avenue Miami Florida

DATE STARTED 11/25/15 COMPLETED 11/25/15 GROUND ELEVATION 11.1 ft HOLE SIZE 3 inches

DRILLING CONTRACTOR NIVIS

GROUND WATER LEVELS: 29 ft

DRILLING METHOD Rotary drill with wash, mud & casing

LOGGED BY D. Correa CHECKED BY A.Sarsour

NOTES

				MATERIAL DESCRIPTION
0	SPT	1-5-4-3 (9)		SAND, loose, brown with top soils and a trace of limestone fragments (FILL)
	SPT	2-3-5-9 (8)		SAND, loose, gray to brown with trace of limestone fragments (FILL)
5	SPT	3-5-4-5 (9)	SP	SAND, loose, brown with limestone fragments (FILL)
	SPT	2-4-4-5 (8)		SAND, loose, brown with pieces of wood (FILL)
	SPT	5-14-50/5" (100)		SAND, dense, brown with wood and trace of limestone fragments (FILL)
10		50/1" (100)		SAND, dense, brown wood with limestone fragments (FILL)
				12.0
	SPT	8-5-3-4 (8)		LIMESTONE, very soft, tan
15	SPT	5-4-3-2 (7)		LIMESTONE, very soft, tan
	SPT	5-4-3-3 (7)	LS	LIMESTONE, very soft, tan
20				
	SPT	3-3-2-3 (5)		LIMESTONE, very soft, tan
25				25.0

Bonng terrmated at 25.0 feet.

BORING NUMBER B 14

NIVI5

PROJECT NAME Douglas Park Improvements

PROJECT NUMBER _1,_4,_,_7_,_74-'---------- PROJECT LOCATION 2795 SW 37th Avenue Miami Florida

DATE STARTED _1'--'1_,_/2=5'--'/1-'5_____ COMPLETED 11/25/15 GROUND ELEVATION _10.1 ft,____ HOLE SIZE _3-_in,""ch,_es_____

DRILLING CONTRACTOR _,N'-'-V-'-'5=---------- Y GROUND WATER LEVELS: 8.8 ft / Elev 1.4 ft

DRILLING METHOD Rotary drill with wash, mud & casing

LOGGED BY D. Correa CHECKED BY A.Sarsour

NOTES

			MATERIAL DESCRIPTION	
0	SPT 2-10-11-1 (21)		SAND, medium dense, dark gray with trace of limestone fragments, topsoil, and roots (FILL)	
	SPT 7-7-5-4 (12)		SAND, medium dense, gray with limestone fragments (FILL)	
		SP		
	SPT 1-1-1-1 (2)		SAND, very loose, gray with limestone fragments (FILL)	
	WOH-1-1-SPT 13 (2)		SAND, very loose, brown with limestone fragments and wood (FILL)	
				2.1
10	SPT 12-7-7-15 (14)		LIMESTONE, very soft, tan with trace of sand	
	SPT 10-5-3-2 (8)		LIMESTONE, very soft, tan	
15		LS		
	SPT 8-3-3-4 (6)		LIMESTONE, very soft, tan	
20				
				23.0 -12.9
	SPT 8-5-2-3 (7)	SP	SAND, loose, tan	
25				25.0 -14.9

Bonng terminated at 25.0 feet.

BORING NUMBER B-15

NIV5

PROJECT NAME Douglas Park Improvements

PROJECT NUMBER _1474 PROJECT LOCATION 2795 SW 37th Avenue Miami Florida

DATE STARTED 11/25/15 COMPLETED 11/25/15 GROUND ELEVATION 12.2 ft HOLE SIZE _3::....::..in""c""he,s------

DRILLING CONTRACTOR _dV.!..!5:!..._.. GROUND WATER LEVELS: 9.6 ft!..../ =.El...v .=,2.6....!:ft .

DRILLING METHOD Rotary drill with wash, mud & casing

LOGGED BY D_,_Correa!... CHECKED BY A.Sarsour

NOTES

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (ft., NGVD)
0	SPT	5-7-7-9 (14)	SP		SAND, medium dense, brown with top soil and a trace of limestone fragments (FILL)	10
	SPT	14-16-20-13 (36)			SAND, dense, brown with trace of limestone fragments and concrete rubble (FILL)	
5	SPT	11-6-7-10 (13)			SAND, medium dense, brown with concrete rubble (FILL)	
	SPT	7-5-4-5 (9)			SAND, loose, gray with limestone fragments and trace of wood (FILL)	5
10	SPT	4-3-3-5 (6)			SAND, loose, dark gray trace of peat and wood (FILL)	0
13.0						-0.8
15	SPT	7-5-4-7 (9)	LS		LIMESTONE, very soft, tan	-5
20	SPT	3-2-1-2 (3)			LIMESTONE, very soft, tan	
20.0						

Boring terminated at 20.0 feet.

KEY TO SYMBOLS

Symbol Description

Strata symbols

	Fill		Concrete
	Silty sand		Asphalt
	Limestone		Sandstone
	Sand		
	Peat		

Misc. Symbols

	Groundwater level measured at boring completion. The date checked is indicated.	WOH	Weight of Hammer
	Boring continues		
	End of Boring		

Soil Samplers

	Standard penetration test. 140 lb. hammer dropped 30"

Notes:

1. Exploratory borings were drilled between 06/26/2015 and 11/25/2015 using a 3-inch diameter rotary drill with mud, wash & casing.
2. Groundwater was encountered at depths ranging from 7.5 to 10.5 feet below grade upon boring completion.
3. Boring locations were taped from existing features.
4. These logs are subject to the limitations, conclusions, and recommendations in this report.
5. Results of tests conducted on samples recovered are reported on the logs.

NVS

NOTES RELATED TO RECORDS OF TEST BORING AND GENERALIZED SUBSURFACE PROFILE

1. Groundwater level was encountered and recorded (if shown) following the completion of the soil test boring on the date indicated. Fluctuations in groundwater levels are common; consult report text for a discussion.

2. The boring location was identified in the field by offsetting from existing reference marks and using a cloth tape and survey wheel.

3. The borehole was backfilled to site grade following boring completion, and patched with asphalt cold patch mix when pavement was encountered.

4. The Record of Test Boring represents our interpretation of field conditions based on engineering examination of the soil samples.

5. The Record of Test Boring is subject to the limitations, conclusions and recommendations presented in the report text.

6. "Field Test Data" shown on the Record of Test Boring indicated as 11/6 refers to the Standard Penetration Test (SPT) and means 11 hammer blows drove the samplerS inches. SPT uses a 140-pound hammer falling 30 inches.

7. The N-value from the SPT is the sum of the hammer blows required to drive the sampler the second and third 6-inch increments.

8. The soil/rock strata interfaces shown on the Record of Test Boring are approximate and may vary from those shown. The soil/rock conditions shown on the Record of Test Boring refer to conditions at the specific location tested; soil/rock conditions may vary between test locations.

9. Relative density for sands/gravels and consistency for silts/clays and limestone are described as follows:

SPT Blows/ Foot	Sands/Gravels Relative Density	SPT Blows/Foot	Silt/Clay Relative Consistency	SPT Blows/ Foot	Limestone Relative Consistency
0-4	Very loose	0-2	Very Soft	0-20	Very Soft
5-10	Loose	3-4	Soft	21-30	Soft
11-30	Medium Dense	5-8	Firm	31-45	Medium Hard
31-50	Dense	9-15	Stiff	46-60	Moderately Hard
Over 50	Very Dense	16-30	Very Stiff	61-50/2"	Hard
		Over 30	Hard	Over 50/2"	Very Hard

10. Grain size descriptions are as follows:

NAME	SIZE LIMITS
Boulder	12 inches or more
Cobbles	3 to 12 inches
Coarse Gravel	3/4 to 3 inches
Fine Gravel	No. 4 sieve to 3/4 inch
Coarse Sand	No. 10 to No.4 sieve
Medium Sand	No. 40 to No. 10 sieve
Fine Sand	No. 200 to No. 40 sieve
Fines	Smaller than No. 200 sieve

11. Definitions related to adjectives used in soil/rock descriptions:

PROPORTION	ADJECTIVE
About 10%	with a trace
About 25%	with some
About 50%	and

APPROXIMATE ROOT DIAMETER	ADJECTIVE
Less than 1/32"	Fine roots
1/32" to 1/4"	Small roots
1/4"to1"	Medium roots
Greater than 1"	Large roots

APPENDIX 8

TEST EXCAVATION LOGS

RECORD OF TEST EXCAVATION
Douglas Park Improvements
NV5 PROJECT NO. 14774

TEST EXCAVATION NUMBER:	**TE-1**
DATE OF EXCAVATION:	November 25, 2015
OBSERVED BY:	G.Curioni
SURFACE ELEVATION, FEET NGVD:	10.6
DEPTH TO GROUNDWATER, FEET:	8.0
TERMINATION DEPTH, FEET:	8.0

DEPTH BELOW GROUND SURFACE, FEET	SOIL/ROCK DESCRIPTION
0.0-2.0	Dark Brown Sand with traces of Peat and some roots. (Top 1" Grass)- FILL
2,0--,4.0	Brown SAND with Limestone Fragments- FILL
4.0- 8.0	Dark Brown Sand & Debris (Wood, glass, tires & concrete fragments)- FILL

TEST EXCAVATION NUMBER:	**TE-2**
DATE OF EXCAVATION:	November 25, 2015
OBSERVED BY:	G.Curioni
SURFACE ELEVATION, FEET NGVD:	10.7
DEPTH TO GROUNDWATER, FEET:	9.0
TERMINATION DEPTH, FEET:	9.0

DEPTH BELOW GROUND SURFACE, FEET	SOIL/ROCK DESCRIPTION
0.0 – 2.0	Dark Brown Sand with traces of Peat and Roots. (Top 1" Grass) -FILL
2.0 -3.0	Grey Sand - FILL
3.0- 9.0	Dark Gray Sand with traces of Limestone fragments & Debris (Wood, glass and concrete fragments)- FILL

RECORD OF TEST EXCAVATION
Douglas Park Improvements
NV5 PROJECT NO. 14774

TEST EXCAVATION NUMBER:	**TE-3**
DATE OF EXCAVATION:	November 25, 2015
OBSERVED BY:	G. Curioni
SURFACE ELEVATION, FEET NGVD:	9.8
DEPTH TO GROUNDWATER, FEET:	9.0
TERMINATION DEPTH, FEET:	9.0

DEPTH BELOW GROUND SURFACE FEET	SOIL/ROCK DESCRIPTION
0.0-2.0	Dark Brown Soil with traces of Peat and some roots (Top 1" Grass)- FILL
2.0-4.0	Brown SAND with Limestone Fragments- FILL
4.0-9.0	Dark Brown Sand with Debris (wood, plastic & concrete fragments)- FILL

TEST EXCAVATION NUMBER:	**TE-4**
DATE OF EXCAVATION:	November 25, 2015
OBSERVED BY:	G. Curioni
SURFACE ELEVATION, FEET NGVD:	9.9
DEPTH TO GROUNDWATER, FEET:	9.0
TERMINATION DEPTH, FEET:	9.0

DEPTH BELOW GROUND SURFACE. FEET	SOIL/ROCK DESCRIPTION
0.0 – 2.0	Dark Brown Sand & roots (Top 1" Grass)- FILL
2.0-5.0	Dark Brown Sand & Debris (Wood, cans and glass)- FILL
5.0 – 9.0	Tan Sand with Limestone Fragments- FILL

RECORD OF TEST EXCAVATION
Douglas Park Improvements
NV5 PROJECT NO. 14774

TEST EXCAVATION NUMBER:	**TE-5**
DATE OF EXCAVATION: OBSERVED	November 25, 2015
BY:	G. Curioni
SURFACE ELEVATION, FEET NGVD:	11.2
DEPTH TO GROUNDWATER, FEET:	10.0
TERMINATION DEPTH, FEET:	10.0

DEPTH BELOW GROUND SURFACE, FEET	SOIL/ROCK DESCRIPTION
0.0-2.0	Dark Brown to Gray Sand with traces of Peat and roots (Top 1" Grass)- FILL
2.0- 4.0	Grey SAND- FILL
4.0 – 6.0	Tan Sand with Limestone Fragments- FILL
6.0- 10.0	Dark Brown Sand with Debris (Concrete Fragments)- FILL

TEST EXCAVATION NUMBER:	**TE-6**
DATE OF EXCAVATION:	November 25, 2015
OBSERVED BY:	G Curioni
SURFACE ELEVATION, FEET NGVD:	11.2
DEPTH TO GROUNDWATER, FEET:	9.0
TERMINATION DEPTH, FEET:	9.0

DEPTH BELOW GROUND SURFACE, FEET	SOIL/ROCK DESCRIPTION
0.0-2.0	Dark Brown Sand & roots (Top 1" Grass)- FILL
2.0-4.0	Brown Sand with Limestone Fragments- FILL
4.0- 9.0	Dark Brown Sand with Debris (Plastic, Wood and Metal) - FILL

RECORD OF TEST EXCAVATION
Douglas Park Improvements
NV5 PROJECT NO. 14774

TEST EXCAVATION NUMBER:	**TE-7**
DATE OF EXCAVATION:	November 25, 2015
OBSERVED BY:	G. Curioni
SURFACE ELEVATION, FEET NGVD:	11.7
DEPTH TO GROUNDWATER, FEET:	10.0
TERMINATION DEPTH, FEET:	10.0

DEPTH BELOW GROUND SURFACE, FEET	SOIL/ROCK DESCRIPTION
0.0-1.0	Dark Brown Sand with traces of Peat. (Top 1" Grass)- FILL
1.0-3.0	Brown Sand with brick fragments- FILL
3.0- 5.0	Grey Sand with Limestone fragments- FILL
5.0-10.0	Dar Brown Sand with debris (Wood, and concrete fragments) - FILL

TEST EXCAVATION NUMBER:	**TE-8**
DATE OF EXCAVATION:	November 25, 2015
OBSERVED BY:	G. Curioni
SURFACE ELEVATION, FEET NGVD:	11.3
DEPTH TO GROUNDWATER, FEET:	10.5
TERMINATION DEPTH, FEET:	10.5

DEPTH BELOW GROUND SURFACE, FEET	SOIL/ROCK DESCRIPTION
0.0-2.0	Dark Brown Sand with roots (Top 1" Grass) - FILL TAN
2.0-3.0	SAND with Limestone Fragments- FILL
3.0-4.0	Dark Brown Sand with trace of peat, wood & glass fragments. -FILL
4.0- 10.5	Brown Sand with traces of limestone fragments.- FILL

RECORD OF TEST EXCAVATION
Douglas Park Improvements
NVS PROJECT NO. 14774

TEST EXCAVATION NUMBER:	**TE-9**
DATE OF EXCAVATION:	November 25, 2015
OBSERVED BY:	G. Curioni
SURFACE ELEVATION, FEET NGVD:	11.9
DEPTH TO GROUNDWATER, FEET:	10.0
TERMINATION DEPTH, FEET:	10.0

DEPTH BELOW GROUND SURFACE, FEET	SOIL/ROCK DESCRIPTION
0.0 – 2.0	Dark Brown Sand with traces of Peat. (Top 1" Grass)- FILL
2.0- 5.0	Brown Sand with roots and Limestone Fragments.- **FILL** Dark
5.0- 10.0	Brown Sand with concrete fragments- FILL

TEST EXCAVATION NUMBER:	**TE-10**
DATE OF EXCAVATION:	November 25, 2015
OBSERVED BY:	G. Curioni
SURFACE ELEVATION, FEET NGVD:	10.8
DEPTH TO GROUNDWATER, FEET:	10.0
TERMINATION DEPTH, FEET:	10.0

DEPTH BELOW GROUND SURFACE, FEET	SOIL/ROCK DESCRIPTION
0.0- 1.0	Dark Brown Sand and roots. (Top 1" Grass) - FILL
1.0-3.0	Brown and with Limestone fragments- FILL
3.0-4.0	Dark Brown Sand- FILL
4.0 – 8.0	Grey Sand- FILL
8.0- 10.0	Dark Sand with Limestone fragments, wood and glass- FILL

RECORD OF TEST EXCAVATION
Douglas Park Improvements
NV5 PROJECT NO. 14774

TEST EXCAVATION NUMBER: DATE OF EXCAVATION: OBSERVED BY:

SURFACE ELEVATION, FEET NGVD:

DEPTH TO GROUNDWATER, FEET: TERMINATION DEPTH, FEET: DEPTH BELOW GROUND SURFACE FEET 0.0-1.0

1.0-4.0

4.0- 9.0

TE-11

November 25,2015

G. Curioni 11.35

9.0

9.0

SOIL/ROCK DESCRIPTION

Light tan to Gray Sand with roots (Top 1" Grass)- FILL Tan Sand- FILL

Dark Brown sand with Limestone Fragments and wood.- FILL

8-6

END OF SECTION

02050
DEMOLITION

1. DESCRIPTION

A. Furnish all labor, materials, equipment, and services to perform demolition and removal of debris from demolition operations as indicated on drawings and specified in this section.

2. QUALITY ASSURANCE

A. QUALIFICATIONS

2.A.1. Provide Staff responsible for demolition work fully experienced in this type of work.

2.A.2. Provide equipment of suitable type, in good working condition, and operated by skilled mechanics.

2.A.3. Perform work in safe and cautious manner to avoid accidents or property damage.

2.A.4. Removal and demolition of hazardous materials including asbestos shall be performed by a company licensed and qualified to do so.

B. REFERENCE STANDARDS

Comply with all codes and regulations regarding demolition work.

C. Shutdown and disconnect all electrical, gas, and water supply at source prior to start of any demolition. The building or structure to be demolished must disconnected from any supply source before demolition is undertaken.

D. If demolition contractor confronts any condition not mentioned on these instructions, call Architect for instruction on course of action prior to undertaking any demolition or other activity.

3. PRODUCTS

A. SALVAGED ITEMS

B. Other salvaged components will be the property of the contractor and shall be removed from the site immediately upon disconnection from building. Contractor to coordinate with Owner about salvageable items.

C. DEMOLITION

The Contractor shall be responsible for the demolition and removal of debris required to complete the construction as specified on the drawings. Existing unused electrical and plumbing shall be removed or adequately capped as allowed by code.

Demolition notes are a general outline of items to be removed. However, any items in the way of new construction must be removed and discarded in order to install new products.

4. EXECUTION

A. PERFORMANCE

4.A.1. Prevent damage to Owner's salvaged property during demolition.

B. Shore structure as required to prevent structural damage or collapse if the work includes demolition of structural elements. Remove finishes first in order to ascertain which items are of structural nature. Contractor shall provide an adequate shoring plan after removal of finishes. Said shoring plan should be prepared by a qualified professional Structural Engineer licensed to practice in the State of Florida.

C. Immediately upon removal of finishes, contact Architect for inspection of existing structure.

D. Removal, disposal and demolition of hazardous materials shall be done in accordance with all applicable codes, rules and regulations.

5. ADJUST AND CLEAN

A. Remove all demolition materials, debris and rubbish from site immediately upon completion of demolition work. Coordinate with Owner’s representative procedures for removal of items-hours, etc.

B. Do not permit any accumulation of debris on site.

C. Transport all demolition material without spillage in occupied areas, walkways, and streets.

D. Leave site neat and orderly on completion of demolition work.

END OF SECTION

02200
EARTHWORK

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Earthwork for buildings and grassed or landscaped areas as indicated on Drawings and specified in this section.

B. Related Sections:

1. 02221 - Excavating, Backfilling, and Compaction for Utilities.
2. 02280 - Soil Treatment.
3. 02900 - Landscaping.
4. 02935 - Sodding.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM), latest edition:

1.	C136	Test Method for Sieve Analysis of Fine and Coarse Aggregates.
2.	D422	Test Method for Particle-Size Analysis of Soils.
3.	D698	Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort.
4.	D1556	Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
5.	D1557	Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort.
6.	D2487	Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
7.	D2922	Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
8.	D2974	Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Materials.
9.	D 4972	Test Method for pH of Soils.

B. Miami-Dade County Public Works Manual (M-DCPW).

C. Florida Statute, Chapter 556, Underground Facility Damage Prevention and Safety.

D. Consumer Products Safety Commission (CPSC): A Handbook for Public Playground Safety.

1.3 QUALITY ASSURANCE

A. Trench Safety Act:

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

1.4 DEFINITIONS

A. "Satisfactory Fill Materials" include materials classified in ASTM D2487 as GW, GP, SW and SP properly worked by Contractor to obtain optimum moisture and compaction.

1. For Grassed or Landscaped Areas:

a. Within 1.5 feet of the surface of the indicated grade, limit rock size to 3 inches.
b. Below 1.5 feet of the surface of indicated grade, limit rock size to 12 inches.
c. Deeper than 6 feet limit rock size to 24 inches.

2. For Buildings:

a. Within 2 feet of the surface of indicated grade, limit rock size to 2 inches.
b. Below 2 feet of the surface of indicated grade limit rock size to 6 inches.

B. "Unsatisfactory Materials" include materials other than "Satisfactory Fill Materials". Materials of any classification determined by testing laboratory as too wet or too soft for providing a stable foundation for structure, paving, and walks will be classified as "unsatisfactory".

C. Degree of Compaction: Required compaction is expressed as a percentage of maximum density obtained by test procedures of ASTM D1557.

D. Building Area: The area bounded by lines not less than 4 feet beyond the outside line of the building perimeter footings.

1. Increase the 4-foot dimension by 1 foot for each foot of excavation depth required exceeding 4 feet.

1.5 SUBMITTALS

A. Submit the following before starting work:

1. Compaction Machinery Specifications.
2. Compaction Tests.
3. Soil Classification Tests using ASTM classification for subgrade materials and USDA classifications for topsoil materials.
4. Stabilized Subgrade Composition and Density.
5. Testing Laboratory.

1.6 SITE CONDITIONS

A. Determine location and nature of work, character of equipment, and facilities needed for performance of work, general, and local conditions prevailing at site, and other matters affecting work under this contract according to Instructions to Bidders and General Conditions.

B. Subsurface data, including soil borings, ground water elevations, or conditions, if shown on the drawings or attached to these specifications, are presented only as information available indicating conditions found and limited to exact locations and shall not be interpreted as an indication of conditions that may actually develop during construction.

1. Make deductions of subsurface conditions that may affect methods or cost of construction and agree that no claim for damages or other compensation shall be made, except as are provided for in the agreement, should conditions be found during construction different from those as calculated or anticipated by the Contractor.
2. Neither the City of Miami nor the A/E will be held responsible for variations found to exist between the subsurface data referred to above and actual field conditions that may develop during construction.

C. Where existing grades, utility lines, or substructures are shown on drawings, the City of Miami, and A/E assume no responsibility for correctness of existing conditions indicated.

1. Contractor shall locate indicated existing utility lines or substructures that may be affected by this Project and shall be responsible for any damage or injury they may sustain as a result from working on or near these existing utilities or substructures not specified to be removed or demolished.

D. Bench Marks and Monuments:

1. Maintain existing bench marks, monuments, and other reference points, and if disturbed or destroyed, replace as directed by A/E.

1.7 JOB CONDITIONS

A. Condition of Premises: Accept site as found and excavate, fill, compact, and backfill site as indicated on drawings and specified in this section.

B. Protection:

1. Adjacent Structures and Property:

a. Take precautions to guard against movement, settlement, injury, or loss to existing structures or to equipment and furnishings housed therein arising directly or indirectly in connection with this contract according to Instructions to Bidders and General Conditions.
b. Provide and place bracing or shoring as necessary or proper according to Instructions to Bidders and General Conditions.
c. Be responsible for the safety and support of such structures and facilities and be liable for any movement or settlement, damage, or injury caused by or resulting therefrom.

1) If, at any time, the safety of any adjacent structures or facilities appears to be in doubt, cease operations and take immediate precautions to support such structures and facilities and notify A/E at once.
2) Resume operations only after permission has been granted by A/E.

2. Adjacent Sidewalks and Streets:

a. Take precautions to guard against movement, settlement, or collapse of any sidewalks, curbs, or street passages on adjoining sites and be liable for any such movement, settlement, or collapse according to Instructions to Bidders and General Conditions.

1) Repair such damage promptly when so ordered at no cost to the City of Miami.
2) Install necessary shoring, including sheet piling as may be required, to protect banks, adjacent paving, structures, and utilities during excavations.
3) Be responsible for any damage to existing structures, equipment, and furnishings due directly or indirectly to construction operations. Except where removal is needed by site grading or location of new buildings, use every possible precaution to prevent injuries to landscaping, drives, curbs, and walks on or next to site of the work and replace, at no expense to the City of Miami, any of the above destroyed.

3. Existing Landscaping, Drives, Curbs, and Walks: Except where removal is required by site grading or location of new buildings, take every possible precaution to prevent injuries or loss to individual trees, groups of trees, and other existing landscaping, drives, curbs and walks on or next to the site of the work according to Instructions to Bidders and General Conditions, and replace any such damaged or destroyed at no cost to the City of Miami.

PART 2 PRODUCTS

2.1 MATERIALS

A. Field Topsoil Mixture:

1. Sand Component:

a. Sands shall be clean, sharp, natural sands, predominantly silica in nature.
b. The sand shall have the following particle size distribution using the USDA classification system:

PARTICLE NAME	SIZE (MM)	ALLOWABLE %
Gravel	(2.00-4.75)	Combined
Very Coarse Sand	(1.00-2.00)	Less than 12
Coarse	(0.50-1.00)	Combined
Medium Sand	(0.25-0.50)	60-80
Fine Sand	(0.10-0.25)	0-20
Very Fine Sand	(0.05-0.10)	0-5
Total Sand	90-100	
Silt	(0.002-0.05)	1-10 *
Clay	(minus 0.002)	1-10 *

(* Silt and clay combined shall not exceed 12 percent)

c. The sand shall have a pH less than 7.6 and a soluble salt value of less than 2.5 mmohs/cm.

2. Soil/organic Component:

a. A muck type soil shall be used. The soil shall have a USDA soil texture classification of loam, sandy clay loam, or sandy loam.
b. The soil shall contain 15 to 30 percent by weight organic matter (ASTM D 2974 Method C).

c. The soil shall have a pH between 5.5 and 7.5.
d. The soil shall have a soluble salt content less than 3.0 mmohs/cm.
e. Mixture shall be free of rocks, limbs, roots, and other deleterious matter.

PART 3 EXECUTION

3.1 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.

3.2 GENERAL

A. Public Safety: Accomplish work in a manner providing for the safety of the public and workers and the protection of property.

B. Construction: Do not close, obstruct, or store material or equipment in streets, sidewalks, alleys, or passageways without a permit according to local ordinances, regulations, codes, and the City of Miami's approval.

C. Interference: Conduct operations with minimum interference with roads and other facilities.

D. Removal:

1. Unless otherwise noted or specified to be relocated or stored, materials removed become property of Contractor and shall be removed completely away from site.
2. Do not store or allow debris to accumulate on site.
3. If Contractor fails to remove excess debris promptly, the City of Miami reserves the right to remove the debris at Contractor's expense.

E. Temporary Structures: Remove temporary structures when no longer required.

F. Repair:

1. Clean up, repair, or replace, at no cost to the City of Miami, property damage arising in connection with this Contract.
2. Patch and repair work shall match existing and be performed in a neat and professional manner by workers skilled in the trade involved.
3. This applies to damage to the newly graded areas within the building area limits and damage to adjacent properties by eroded materials.

G. Erosion Repair:

1. Take every precaution and temporary measure to prevent damage from erosion of freshly graded areas.
   a. Repair and reestablish grades to required elevations and slopes where settlement or washing occurs before acceptance of work at no cost to the City of Miami.
   b. This applies to damage to the newly graded areas within the building area limits and damage to adjacent properties by eroded materials

3.3 LOCATIONS AND ELEVATIONS

A. Be responsible for surveys, measurements, and layouts required for proper execution of the work.

1. Lay out lines and grades from existing survey control system and as shown on drawings.

B. Locate by stake and mark locations and elevations of following:

1. Elevations of existing earth cut and fill.
2. Final grades for landscape contours.
3. Other items as required to execute work as specified.

3.4 CLEARING AND GRUBBING

A. Within limits of areas designated for building area, grading and site construction work, remove trees, brush, stumps, wood debris, and other deleterious materials not required to remain as part of finished work.

B. Remove grass, plants, vegetation, and organic material from same area.

C. Burning of materials is not allowed on the site.

D. Remove accumulated material daily or as necessary to prevent fire hazard condition.

3.5 STRIPPING

A. Strip turf, organic material, surface litter, rubble, and overburden for entire depth of root system of grass or other vegetation within areas indicated on Site Plan.

B. Stockpile topsoil on site where directed.

C. 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.

3.6 EXCAVATION

A. Begin excavation after stripping, clearing, and grubbing has been completed.

B. Excavate to grades required to accommodate the proposed construction.

C. Dewater as specified.

D. Excavations for structures shall conform to dimensions and elevations indicated for each building.

1. Extend excavations a sufficient distance from walls and footings to allow for placing and removal of forms and installation of services, except where the concrete for walls and footing is authorized to be deposited directly against excavation surfaces.
2. Excavation below general machine excavation for footings and foundations shall be hand worked.
3. Bottoms of footings shall be on level planes.

E. Excavate in such a manner that quick and efficient drainage of storm water will occur.

F. Remove "unsatisfactory materials" encountered from the building areas.

G. Classify excavated materials and stockpile separately suitable soils for use as backfill materials. If sufficient quantities of excavated materials meeting requirements for backfill are not available on site, provide materials meeting these requirements.

H. Stockpile excavated material suitable for use as fill and backfill where directed by A/E.

3.7 FILLING, BACKFILLING, AND COMPACTION

A. Compaction:

1. Compact existing earth surfaces (exclude rock) after excavation, backfilling, and compaction of said areas to levels required with "Suitable Backfill Materials".

   a. Compact with equipment suited for soil compaction.
   b. Moisten or aerate material, as necessary, to provide moisture content to facilitate obtaining specified compaction with equipment being used.
   c. Compact each layer to not less than percentage of maximum density specified below, determined according to ASTM D1557, Method D.
   d. Insure compaction of previously prepared fill areas has been maintained before placing new layers.

	Location	Percent
1)	Under structures and building slabs, except footings, each layer.	95
2)	Under footings, top 1 foot in cut, each layer of fill.	95
3)	Under pavements and sidewalk areas, top 12 inches, each layer.	95
4)	Under pavements and sidewalk areas, below 12 inches, each layer.	90
5)	Under landscaped areas, each layer including physical education fields.	80-85

B. Filling and Backfilling:

1. Materials: "Satisfactory Fill Materials" shall be used in fills and backfills.
2. Place "Satisfactory Fill Material" in horizontal layers not exceeding 12 inches in loose depth.

   a. Compact as specified in this section.
   b. Do not place materials on muddy surfaces.

C. Reconditioning of Subgrade:

1. Where approved compacted subgrades are disturbed by the Contractor's subsequent operations or adverse weather, scarify and compact the subgrade as specified to required density before further construction occurs.
2. Use power driven hand tampers for recompaction over underground utilities

D. Backfilling:

1. Do not begin backfilling until:

    a. Construction below finished grade has been accepted.
    b. Underground utilities systems have been inspected, tested, and accepted.
    c. Forms have been removed.
    d. Excavation cleaned of trash and debris.

2. Bring backfill to indicated finished grades.
3. Backfill materials and compaction shall be as specified.
4. Do not place backfill in wet areas.
5. Do not operate heavy equipment for spreading and compacting backfill closer to foundation or retaining walls than a distance equal to height of backfill above top of footing.
6. Compact the area remaining by power-driven hand tampers suitable for material being compacted.
7. Place backfill carefully around pipes to avoid damage to the pipes.

E. Protection: Settlement or washing occurring in backfilled areas before acceptance of work shall be repaired and grades reestablished to required elevation and slope.

3.8 DISPOSAL OF EXCESS EXCAVATED MATERIALS

A. Excess "Satisfactory Fill Materials" and "Unsatisfactory Materials" shall become the property of the Contractor.
    1. Remove from site.

3.9 LASER GRADING

A. Provide gradients and elevations as shown in Construction Documents with current industry standard laser grading procedures using laser automated graders and laser automated dozers to ensure specified tolerances.

3.10 DEWATERING

A. Dewater excavations for inspection and for construction. Concrete or fill shall not be placed in water and concrete less than 8 hours of age shall not be subjected to ground water pressure.

1. Keep excavations free of water while backfilling or construction takes place.
2. Dispose of water resulting from dewatering operations according to city, county, state, and federal regulations.
3. Conduct operations to insure storm water runoff sediment is not discharged to the adjacent lakes, waterways, sewers, streets, and adjacent properties.

END OF SECTION

02221
EXCAVATING, BACKFILLING AND COMPACTION FOR UTILITIES

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 02200 - Earthwork.
2. 02660 - Water Systems.
3. 02720 - Storm Drainage System.
4. 02731 - Sanitary Sewer System.
5. 15047 - Identification.
6. Division 15 - Mechanical Work.
7. Division 16 - Electrical Work.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM), latest edition:

1. D1556 Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
2. D1557 Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort.
3. D2487 Practice of Classification of Soils for Engineering Purposes (Unified Soil Classification System).

B. Occupational Safety and Health Administration (OSHA): Trench Safety Act.

1.3 DEFINITIONS

A. "Satisfactory Fill Materials" include materials classified in ASTM D2487 as GW, GP, SW, and SP properly worked by Contractor to obtain optimum moisture and compaction. Maximum size of rock limited to 6 inches. Use 2-inch maximum size for the top 2 feet below the finish indicated grade.

1.4 SUBMITTALS

A. Submit copies of tests and records performed as specified to A/E for review before starting work.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with OSHA, Trench Safety Act, Standard 29 C.F.R.s., Chapter XVII, Subpart P (para. 1926.650 thru 1926.653).

1.6 PROJECT CONDITIONS

A. Excavation, filling, and backfilling for utilities complete for underground utility lines and structures as specified and as shown on the drawings.

B. Sidewalks and Streets:

1. Take precautions to guard against movements, settlement, or collapse of sidewalks or street passages on site or on adjoining property.
2. Be liable for any such movement, settlement, or collapse.
3. Repair promptly such damage.
4. Install shoring, including sheet piling, as may be required during excavation to protect trench banks, adjacent paving, structure, and utilities.

C. Existing Utilities:

1. Protect existing utilities from movement, settlement, or other damages according to Instructions to Bidders and General Conditions.

D. Trench Safety Act: Provide trench safety systems at all trench excavations where workers may be exposed to moving ground or cave-ins regardless of depth of trench. All trenches more than 5 feet in depth shall comply with OSHA "Trench Safety Act".

PART 2 PRODUCTS

2.1 MATERIALS

A. Trench Backfill Materials: Either satisfactory excavated material or fill materials as specified.

B. Pipe Bedding Material: Bedding material shall be selected or satisfactory backfill material and free of any rocks or stones larger than 2 inches in diameter for cast iron and PVC pipe. Limerock screenings or sand shall be used for copper tubing. (Underground copper lines are 3-inch diameter or less.)

PART 3 EXECUTION

3.1 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.

3.2 EXCAVATION

A. General:

1. Perform excavating of every description and of whatever substance encountered to depths indicated or specified.
2. Pile materials suitable for backfilling a sufficient distance from banks of trenches to prevent slides or cave-ins.
3. Keep surface drainage of adjoining areas unobstructed.
4. Remove excavated materials not required nor suitable for backfill from site.
5. Remove water by pumping or other acceptable method and discharge at a safe distance from excavation. Continue dewatering until deemed proper or desirable for the installation of utility lines.
6. Comply with the applicable standards and regulations of Miami-Dade County and the city where building is located.

7. Sheeting and shoring shall be done as is necessary for protection of work and for safety of personnel. Excavating shall be by open cut.

B. Trench Excavations:

1. Make trench of necessary width and depth for proper laying of pipe, with bank as vertical as practical.
2. Coordinate trench excavation to avoid open trenches for prolonged periods.
3. Grade bottom of trenches accurately to provide uniform bearing and support for each section of pipe on undisturbed soil at every point along their entire length, except portions of pipe sections where it is necessary to excavate for couplings and for proper making of pipe joints or where unsatisfactory materials incapable of properly supporting pipe and utility structures are encountered at bottom of trench.
4. Dig holes and depressions for joints after trench bottom has been graded of length, depth, and width required for properly making the particular type of joint.
5. When unsatisfactory soil, incapable of properly supporting pipe, is encountered at the bottom of the trench, remove such soil to a minimum depth of 12 inches, or 1/4 of the pipe diameter, whichever is greater, below the bottom of pipe and backfill material specified.
6. Over-depths in unstable soil excavation and unauthorized over-depths shall be at the expense of Contractor.

C. Special requirements relating to specific utilities are as follows:

1. Storm Drains and Sanitary Sewers:

a. Where shown on drawings, make width of trench at and below top of pipe adequate to allow space for workers to place and properly joint pipe.
b. Clear space between the barrel of the pipe and trench wall shall not exceed 8 inches on either side of the pipe.
c. Width of the trench above the level may be as wide as necessary for sheeting and bracing and proper performance of the work.
d. For plastic pipe, where shown on drawings, make depth of trench to allow a minimum of 24 inches of cover over the top of 2-1/2" or less pipe and a minimum of 36 inches of cover over the top of 3 inch or larger pipe from finished grade unless otherwise indicated or required by local utility. Install metallic detection tape 4 inches - 6 inches below finish grade. See Section 15047 - Identification.
e. Round the bottom of the trench so at least the bottom quadrant of the pipe shall rest firmly on undisturbed soil or select bedding for as nearly the full length of the barrel as proper joining operations will allow.
f. Trenches for plastic pipe shall be cut to an over-depth of not less than 6 inches and a cushion of rock free soil or coarse sand used for not less than 6 inches bedding and 12 inches backfill over the plastic pipe.
g. Perform this part of the excavation manually a few feet ahead of the pipe laying operation by workers skilled in this type of work.

2. Water Lines, Force Mains, and Gas Lines:

a. Where shown on drawings, make depth of trench to allow a minimum of 24 inches of cover over the top of the pipe from finished grade unless otherwise indicated or required by local utility.
b. For plastic pipe, install metallic detection tape 4 inches - 6 inches below finish grade. See Section 15047 - Identification.

c. Avoid interference of water lines with other utilities, grade water lines to avoid air pockets.
d. Trenches for plastic pipe shall be cut to an over-depth of not less than 6 inches and a cushion of rock free soil or coarse sand used for not less than 6 inches bedding and 12 inches backfill over the plastic pipe.

3. Electrical Conduit or Cables:

a. Trenches for plastic conduits shall be a depth providing not less than 24 inches of cover from finished grade or 12 inches or greater of cover from underside of slabs to accommodate bending radii, unless otherwise indicated. Install warning tape 8 inches below finish grade or underside of slab. See Section 15047 - Identification.
b. Trenches for plastic conduit and cables shall be cut to an over-depth of not less than 3 inches and a cushion of rock free soil or coarse sand used for not less than 3 inches bedding and 3 inches backfill over the plastic conduit and cable.

4. Excavating for Appurtenances:

a. Excavations for structures shall be sufficient to leave at least 12 inches in the clear between their outer surfaces and the embankment or shoring used.
b. Whenever unstable soil is incapable of properly supporting the structure is encountered in the bottom of the excavation, such soil shall be removed and excavation backfilled as specified herein in paragraph "Trench Excavation".
c. Unauthorized over-depths or under-depths in wet or otherwise unstable soil shall be filled with selected backfill material or concrete, as directed, at the expense of the Contractor.

3.3 EXCAVATION OF UNCLASSIFIED MATERIAL

A. Materials encountered during the excavating to the depth and extent specified and indicated on drawings may include rock, concrete, masonry, or other similar materials.

1. No adjustment will be made in the Contract Price because of the presence (or absence) of rock, concrete, masonry, or other similar materials.

3.4 PROTECTION OR REMOVAL OF UTILITY LINES

A. Protection:

1. Protect existing utility lines indicated on drawings (or the locations of which are made known to Contractor before excavating and trenching) specified to remain, including utility lines constructed during trenching operations, from damage during trenching, backfilling, and compacting operations.

a. If such new or existing utility lines are damaged during trenching, backfilling, and compacting operations, repair or replace at no cost to A/E.

2. When utility lines specified to be removed or replaced are encountered within the area of operations, issue notices in ample time for measures to be taken to coordinate necessary interruption of services.

B. Repair of Damage to Unknown Existing Utility Lines:

1. Existing utility lines not shown on drawings (or the location of which is not known to Contractor in time to avoid damage) damaged during trenching operations shall be repaired by Contractor and an adjustment to the Contract Price will be made according to Instructions to Bidders and General Conditions.

3.5 BACKFILLING

A. General:

1. Coordinate backfilling with testing of utilities. Leave sheeting in place where damage is likely to result from withdrawal.
2. Carefully backfill trenches with satisfactory specified materials.
3. Bring backfill up evenly in 9-inch maximum layers, loose depth, and thoroughly and carefully compact with mechanical or hand tampers until pipe has a minimum cover of one foot. Take care not to damage the pipe.
4. Deposit remainder on the satisfactory backfill material in the trench in one-foot layers and compact by mechanical means to percentages as specified.

a. Trenches and excavation pits improperly backfilled or where settlement occurs shall be reopened to the depth required for proper compaction, refilled and compacted, with the surface restored to the specified grade and compaction.

1) Keep excavations free of ground and surface water until backfilling operation is complete.

B. Appurtenances:

1. At structures, remove forms and trash before backfilling:

a. Place satisfactory backfill materials symmetrically on all sides in 9-inch maximum loose depth layers.
b. Moisten each layer, if necessary, and compact with mechanical or hand tamper, taking care not to injure the structure by excessive tamping.

2. Materials and density shall be as previously specified for trenches depending upon location of the structure.

C. Compaction:

1. Material may be compacted by a hand tamper, a powered hand tamper, a vibrating tamper, or mechanized power tamper provided such compaction percentages meet the required density as specified below.
2. Backfilling and compacting by means of hydraulic methods will not be allowed except as may be approved by A/E.

a. Compact each layer to not less than the percentage of maximum density specified below, determined according to ASTM D1557, Method D:

FILLS AND BACKFILL	COHESIONLESS SOIL
Under slabs and pavement	95%
Under walk areas, top 12 inches	95%
Under walk areas, below top 12 inches	90%
Under landscape areas	85%
Under other areas noted on Site Plan	85%

3.6 TESTING

A. Notify, Contractor providedTesting Laboratory to perform specified tests.

B. Tests of Materials shall be as follows:

1. Laboratory Tests for Moisture Content and Density:

a. According to ASTM D1557, one test for each material encountered or proposed to be used.

2. Field Tests for Moisture Content and density:

a. According to ASTM D1556, one test per layer per 100 linear feet of ditch.

END OF SECTION

02280
SOIL TREATMENT

PART 1 GENERAL

1.1 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.
2. 03300 - Cast-In-Place Concrete.
3. 07262 - Vapor and Radon Retarder.

1.2 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.

1.3 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.

B. Field Samples:

1. Test samples of the mixture of the concentrate and water will be taken by Contractor provided Testing Laboratory.
2. If sample solution indicates noncompliance with the manufacturer's application requirements, the Contractor shall pay for the initial test performed any subsequent retesting required by the City of Miami, and reapplication of soil treatment solution.

1.4 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.

1.5 WARRANTY

A. Upon completion of soil treatment and as a condition of substantial completion, furnish the City of Miami 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 City of Miami, 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 City of Miami. 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 City of Miami.
5. Warranty bond shall be drawn in favor of the City of Miami, successor, or assigns and shall be non-cancelable by all parties to the contract except the City of Miami.

PART 2 PRODUCTS

2.1 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. Termidor, fipronil, Aventis Environmental Science.
6. Premise, imidicloprid, Bayer Corporation.
7. Dragnet SFR, permethrin, FMC Corporation.
8. Prelude, permethrin, Zeneca.

PART 3 EXECUTION

3.1 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.

3.2 APPLICATION

A. Before mixing concentrate and water as recommended by the manufacturer for specific application and conditions, contact the City of Miami 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.

3.3 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

02513
PORTLAND CEMENT CONCRETE PAVING

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 02200 - Earthwork.
2. 02221 - Excavating, Backfilling, and Compaction for Utilities.
3. 02529 - Concrete Sidewalk, Straight Curb, Curbs, Gutters, and Wheel Stops.
4. 03300 - Cast-In-Place Concrete.

1.2 REFERENCES

A. American Concrete Institute (ACI)-318, latest edition.

B. American Association of State Highway and Transportation Officials (AASHTO) Standard.

1. T-180 Moisture-Density Relations of Soils Using a 10 lb. Rammer and an 18-inch Drop.
2. T-181 In-Place Density of Compacted Base Courses Containing Large Sizes of Coarse Aggregates.

C. American Society for Testing and Materials (ASTM), latest edition:

1. C78 - Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading).
2. C192 - Practice for Making and Curing Concrete Test Specimens in the Laboratory.
3. D1751 - Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

1.3 SUBMITTALS

A. Submit the following for review before starting work:

1. Concrete design mix and proving flexural strength (modulus of rupture) tests.
2. Expansion joint filler data.
3. Joint sealer data.
4. Proposed finish procedure and technique for placing the concrete.
5. Results of concrete tests as specified.
6. Results of field tests of compaction of base course.

1.4 QUALITY ASSURANCE

A. Comply with ACI 318 - Recommended Practices for Construction of Concrete Pavements and Concrete Bases, and applicable requirements of Section 03300-Cast-In-Place Concrete, except as specified.

PART 2 PRODUCTS

2.1 MATERIALS

A. Base Course: Provide 12-inch stabilized subgrade compacted to a maximum density of 95 percent as determined by AASHTO T-180.

B. Concrete for concrete pavement shall have a 28-day modulus or rupture of 650 psi as determined by the requirements as specified.

1. Minimum compressive strength shall be 3,000 psi at 28 days.

C. Joint sealing: Comply with Fed. Spec. SS-S1401 or SS-S-200d (cold applied).

D. Premolded expansion joint filler: Comply with ASTM D1751.

PART 3 EXECUTION

3.1 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.

3.2 PREPARATION

A. Surface Requirements:

1. The finished test standard pavement surface in both transverse and longitudinal directions shall have a maximum deviation from the specified plane of $\pm$ 1/8".
2. Corrections shall be by grinding with the ground finish to match the specified finish.
3. Exterior paving shall have a maximum deviation from the specified grade of 1/8" in 10 feet.

3.3 APPLICATION

A. The surface finish, a medium broom finish after troweling, requires acceptance by the A/E.

B. Joints:

1. Contraction Joints:

a. Place as indicated and to be perpendicular to the finish grade of the concrete.
b. Joints shall be cut to a depth of 1/4 of the slab thickness by cutting with an edging tool having a 1/4" radius or by sawing with a blade producing a cut not less than 1/8" in width.
c. Saw joints within 24 hours of concrete placement.

2. Expansion Joints:

a. Place where indicated on the drawings, using 1/2" thick preformed expansion joint material.
b. Anchor with accepted devices to prevent displacement during pouring and finishing.

c. Edges shall be rounded with an edging tool.
d. Joints shall be full depth of concrete except that top edges shall be 1/2" below the finish concrete surface.
e. Seal expansion joints by filling with joint sealing compound. Joints shall be clean and dry before sealing compound is put in place.

3. Construction joints are to be used at indicated locations to stop concrete pours.

C. Curing: Methods of curing shall be accepted by the A/E.

3.4 TESTING

A. Laboratory and field testing shall be made by Contractor contracted testing laboratory.

B. Testing requirements for concrete as specified shall be according to the requirements of Cast-In-Place Concrete - Section 03300 of these specifications, and as specified.

C. Design mixes and testing requirements for the concrete pavement shall be flexural strength tests of concrete as basis for design.

D. Where the flexural strength of the concrete is specified, make 1 strength test and one flexural test following (ASTM C192 and ASTM C78) for each 100 cubic yards or fraction thereof placed per day. Number of cylinders shall be 3 for strength test and 3 for flexural test. Test one at 3 days, one at 7 days and one at 28 days.

E. Base Course: Provide 1 field density test at each location of the concrete paving according to Section 02200 - Earthwork.

END OF SECTION

02529
CONCRETE SIDEWALKS, STRAIGHT CURBS, CURBS, GUTTERS & WHEEL STOPS

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 02200 - Earthwork.
2. 03300 - Cast-In-Place Concrete.

1.2 REFERENCE STANDARDS

A. Miami-Dade County Public Works Manual (M-DCPW), latest edition.

B. Florida Department of Transportation (FDOT), latest edition, Standard Specifications for Road and Bridge Construction.

1. Delete the basis of payment and other pay measurement requirements from FDOT specifications.
2. Payment for work specified in this section will be included as part of lump sum bid for entire project according to Construction Documents.

1.3 SUBMITTALS

A. Submit properly identified manufacturer's literature and installation instructions before starting work.

B. Shop Drawings: Submit precast wheel stop shop drawings.

C. Concrete Tests: Submit for review.

1.4 QUALITY ASSURANCE

A. Perform tests according to the specified standards.

B. Provide reinforcing at extruded curbing.

PART 2 PRODUCTS

2.1 MATERIALS

A. Concrete:

1. Provide concrete for sidewalks, straight curbs, curbs, gutters, and wheel stops as specified in Section 03300.
2. For work on Public Right of Way: Comply with applicable requirements from Miami-Dade County Public Works (M-DCPW) and FDOT Section 520 "Concrete Gutter, Curb Elements, and Traffic Separator".

PART 3 EXECUTION

3.1 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.

3.2 INSTALLATION

A. Concrete Sidewalks: Provide as indicated on drawings and specified in Section 145 of M-DCPW.

B. Straight Curbs: Provide as indicated on drawings and specified in Section 520 of FDOT.

C. Curbs and Gutters: Provide as indicated on drawings and specified in Section 520 of FDOT.

D. Wheel Stops: Approximately 6 inches x 8 inches x 6 feet. long, reinforced precast concrete, anchored with at least two 5/8" round reinforcing bars driven 18 inches into ground as indicated on drawings. Units as made by Denmark Cast Stone Co. or Precast Corp.

3.3 TESTING

A. Provide tests as specified in Section 03300, M-DCPW and Section 520 of FDOT.

END OF SECTION

02660
WATER SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. A complete underground domestic/fire water supply system, with all necessary accessories indicated on drawings or specified in this section.
2. System shall start from an existing water main located either inside or outside the property line, having sufficient capacity, and extended to within 5 feet from the new building services or as indicated in the drawings and connection to lines furnished under other sections of specifications.
3. The system's total installation cost shall include the costs imposed by the utility, municipality, and federal agencies having jurisdiction. System's costs include, but are not limited to:

    a. Furnishing and installing the water meters.
    b. Tapping to the existing lines as shown on the drawings and the services extension to the point of use.
    c. Installation and permit fee.
    d. Meter and tapping fees.
    e. Reduced pressure backflow preventers for domestic water, full sized, aboveground, complete with concrete pad and fencing.
    f. Fire line, full sized, aboveground, double check valve backflow preventer, complete with OS&Y valves, concrete pad, chains, and tamper switches, with installation and applicable items Underwriters Laboratories (UL) listed and Factory Mutual (FM) approved.
    g. Piping, pipe coatings, valves, backflow preventers, valve boxes, meter box or vault, and any other item or accessory required for a complete water supply system installation from the point of connection to the point of use shall be either provided by the Contractor directly or paid for by the Contractor.
    h. Site restoration inside and outside the property line including road restoration.

4. The City of Miami will only pay the meter deposits.

B. Related Sections:

1. 02221 - Excavating, Backfilling and Compacting for Utilities.
2. 03300 - Cast-In-Place Concrete.
3. 09900 - Painting of Unpainted Surfaces.
4. Division 15 - Mechanical Work.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM), latest edition:
1. A53/A53M Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
2. B88 Specification for Seamless Copper Water Tube.
3. D2241 Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe.

4. D1785 Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
5. D3139 Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.

B. American National Standards Institute (ANSI), latest edition:

1. A21.4 Cement-mortar Lining for Cast-iron and Ductile Iron Pipe and Fittings for Water.
2. A21.6 Cast-iron Pipe Centrifugally Cast in Metal Molds, for Water or Other Liquids.
3. A21.8 Cast-iron Pipe Centrifugally Cast in Sand-lined Molds, for Water or Other Liquids.
4. A21.11 Rubber Gasket Joints for Cast Iron and Ductile Iron Pressure Pipe and Fittings.
5. A21.51 Ductile-iron Pipe, Centrifugally Cast in Metal Molds or Sand-lined Molds, for Water or Other Liquids.
6. B16.22 Wrought Copper and Bronze Solder Joint Pressure Fittings for Piping under 3 Inches in Diameter.
7. B16.3 Malleable Iron Threaded Fittings, 150 and 300 Lbs.

C. American Water Works Association (AWWA), latest edition:

1. B300 Hypochlorites.
2. B301 Liquid Chlorine.
3. C203.66 Coal Tar Enamel Protective Coating for Steel Water Pipe.
4. C5OO Gate Valves - 3" through 48" for Water and Other Liquids.
5. C601 Disinfecting Water Mains.
6. C800 Threads for Underground Service Line Fittings.
7. C900 Polyvinyl Chloride Pressure Pipe.

1.3 SUBMITTALS

A. Submit manufacturer's literature on the following items before starting work.

1. Pipe and fittings, complete with gaskets and lubricants.
2. Valves.
3. Solder and flux.
4. Chemical solvents.
5. Sterilizing chemicals.
6. Test reports and certificates.
7. Backflow preventers.
8. Fire hydrants.
9. Detector check valve.

B. Certification: Submit certification that solder used for copper tubing joints is lead free and complies with specifications.

1.4 QUALITY ASSURANCE

A. Provide manufacturer's certificate of compliance or certified analysis with each shipment of materials used.

PART 2 PRODUCTS

2.1 MATERIALS

A. Cast Iron Pipe:

1. ANSI S21.6 or A21.8, cement mortar lined, working pressure minimum 150 psi.
2. Standard thickness cement mortar lining shall comply with ANSI A21.4.
3. For all water and fire mains inside the property line, for sizes 3 inches and above.

B. Ductile Iron Pipe:

1. ANSI A21.51, cement mortar lined, working pressure minimum 150 psi.
2. Standard thickness cement mortar lining shall comply with ANSI A21.4.
3. For all water and fire mains inside and outside the property line, for sizes 3 inches and above. Pipe also allowed where required by Miami-Dade County Public Works Manual for use in backflow preventer installations.

C. Polyvinyl Chloride Pipe:

1. AWWA C-900, DR 18, 150 psi minimum working pressure.
2. For all water and fire mains inside and outside the property line, for sizes 4 inches and above.

D. Polyvinyl Chloride Pipe:

1. ASTM D2241, SDR 26, 160 psi minimum working pressure.
2. For non-fireline use inside the property line, sized 3 inches and above.

E. PVC Pipe:

1. ASTM D1785, Schedules 40, and 80.
2. For sizes below 3 inches.

F. Copper Tubing:

1. ASTM B88, Type "K" or "L".
2. For sizes below 3 inches.

G. Galvanized Steel Pipe:

1. ASTM A120.
2. For sizes below 3 inches.
3. Allowed only where mandated by Miami-Dade County Public Works Manual for use in backflow preventer installations.

H. Joints:

1. ASTM D3139, PVC push-on joints.

    a. For 3 inches diameter and above:
    b. Rubber gaskets and lubricants: ASTM D3139.

2. Schedule 40 PVC piping below 3 inches diameter:

a. Solvent welded according to manufacturer's written recommendations.
b. Do not thread schedule 40 pipe.

3. Copper Water Tubing Joints:

a. Sweat solder joints using tin-antimony solder and flux according to manufacturer's recommendations without using lead compounds.

4. Cast Iron and Ductile Iron Pipe:

a. Push-on Joints: ANSI A21.11
b. Rubber Gaskets and Lubricants: Applicable requirements of ANSI A21.11.

5. Galvanized Steel Pipe:

a. AWWA C800.
b. Joints shall be threaded.

6. Dissimilar Metal Joints: Consist of a sandwich-type flange insulating gasket of the dielectric type, insulating washers, and insulating sleeves for flange bolts (for installation between non-threaded ferrous and non-ferrous metallic pipe).

a. Make gaskets full faced with outside diameter equal to the flange outside diameter.
b. Provide full length bolt insulating sleeves.
c. Make units of a shape to prevent metal-to-metal contact between dissimilar metallic piping elements.

I. Fittings and Special Items:

1. For PVC Piping:

a. Fittings: ASTM D2466 and D3139.
b. Solvent welding: Comply with manufacturers written recommendations.

2. For Copper Tubing:

a. Sweat solder type red bronze or wrought copper complying with ANSI B16.22.
b. Solder: 95-5 tin-antimony solder. Solder containing lead is not acceptable.

3. For Cast Iron and Ductile Iron Pipe:

a. Suitable for 150 psi pressure rating.
b. Pipe, fittings, and special items shall have standard thickness cement mortar lining complying with ANSI A21.4.
c. Fittings and Special Items for Use with Push-on Joints Pipe: ANSI/AWWA C110 and A21.1 1.

4. For Galvanized Steel Piping less than 3 inches.

a. Steel fittings shall be galvanized malleable iron.
b. Screwed fittings: ANSI Bl 6.3.
c. Dresser-type fittings shall not be used.

J. Gate Valves Not in Fire Service.

1. Design gate valves for a WOG working pressure of 150 psi minimum.

    a. Connect valves as required for the piping in which they are installed.
    b. Valves smaller than 3 inches shall be rising stem.
    c. Provide a clear waterway equal to the full nominal diameter of the valve. Valve shall open by turning counter clockwise.

2. Valves Smaller Than 3 Inches:

    a. Nibco Scott T-143.
    b. Crane 431-UB.
    c. Milwaukee 1150.
    d. Other A/E accepted equivalent.

3. Valves 3 Inches and Larger:

    a. Iron body, bronze mounted, AWWA C500.
    b. Crane 461/462, Nibco Scott F-619, Milwaukee F-2882 or other A/E accepted equivalent.

K. Fire Service Valves.

1. Design valves for a WOG working pressure of 175 psi minimum. Valves shall be UL listed and FM approved.
    a. Connect valves as required for the piping in which they are installed.
    b. Provide gate valves with a clear waterway equal to the full nominal diameter of the valve. Valve shall open by turning counter clockwise.

2. Underground Gate Valves:
    a. Crane 4621/2.
    b. Other A/E accepted equivalent.

3. Check Valves:
    a. Crane 375.
    b. Nibco Scott F-908-B
    c. Other A/E accepted equivalent.

L. Domestic Water Reduced Pressure Backflow Preventer.
1. Reduced Pressure Backflow Preventer: Full pipe sized and designed for a pressure drop not to exceed 13 psig at full flow, provided adequate water pressure may be maintained at the most remote water closet fixture while flushing plus a 5 psig safety margin.
2. Mount at heights complying with Miami-Dade Water and Sewer Department (M-DWS) Standard Details WS 4.18 latest edition.
3. 2 Inches and Smaller:

    a. Watts Model FAE-909S, with bronze strainer and flanged adapter ends.
    b. Provide drain line with Watts Model 909 AG Series air gap, as directed by A/E.

4. 3 Inches and Larger:

a. Watts Model 909-S-QT-FDA, or accepted equivalent with FDA approved epoxy coated strainer and quarter turn FDA epoxy coated ball valve shut-offs.
b. Provide drain line with Watts Model 909 AG Series air gap as directed. Provide intermediate support as required.

5. Provide fenced enclosure complete with top cover and lockable access door, either on side or top of fence, as required.

M. Valve Boxes:

1. Cast Iron:

a. Traffic type for use at all asphalted locations. Valve box shall be extension type with slide-type adjustment and flared base. Minimum metal thickness 3/16". Provide concrete minimum 8 inches deep and 8 inches around base of valve box.
b. Cover shall have the work "Water".
c. Provide ductile iron riser pipe of sufficient diameter to surround valve's bolted bonnet and sufficient length to enter 6 inches into valve box proper.
d. Cast iron valve boxes may be used at non-traffic locations when approved by A/E.

2. Pre-Cast Concrete:

a. Shall be used in non-asphalted areas, have the word "Water" embossed or permanently affixed on the cover.
b. Valve boxes shall be Brooks Products Inc. 36, 37, 38 or 66 series having either cover or lid weighting not less than 16 pounds. Size of valve box shall be adjusted to the size of the valve.
c. Provide extensions as required so depth of box reaches bottom of valve.

3. Precast Polymer Concrete:

a. Quazite by Strongwell, Lenoir City, TN or accepted equivalent.
b. The word "Water" shall be permanently embossed on the cover.
c. Provide standard colors as selected by A/E.
d. Not to used where exposed to vehicular traffic.

N. Meters and Vaults: Water meters and vaults shall comply with the utility company having jurisdiction in the area.

O. Thrust Blocks, Tie Rods, and Socket Clamps:

1. Provide concrete for thrust blocks according to Section 03300 Cast-in Place Concrete. Provide thrust blocks for all push-on type joint water piping, at each pipe junction, dead ends, and change in direction.
2. Provide tie rods and socket clamps underground near each building entrance and elsewhere as required to prevent piping from joint disassembly or blow-out.
3. Transitions to aboveground piping shall be done sufficiently underground to minimize requirements for aboveground tie rods and socket clamps.

P. Miscellaneous Items:

1. Disinfection:

a. Chlorinating materials complying with the following:

1) Chlorine, Liquid: AWWA B301.
2) Hypochlorite, Calcium, and Sodium: AWWA B300.

Q. Piping Materials:

1. Domestic Water Piping:

a. Exterior Aboveground: Copper Type "L", except at aboveground backflow preventers where steel piping shall be used according to M-DWS and Public Works Manuals.
b. Exterior Underground: PVC, cast iron, ductile iron, "K" or "L" copper tubing.

PART 3 EXECUTION

3.1 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.

3.2 INSTALLATION

A. Install main according to the requirements of authorities having jurisdiction and AWWA Standard C600.

3.3 HANDLING

A. Handle pipe and accessories to insure delivery to the trench in sound, undamaged condition.
1. Take care not to injure pipe coating.
2. Repair damaged coating or lining, if any, of any pipe or fitting in a satisfactory manner at no cost to the City of Miami.
3. Do not place pipe or materials of any kind inside a pipe or fitting after coating has been applied.
4. Carry pipe into position. Do not drag it.
5. Pinch bars or tongs for aligning or turning pipe may be used only on bare ends of pipe.
6. Clean interior of pipe and accessories of foreign matter before lowering into trench.
7. Keep pipe clean during laying operations by plugging or other accepted method.
8. Inspect pipe for defects before installation.
9. Replace material found defective before or after laying with sound material without cost to the City of Miami.
10. Store rubber gaskets not immediately installed in a cool, dark place.

3.4 PIPE CUTTING

A. Cut pipe in a neat and professional manner without damage to the pipe.

1. Cut with an accepted type of mechanical cutter unless otherwise recommended by manufacturer and authorized by A/E.

a. Use a wheel cutter when practical.

3.5 LOCATING

A. Outside property Line:
   1. Do not lay pipe closer horizontally than 10 feet from the edge of a sewer line except where bottom of water pipe will be at least 18 inches above the top of the sewer pipe.
   2. For further requirements comply with Miami-Dade Water and Sewer Authority Department Standard Detail WS 4.61.

B. Inside property Line:
   1. Do not lay pipe closer horizontally than 5 feet from the edge of a sewer line except where bottom of water pipe will be a least 12 inches above the top of the sewer pipe.
   2. Comply with Florida Building Code (FBC) - Plumbing, paragraphs 608.3 and 608.4.
   3. Where water lines do not meet the above conditions, encase sewer line in concrete, minimum 4 inches thick, for a distance of at least 5'-1" each side of the crossing, or sewer lines shall be made of cast iron pipe with no joint located within 5'-1" horizontally of crossing. The water line may also be sleeved, with the edges of the sleeve being caulked, for a distance of 5'-1" horizontally from the edge of the sewer line.
   4. Water lines shall cross above sewage force mains a minimum of 2 feet above force main.

C. Do not lay water lines in same trench with sewer, gas, or fuel lines or electrical conduit.

D. Maintain a minimum vertical separation of 12 inches between pipes where non-ferrous metallic pipe (copper) crosses any ferrous piping material.

3.6 PLACING AND LAYING

A. Carefully lower pipe and accessories into trench by means of derrick, ropes, belt slings, or other authorized equipment.

   1. Do not drop or dump any water line materials into trench.
   2. Avoid abrasion to pipe coating.
   3. Lay pipe, except where necessary to make connections with other lines, with bells facing direction of laying.
   4. Rest full length of each section of pipe solidly upon pipe bed, with recesses excavated to accommodate bells, coupling and joints.
   5. Take up pipe that has had grade or joint disturbed after laying.
   6. Do not lay pipe in water or when trench conditions are unsuitable for the work.
   7. Securely close open end of pipe, fittings and valves when work is not in progress.
   8. Keep water out of trench until jointing work is complete.
   9. Repair damage to existing piping, or to new piping coating or lining in a satisfactory manner without cost to the City of Miami.
   10. Valve, plug, or cap and anchor pipe ends left for future connections.
   11. Place a metallic location tape above all plastic lines, Seton 37220 or 37222 as required.
   12. Provide clean sand minimum 6 inches all around plastic lines.

3.7 JOINTING

A. Cast Iron Pipe: Install push-on type joints according to AWWA C600.

B. Galvanized Steel Pipe: screw joints shall be made tight with a stiff mixture of graphite and oil, inert filler and oil, or with an acceptable graphite compound, applied with a brush to the male threads only. Compounds shall not contain lead.

C. Copper Tubing: Sweat solder fittings using solder and flux. Connections made with solder containing lead are not allowed. Joints with lead shall be disassembled, solder remaining removed, and reconnected using the specified solder, at no additional cost to the City of Miami.

D. Insulating Joints: Install according manufacturer's requirements.

E. Connections between different type of pipe and accessories shall be made with transition fittings accepted by A/E.

3.8 SETTING OF VALVES AND BOXES

A. Install where shown or specified and set plumb at finished grade.

B. Valve boxes shall be centered on the valves.

1. Boxes shall be installed over each outside gate valve unless otherwise shown.
2. Where feasible, valves shall be located outside the area of roads and parking.
3. Earth fill shall be carefully tamped around each valve box to a distance of 4 feet on all sides of the box, or to the undisturbed trench face if less than 4 feet.

3.9 METER, BACKFLOW PREVENTER, DETECTOR CHECK VALVE, AND VAULTS

A. Install according to local utility company standards, as specified, and as indicated on drawings.

B. Blocking shall be placed between solid ground and the hydrant or fitting to be anchored.

C. Unless otherwise indicated the base and thrust bearing sides of thrust blocks shall be poured directly against undisturbed earth.

D. The sides of thrust blocks not subject to thrust may be poured against forms.

E. The area of bearing shall be as shown.

F. Blocking shall be placed so that the fitting joints will be accessible for repair.

G. Steel rods and clamps shall be protected by galvanizing or by coating with coal tar enamel coating.

3.10 HYDROSTATIC PRESSURE TEST

A. Test:

1. After pipe is laid, joints completed, and trench partially backfilled, leaving joints exposed for examination, subject newly laid water piping or any valved section of water piping to a one hour, 150 psi hydrostatic pressure test, unless otherwise specified.
2. Open and close each valve several times during test.

3. Carefully examine exposed pipe, joints, fittings and valves during the partially open trench test.
4. Replace or remake joints showing visible leakage as necessary.
5. Remove and replace cracked or defective pipe, joints, fittings, or valves discovered after this pressure test with sound material.
6. Repeat test until results are satisfactory.
7. Replace, repair and retest as required at no cost to the City of Miami -
8. Test shall be according to and accepted by the local utility company.
9. Test shall be also accepted by the A/E.

B. Time for Making Test:

1. Except joint material setting or where concrete reaction backing requires a 5-day delay, pipelines or couplings may be subjected to hydrostatic pressure, inspected and tested for leakage any time after partial completion of backfill.
2. Cement mortar lined pipe may be filled with water as recommended by manufacturer before being subjected to pressure test.

C. Concurrent Hydrostatic Test and Disinfection:

1. Despite sequence of tests employed, results of pressure tests and disinfection shall be satisfactory as specified.

   a. Replace, repair, or retest as required at no cost to the City of Miami.

2. Pressure test and disinfection may be conducted separately or hydrostatic tests and disinfection may be conducted concurrently, using water tested for disinfection to accomplish hydrostatic test.
3. If water is lost when treated for disinfection and air is admitted to piping unit being tested, or if any repair procedure results in contamination of piping unit, repeat disinfection procedures until satisfactory results are obtained.

3.11 DISINFECTION

A. Before acceptance of potable water operation, disinfect each unit of completed water piping as prescribed by AWWA C601.

3.12 CLEANUP

A. Upon completion of installation of water lines and appurtenances, remove debris and surplus materials resulting from work.

3.13 TESTS

A. Cost of tests by Contractor.

END OF SECTION

02720
STORM DRAINAGE SYSTEM

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 02221 - Excavating, Backfilling, and Compaction for Utilities.
2. 03300 - Cast-in-place Concrete.

1.2 REFERENCES

A. The American Society for testing and Materials (ASTM), latest edition:

1. A53	Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
2. A74	Specification for Cast Iron Soil Pipe and Fittings.
3. C131	Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
4. C443	Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets (Metric).
5. C564	Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
6. D3034	Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

B. The American Association of the State Highway Transportation Officials (AASHTO).

C. Florida Department of Transportation (FDOT), latest edition, Standard Specifications for Road and Bridge Construction.

1. Delete the basis of payment and other pay measurement requirements from FDOT specifications.
2. Payment for work specified in this section will be included as part of lump sum bid for entire project according to Construction Documents.

D. Miami-Dade County Department of Environmental Regulations -Drainage Wells.

E. Miami-Dade County Health Department - Drainage Wells.

F. Miami-Dade County Public Works Manual - Standard Specifications (DCPW).

G. Cast Iron Soil Pipe Institute.

H. City of Miami Public Works Engineering Standards for Design and Construction (CoM-PWESDC)

1.3 SUBMITTALS

A. Submit properly identified shop drawings and manufacturer's catalog cuts, technical data, and certificates on the following for review before starting work.

1. Precast concrete structures.
2. Frames and grates.
3. Pipe.
4. Test reports.
5. Plastic filter fabric.

B. Include manufacturer's certificates of compliance or certified analysis according to applicable standards with each shipment of material.

1.4 QUALITY ASSURANCE

A. Work shall be performed according to plans and specifications in a neat and accurate manner.

B. Wells shall be installed by a qualified well driller, licensed by the State of Florida, actively engaged in well drilling work and with a minimum of 5 years' experience in installing wells.

C. Contractor shall be totally responsible for the design, construction, installation, development, and testing of disposal wells to provide the City with completed wells adequate for the performance required of the wells as indicated on the drawings and as specified.

1.5 STORAGE

A. Keep materials, structures, equipment, and appurtenances stored on the site clean and free of foreign materials.

B. Replace damaged items at no cost to the City.

1.6 PROJECT CONDITIONS

A. Comply with Standards and Regulations of Florida State and Miami-Dade County Health Departments and Department of Environmental Regulations for drainage well and detention tanks.

PART 2 PRODUCTS

2.1 MATERIALS

A. High Density Polyethylene Storm Drainage Pipe:

1. Advance Drainage Systems, Inc.
2. Hancor, Inc.

B. Corrugated Metal Pipes:

1. Helically corrugated aluminum alloy round pipe shall comply with AASHTO M196. 16 gage thickness unless otherwise indicated on the drawings.

2. Helical corrugated aluminum-alloy pipe perforated shall comply with AASHTO M196. 16 gage thickness unless otherwise indicated on the drawings.

a. Perforated pipe shall have perforations of 1/4" to 3/8" diameter holes at + 2-3/4" o.c., with a minimum of 114 holes per linear foot.

3. Helically corrugated steel pipe shall comply with AASHTO M36. Pipe shall be fully bituminous coated according to the requirements of AASHTO M190, for Type A. Thickness: 16 gage unless otherwise indicated on the drawings.

4. Joint: Locking bands with a rubber or neoprene gasket for a flexible watertight joint. Locking band shall comply with AASHTO M36 and gasket shall comply with ASTM C443.

C. PVC Sewer Pipe and Fittings: ASTM D3034 for SDR 35.

1. Joints: Bell spigot type, elastomeric gasket joints.

D. Cast Iron Soil Pipe: Comply with ASTM A74 for Cast Iron Soil Pipe and Fittings.

1. Joints: Provide with roll-on joints complying with ASTM C564 and Cast Iron Soil Pipe Institute recommendations for compression joints.

E. Black Steel Pipe: Comply with ASTM A53 for schedule 40 Pipe and Fittings.

F. Well Casing: Black steel pipe with a minimum wall thickness of 5/16", diameter as indicated on drawings, complying with ASTM A53.

1. Casing cover as specified on drawings.

G. Detention Tank and Well Manhole: Cast-in-place concrete or precast concrete with hinged covers and frames as specified on drawings.

H. Catch Basins and Storm Manholes: Cast-in-place concrete or precast concrete, with cast iron frames and hinged grates as indicated on drawings and specified in Section 425 of FDOT Specification.

I. Ballast Rock: Ballast rock shall be obtained from fresh water local sources. When subjected to ASTM C131 tests, the loss shall not exceed 40 percent. Ballast rock designated as 2 inches shall fall within the 3/4" to 2-1/2" range.

J. Plastic Filter Fabric: Plastic filter fabric shall comply with Section 985 of the FDOT "Plastic Filter Fabric" for the piping trench.

PART 3 EXECUTION

3.1 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.

3.2 INSTALLATION

A. Excavation and Backfilling for Trenches and Manholes: As specified in Section 02221-Excavating, Backfilling, and Compaction for Utilities.

B. Placing Pipe:

1. Carefully examine each pipe before laying. Do not use defective or damaged pipe.
2. Lay pipelines to grades and alignment indicated.
3. Provide proper facilities for lowering sections of pipe into trenches.
4. Inspect pipe in place before backfilling and remove and replace those damaged during placement at no cost to the City.
5. Storm Sewer Pipe:

a. Shape bottom of trench by hand to give uniform circumferential support to lower one fourth of each pipe.
b. Where applicable, lay pipe upgrade with tongue or spigot ends pointing in direction of flow.
c. Lay each pipe true to line and grade indicated on drawings and in such a manner to form a close concentric joint with adjoining pipe and to prevent sudden offsets of flow line.
d. Keep interior of storm sewer free of dirt and superfluous materials as work progresses.
e. Keep a suitable swab or drag in pipe where cleaning after laying is difficult due to small pipe size and pull forward past each joint immediately after each jointing has been completed.
f. If maximum width of trench at top of pipe as specified is exceeded, install either concrete cradling, pipe encasement or other bedding as may be required to support added load of backfill.
g. Keep trenches for sections of sewer free from water until pipe-jointing material has set and trench backfilled.
h. Do not lay pipe when condition of trench or weather is unsuitable for such work.
i. Keep open ends of pipes and fittings securely closed at times when work is not in progress.
j. If pipe cannot be adequately supported on undisturbed earth or tamped backfill, encase pipe in concrete or support it on a concrete cradle.

C. Seepage Trenches:

1. Excavate trench to depth indicated.
2. Place filter fabric and ballast rock to the level of the proposed pipe.
3. After pipe has been laid and approved, place ballast rock carefully so as not to displace pipe and tamp carefully.
4. Fill the trench to level indicated with ballast rock of the size or sizes indicated.
5. Install filter fabric as indicated on plans. Backfill and compact according to Section 02221.

6. Provide concrete slab cover and specified in "Concrete Work", Division 3, and as indicated in drawings.

D. Concrete Structure:

1. Concrete structures shall be constructed according to plans and as specified on Concrete Work - Division 03300, excavation and backfill as specified in Section 02221 - Excavating, Backfilling, and Compaction for Utilities, DCPW, and as indicated on the drawings.
2. Leveling courses at structures for manholes and catch basins shall be 3 to 12 inches and according to DCPW SD4.5.

E. Detention Tank: Detention tank shall be constructed as indicated on drawings.

F. Catch Basins and Manholes: Frames and Inlet Grates or Solid Covers: Set the cast iron frames and grates in a bed or mortar and carefully adjust to elevations shown on the drawings.

G. Disposal Well:

1. Construction:

a. Drill and construct as indicated on drawings.
b. Provided casing with drive shoe and other necessary accessories.

2. Required Discharge: Provide sufficient length to discharge a minimum of _____ gpm in a saline ground water table with 3,000 ppm chloride or more.

a. Drive well casing to a seat in rock before developing well capacity. The entire cost of the above described disposal wells shall be included in the Contractor's lump sum price bid. No additional payment will be made.

3. Well manhole shall be constructed as indicated on drawings and as specified in Section 02221, Excavation, Backfilling and Compacting for Utilities.

3.3 CLEAN UP

A. If drainage well has been used for disposal of water from dewatering operation, upon completion of dewatering clean out the detention tank and perform capacity tests as specified to ensure that the disposal well is capable of disposing of storm water as indicated on drawings and specified in this Section.

3.4 FIELD QUALITY CONTROL

A. Test according to the following:

1. Pumping from well, for a minimum of 2 hours duration to demonstrate, to the satisfaction of the A/E, that the well has the capacity to absorb the amount of disposal indicated on drawings and specified in this Section. Test shall be paid by the Contractor.

END OF SECTION

02731
SANITARY SEWER SYSTEM

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Sanitary sewer system including necessary accessories indicated on drawings and specified in this section. Contractor shall include in his bid price any amount imposed by the utility company having jurisdiction to connect into the existing sanitary system.

B. Related Sections:

1. 02221 - Excavating, Backfilling, and Compaction for Utilities.
2. 03300 - Cast-in-Place Concrete.
3. Division 15 - Mechanical Work.

1.2 REFERENCES

A. American Society for testing and Materials (ASTM), latest edition:

1. A74 Specification for Cast Iron Soil Pipe and Fittings.
2. C564 Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
3. D2321 Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
4. D3034 Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
5. D3139 Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
6. F477 Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

B. Cast Iron Soil Pipe Institute.

C. Florida Building Code (FBC) - Plumbing.

1.3 SUBMITTALS

A. Submit properly identified manufacturer's literature including data on pipe before starting work.

B. Submit test reports and certificates for approval.

1. Certificate: Submit manufacturer's certificate of compliance or certified analysis according to applicable standards for each shipment of materials.

1.4 PRODUCT STORAGE

A. Store materials on site and keep clean and free of foreign materials. Any damaged items shall be replaced at no additional cost to the City.

PART 2 PRODUCTS

2.1 MATERIALS

A. Pipe and Fittings:

1. Polyvinyl Chloride (PVC) Sewer Pipe and Fittings:

a. Comply with ASTM D3034 for SDR35 and except where indicated otherwise on the drawings. Use bell and spigot type pipe.
b. The pipe shall be colored with a different color from water pressure pipe and force main for in ground identification as sewer pipe.

2. Cast Iron Soil Pipe and Fittings: Comply with ASTM A74 for cast iron soil pipe and fittings.

B. Pipe Joints:

1. PVC Sewer Pipe: Elastomeric gasket joints providing a watertight seal.
2. Cast Iron Soil Pipe and Fittings: Furnish with roll-on joints complying with ASTM C564 and Cast-Iron Pipe Institute Recommendations for Compression Joints.

C. Manholes: Cast in place concrete or precast concrete with cast iron frames and hinged covers as indicated on drawings and as specified in Section 03300 - Cast-in-Place Concrete.

D. Cleanouts: Commercially manufactured wye branches and as indicated on drawings.

PART 3 EXECUTION

3.1 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.

3.2 LOCATION

A. Where location of sewer is not clearly defined, do not locate sewer closer horizontally than 10 feet to a water supply main or service line, except that where bottom of water pipe will be at least 18 inches above top of sewer pipe. Horizontal spacing may be a minimum of 6 feet within the City of Miami property.

1. Where gravity-flow sewers cross above waterlines, fully encase sewer pipe for a distance of 10 feet on each side of crossing in concrete or provide acceptable pressure pipe with no joint closer horizontally than 3 feet to crossing.
2. The thickness of the concrete encasement including that at the pipe joints shall be not less than 4 inches.

B. Excavation and backfilling for trenches and manholes shall be as specified in Section 02221 - Excavating, Backfilling, and Compacting for Utilities.

3.3 INSTALLATION

A. Placing Pipe:

1. Shape bottom of trench by hand to give uniform circumferential support to the lower fourth of each pipe.
2. Where applicable, pipe laying shall proceed upgrade with tongue or spigot ends pointing in direction of flow.
3. Lay each pipe true to line and grade indicated on drawings and in such manner to form a close concentric joint with adjoining pipe and to prevent sudden offsets of flow line.
4. As work progresses, clean interior of sewer of dirt and superfluous materials.

    a. Where cleaning after laying is difficult because of small pipe size, a suitable swab or drag shall be kept in the pipe and pulled forward past each joint immediately after joint has been completed.
    b. If maximum width of trench at top of pipe as specified is exceeded, install either concrete cradling, pipe encasement or other bedding as may be required to support added load of backfill.

5. Keep trenches for all sections of sewer free from water until the pipe-jointing has set and trench backfilled.

    a. Do not lay pipe when condition of trench or weather is unsuitable for such work.

6. At time is not in progress, keep open end of pipes and fittings securely closed.

    a. When conditions prevent pipe from being adequately supported on undisturbed earth or tamped backfill, encase the pipe in concrete or support it on a concrete cradle.
    b. Pipe and fittings shall be installed according to ASTM D2321.

B. Pipe Joints:

1. Polyvinylchloride (PVC) Pipe: Install joints according to ASTM D3212 and approved manufacturer's installation procedures.
2. Cast Iron Soil Pipe: Install roll-on joints according to Cast Iron Soil Pipe Institute for compression joints.

C. Manholes:

1. Construction: As indicated on drawings and as specified in Section 02221 - Excavating, Backfilling and Compacting for Utilities.

    a. Frames and Covers: Set the cast iron frames and covers in a bed of mortar and carefully adjust to elevations shown on drawings.

D. Cleanouts: Install commercially manufactured wye branches where indicated on the drawings. Cutting into pipe for connection will not be allowed except in special cases when accepted by the A/E.

E. Pipe Connections to Existing Structures: Make finished work to comply as nearly as practicable to essential applicable requirements for new structures, including all necessary concrete work, cutting, and shaping. Coordinate work with utility company having jurisdiction.

3.4 TESTING AND INSPECTION

A. Inspect sewer lines by checking each section for alignment.

1. A full circle of light shall be seen by looking through the pipe at a light held at opposite end of the section of sewer line being inspected.
2. Make any corrections required in line or grade.

B. Leakage Tests:

1. Test lines for leakage by either infiltration tests or exfiltration tests, as appropriate.
2. Backfill trench before testing for leakage, up to at least the lower half of pipe.
3. If required, place sufficient additional backfill to prevent pipe movement during testing, leaving joints uncovered to allow inspection.
4. Correct visible leaks encountered regardless of leakage test results.
5. Measure infiltration when water table is two feet or more above top of pipe at upper end of pipeline section to be tested, using a suitable weir or other acceptable device.
6. When infiltration cannot be properly tested, an exfiltration test shall be made by filling the line to be tested with water so that a head of at least 2 feet is provided above both water table and top of pipe at the upper end of pipe to be tested.
7. Allow filled line to stand until pipe has reached its maximum absorption, but not less than 4 hours. After absorption, reestablish the head.
8. The amount of water required to maintain this water level during a 2-hour test or exfiltration test shall not exceed 0.4 gallons/inch diameter per 100 feet of pipeline per hour.
9. When leakage exceeds maximum amount specified, satisfactory correction shall be made and retesting accomplished.
10. Testing, correction and retesting shall be made at no additional cost to the City.

END OF SECTION

02810
IRRIGATION SYSTEM

PART 1 GENERAL

1.01 SUMMARY

A. Related Sections:

1.	02200 -	Earthwork.
2.	02221 -	Excavating, Backfilling, and Compaction for Utilities.
3.	02900 -	Landscaping.
4.	02935 -	Sodding.
5.	Division 16 -	Electrical.

1.02 WORK INCLUDED

A. Provide labor, materials, necessary equipment, and services to complete the underground sprinkler systems work, as indicated on the drawings and as specified, except for items indicated as not-in-contract (NIC).

B. The completed and proper construction of the landscape irrigation system shall include, but not be limited to:

1. A complete and operable system for the irrigation of areas to be landscaped on the project site.

    a. Size the pump for the number of circuits/zones for proper irrigation during a maximum 5 hour per day irrigation cycle to achieve 1.5 inches per week.
    b. Maintain operation of the remaining existing system where needed, while construction of the new system is under way.
    c. Plans and specifications are intended to include items obviously necessary and requisite for the proper irrigation of the project.
    d. Provide any additional labor, materials, and equipment required for a proper system.

2. For existing sites, locate, interface, and connect, where indicated, the existing system to the proposed.
3. Repair any of the existing irrigation system damaged during construction.
4. The City of Miami will supply as-built-plans of the existing system.

C. On-Site Conditions.

1. Protection of Property:

    a. Preserve and protect site conditions to remain from damage due to this work. In the event damage does occur, damage shall be completely repaired to its original condition at no additional cost to THE CITY.

2. Trenching:

a. Trenching or other work under the leaf canopy of trees shall be done by hand or by other methods so that no branches are damaged in any way.
b. Trenching around existing plant material shall be done by hand to minimize root disturbance.
c. Buildings, walks, walls, and other property shall be protected from damage. Open ditches left exposed shall be flagged and barricaded by approved means.
d. Restore disturbed areas to their original condition.

3. Protection and Repair of Underground Utilities:

a. Request the proper utility company to stake the exact location of any underground lines including but not limited to electric, gas, telephone service, water, and cable.
b. Take whatever precautions necessary to protect underground lines from damage. In the event damage does occur, damage shall be completely repaired to its original condition, at no additional cost to THE CITY.

4. Protection of Existing Plants and Site Conditions:

a. Take necessary precautions to protect site conditions to remain. Should damages be incurred, repair the damage to its original condition at no additional cost to THE CITY.
b. Any disruption or disturbance of any existing plant, tree, shrub, or turf, or any structure shall by completely restored to the satisfaction of THE CITY at no additional cost to THE CITY.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM):

1.	A53-96	Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
2.	D1785-96a	Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
3.	D2564-96a	Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
4.	D2855-96	Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.

1.04 SUBMITTALS

A. Submit properly identified manufacturer's literature before starting Work.

B. Submit Shop Drawings on the following:

1. Pipe and Fittings.
2. Sprinkler Heads.
3. Swing joints.
4. Pump.

5. Gate Valve.
6. Electric Control Valve.
7. Pressure Gage.
8. Controller.
9. Foot Valve.
10. Compound Gage.
11. Pressure Switch.
12. Backflow Preventors.
13. Valve Boxes.
14. Pressure Relief Valve.
15. Hydropneumatic Tank.

C. Record Drawings:

1. After completion of installation, furnish completed as-built reproducibles showing locations of sprinkler heads, valves, drains, and piping to scale, with dimensions where required or necessary.

    a. Show vertical and horizontal deviations from the bid documents made during construction affecting, but not limited to, the mainline pipe, controller locations, remote control valves, quick-coupling valves, and sprinkler heads.
    b. The drawing shall also indicate and show approved substitutions of size, materials, manufacturers' names, and catalog numbers.
    c. Piping shall be dimensioned and drawn to scale.
    d. Remote control valves and isolation valves shall have 2 measurements from fixed objects.

2. The A/E will supply one complete set of sepia mylar prints to be used for Record Document submittal. Transfer record documents information outlined above to these reproducible prints.
3. At contract close out, deliver the completed set of sepia mylar prints fully updated and containing the information outlined above to the A/E for THE CITY.
4. Furnish two blueline copies of "as-built" drawings. These drawings shall be delivered to the Landscape Architect before his review for Substantial Completion of the work.

D. Operation and Maintenance Manuals:

1. Prepare and deliver to the Landscape Architect within ten calendar days before completion of construction a minimum of three hard cover binders with three rings containing the following information:

    a. Index sheet stating the contractor□s address and business telephone number, list of equipment with names and addresses of local manufacturers' representatives.
    b. Catalog and parts sheet on every material and equipment installed under this contract.
    c. Complete operating and maintenance instructions on major equipment components.
    d. Provide THE CITY 's maintenance personnel with instructions for major

equipment and show evidence in writing to the Landscape Architect at the conclusion of the project that this service has been rendered.

e. Furnish a reduced color-coded copy of the as-built drawings laminated in plastic and mounted inside the controller cover. Note the valve number on drawings and include same number on tag attached to valve or engrave on outside cover of valve box.

1.05 WARRANTY

A. Fully warrant the landscape irrigation system for a period of one year after the written confirmation from the Landscape Architect that the warranty period is in effect.

B. During the warranty period, enforce manufacturer□s and supplier□s warranties. Any malfunctions, deficiencies, breaks, damage, disrepair, or installation by the contractor and his suppliers shall be immediately and properly corrected to the proper order as directed by THE CITY or Landscape Architect.

C. Make full and immediate restoration for any damages caused by system malfunction at no additional cost to THE CITY.

PART 2 PRODUCTS

2.01 MATERIALS

A. Pipe and Fittings:

1. All materials throughout the system shall be new and in working condition.
2. Underground Piping:

a. Main lines (Irrigation lines on the supply side of the system up to the zone control valves).

1) Pipe 4" Diameter and Less: Schedule 40 PVC plastic pipe 1120 or 1220, NSF approved, and complying with ASTM D1785.
2) Pipe Larger than 4" Diameter: PVC plastic pipe, SDR 21, 1120, or 1220, complying with to ASTM D2241 with a minimum pressure rating of 200 psi.
3) Fittings: PVC molded fittings manufactured of the same material as the pipe and suitable for solvent weld. Slip joint ringtie seal (SCH 40) complying with ASTM D 2466 or threaded connections (SCH 80) complying with ASTM D2464.

b. Lateral lines (Irrigation lines on the sprinkler head side of the system from the control valves to the sprinkler heads.)

1) Schedule 40 PVC plastic pipe 1120 or 1220, NSF approved, and complying with ASTM D1785.

c. Swing Joints:

1) Triple elbow swing joints for all rotors and quick coupling valves.
2) Nipples: PVC complying with ASTM D1785, Type 1, Grade 1,

Schedule 80.
3) Poly-pipe swing joints are not allowed.
4) Fittings schedule 40 PVC ells and street ells.

3. Above Ground Piping:

a. Spray nozzle riser pipe: UV radiation resistant SCH 80 PVC nipple.

4. Pipe Sleeves: Schedule 40 galvanized steel pipe providing minimum 1/2" clearance between sleeve and PVC sprinkler pipe.

B. Solvent Cement: Heavy body grey, according to ASTM D2564.

C. Thrust Blocks:

1. Main line piping shall have thrust blocks sized and placed according to pipe manufacturer□s recommendations and as shown on drawings.
2. Thrust blocks shall be standard concrete mix according to ASTM C150, ASTM C33, and ASTM C94 with a 28-day compressive strength of 3,000 PSI.
3. Thrust blocks shall be installed at tees, elbows, 45's crosses, reducers, plugs, caps, and valves.
4. Ensure stability of thrust blocks.

D. Sprinkler Heads:

1. Provide sprinkler heads as scheduled on Drawings.
2. Paint above grade risers for stationary head with 2 coats of exterior flat black paint unless already black painted by manufacturer.

E. Gate Valve: Nibco Model T-111, all bronze body, Class A, Type II, or accepted equivalent.

F. Control Valve Box: Precast polymer concrete box and green lockable cover with the words "Irrigation Valve".

1. L.R. Nelson Corp.
2. Quazite by Strongwell, Lenoir City, TN.

G. Irrigation Control Wire:

1. Electrical control and ground wire shall be irrigation control cable. Wiring used for connecting the automatic remote-control valves to the automatic independent station controllers shall be Type "UF", 600-volt, solid copper, single conductor wire with PVC insulation and bear UL approval for direct underground burial feeder cable.
2. Insulation shall be 4/64" thick minimum covering of an approved thermoplastic compound for positive waterproof protection of the following sizes:

a. Control wire form independent station controllers to electric valves shall

be AWG Size 14/1.

b. Any major controller wire splices (10-12wires) need to be in junction box.

3. Verification of wire types and installation procedures shall be checked to conform to local codes.

H. Quick Coupler Valves:

1. Quick coupling valves shall be 3/4" Rainbird #3RC Series single piece valve.
2. Valve shall be mounted on tripe swing joint as shown on drawings.
3. Provide Rainbird #33K Series quick coupler keys and two 3/4" swivel hose ells to THE CITY for each quick coupling valve installed.
4. Quick couplers shall be located and installed as specified.

I. Pumps:

1. Self-priming centrifugal end suction type with capacitor start motor designed for continuous operation and with ball bearings and steel shaft by Sta-Rite or accepted equivalent.
2. Furnish starter with pump.

a. Base and diffuser shall be cast iron with bronze impeller.
b. Capacity as indicated on Drawings.

J. Electric Zone Control Valve:

1. Brass body rated at 200 psi with, with brass valve, flow control and manual shut-off, Toro 21.
2. Non-corrosive piston and cylinder assembly, 24 volts AC solenoid.

K. Controller:

1. Electromechanical, 14-day, 24 hours, 110 volts, 60 Hz AC with 24 volts output, RC Series by Rainbird or Monitor by Toro.
2. Provide number of stations as shown in Drawings.
3. Provide complete with internal transformer.
4. Provide pump switch control circuit.

L. Pressure Relief Valve:

1. Watts No.53L or accepted equivalent.
2. Sized as indicated on Drawings.

M. Pressure Gage:

1. 4-1/2" diameter drawn steel case, 0-100 psi range, Marshalltown No.23, or accepted equivalent.
2. Provide gage cock.

N. Foot Valve:

1. Flomatic Model 60-S, bronze body, or accepted equivalent.
2. Valve shall be 4-inch size.

O. Compound Gage:

1. 4-1/2" steel case, Marshalltown Model 45, or accepted equivalent.
2. Provide gage cock.

P. Pressure Switch: Mercoid Series "D", with visible calibrated dial or accepted equivalent.

Q. Backflow Preventor: Reduced pressure type. Comply with local authority requirements and as indicated on Drawings.

R. Hydropneumatic Tank: As indicated on Drawings.

S. Wells:

1. Wells shall comply with South Florida water management guidelines.
2. 6-inch nominal diameter, standard weight galvanized steel drive pipe with butt welded joints, flow capacity as shown on Drawings.
3. Bronze fitted pump with air and heat release valves.
4. Provide domestic water hose bibb in pump room.
5. Provide hose bibb connection at pump piping suitable for priming connection.
6. Well system suction line from well to pump and discharge pipe from pump to 10 feet outside building wall shall be schedule 40 galvanized.
7. Provide a well system for all other areas consisting of either a turbine pump or centrifugal split case pump with a 60-gallon minimum pressure tank, depending on the type of area being irrigated.

    a. System design shall include a pressure switch interlocked with the controller and pump starter.
    b. Pressure switch shall have high and low settings for emergency shut down.

T. Solvent Cemented Joints in PVC Pipe and Fittings: According to ASTM D2855.

U. Rain Sensor/Rain Switch: As indicated on drawings.

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. Excavation, Placing Piping, and Backfilling:

1. Excavate trenches for underground piping to provide:

    a. A minimum of 24 inches cover under pavement without pipe sleeve.
    b. A minimum of 12 inches cover with pipe sleeve:
    c. A minimum of 12 inches cover in landscaped areas for lateral lines 4" and under.
    d. A minimum of 18 inches cover in landscaped areas for main lines.
    e. A minimum of 24 inches cover in landscaped areas for main lines larger than 4".
    f. The pipe and fittings shall be carefully inspected before installation of trench.
    g. Rocks over 2 inches in diameter and unsuitable bearing material shall be removed from trench according to manufacturer's recommendations.

2. Backfill shall be carefully placed to avoid pipe dislocation.

    a. Backfill material shall be free of rocks, stumps, roots and other unsuitable material.
    b. Backfill shall be placed in six-inch lifts and shall be thoroughly compacted, except in planting area where planting soil is used.
    c. In planting areas, the top six inches shall be suitable planting soil.
    d. Backfill under pavement or sidewalks shall be compacted to 98 percent of maximum A.A.S.H.O. T-180 density.
    e. The surface of backfilled trenches shall be even with the surrounding ground surface.

3. Plant and portable classroom locations shall take precedence over sprinkler and pipe locations. The contractor shall coordinate the routing of lines and final head locations with the placement of specimen trees, shrubs and portable classrooms.

4. After pipe has been installed and tested, cover with 3 inches of rock-free soil and backfill trenches to grade.

    a. Backfill shall be tamped in place.
    b. Remove from the site, materials not suitable or required for backfill.

5. Coordinate underground piping location with new tree locations and portable building locations to avoid interference.

B. Swing Joints: Install sprinkler heads on the swing joints as indicated on Drawings.

C. Threaded Joints in PVC Pipe and Fittings:

1. Use Teflon thread tape or liquid Teflon thread lubricant.
2. Do not use pipe wrenches or pump pliers on PVC pipe or fittings.

D. Sprinkler Heads:

1. Install flush with the finished grade, or as called for in Drawings.
2. Sprinkler heads located along curbs and edges of paving shall be installed 6 inches from back of curb or paving. Along roadways without curbs, sprinkler heads shall be located 18 inches from edge of pavement.

E. Controllers:

1. Equip with lighting protection and grounded to a standard 5/8" copper clad steel ground rod driven a minimum of 8 feet into the ground and clamped.
2. Surge protection of 10 OHMS or less is required. If grounding rods will not give the 10 OHMS or less, 150 feet of bare #6 wire shall be installed 8 inches to 12 inches deep into an irrigated area.
3. This wire shall be connected to the ground rod by a brass, single piece clamp.
4. Wire used to connect equipment to grounding rod shall be one size larger than largest wire used on the irrigation system at same location, and connected with a brass, single piece clamp.

F. Control Wire Installation:

1. Install control wires at least 18 inches below finish grade and lay to the side of the main line. Provide a minimum of 24 inches of looped wire slack at valves and snake wires in trench to allow for contraction of wires. The color-coded wires in bundles at 10-foot intervals. The wire shall be laid in the trench before the installation of the pipe. The wire shall be beneath and 6 inches to the side of the main line pipe.

2. Underground splices shall be made at electric valves in valve boxes. Solder splices and coat with elastomeric waterproof cement. Wrap with electrical tape and coat again with elastomeric waterproof cement.
3. Wire passing under existing of future paving or construction shall be encased in Schedule 40 PVC conduit extending at least 12 inches beyond edges of paving and stabilized for construction. Any wire in plant beds shall be placed in 3/4" Class 160 PVC with 18-inch minimum burial. Installation procedures shall comply with local codes.
4. Electrical connections to electrical control devices shall be made with Rainbird Pen-Tite connector or accepted equivalent.

G. Well:

1. Case the well through sand and seat in rock.
2. Develop the well by pumping continuously at the rate of 240 gpm minimum or until the water is free of sand.
3. Well Depth: Minimum 50 feet.

H. VALVE AND VALVE BOX INSTALLATION

1. Gate Valves: Install as located and detailed on the drawings. Position boxes in straight line layouts.
2. Quick Coupling Valves:

a. Install on main line pipe in areas shown on the drawings.
b. The connection between the main line and quick coupler valve shall be with a threaded Schedule 40 PVC pipe and triple swing joint.

3. Electric Control Valves:

a. Install in specified valve boxes.
b. The valve shall have 6 inches of 3/4" pea gravel installed below the bottom of the valve.
c. The valve shall be connected to the main line as shown in the details.
d. If the valve box does not extend to the base of the valve, a valve box extension shall be installed.
e. Electric control valves shall be installed where shown and grouped together where practical. Place no closer than 36 inches to walk edges, building, and walls. Placement shall neatly reflect the adjacent site geometry.
f. Adjust the valve to provide flow rate or rated operating pressure required for each sprinkler circuit.

I. PAINT

1. Exterior alkyd enamel, forest green, or as accepted by THE CITY, shall be used on aboveground PVC risers and other designated irrigation equipment.
2. Provide paint sample before starting painting.

3.03 CLEANING, TESTING, AND BALANCING

A. Before testing, thoroughly flush piping system until clean.

B. Do not cover piping system with backfill until tests are satisfactorily performed.

C. Hydrostatically test the piping system at 100 psi for 1 hour with no loss in pressure.

1. Test the piping system with plugs at swing joint and branch the locations.
2. Install swing joints after hydrostatic testing is satisfactorily performed.

D. Notify A/E 24 hours before any test and obtain acceptance of tests from A/E before covering piping.

E. Provide pattern, throw, and delivery as shown on Drawings.

F. Adjust and balance the components of the piping system to provide complete coverage with a minimum of overthrow.

G. Provide an 8" x 10" reduced laminated photocopy, inside controller box door, of the irrigation plan with color coded circuits noted in sequence equal to automatic operation.

END OF SECTION

02870
SITE AND STREET FURNISHINGS

PART 1 GENERAL

1.01 SUMMARY

A. Related Work:

1. 02200 - Earthwork.
2. 03300 - Cast-In-Place Concrete.

1.02 SUBMITTALS

A. Submit properly identified manufacturer's literature and catalog cuts before starting work.

B. Submit shop drawings including manufacturer's recommended installation procedures for each item of equipment.

PART 2 PRODUCTS

2.01 EQUIPMENT

A. Benches:

1. Metal Benches: Victor Stanley, Inc., Dunkirk, MD or accepted equivalent.
2. Recycled Plastic Benches:
    a. American Earth Friendly, Inc., Boca Raton, FL.
    b. Better Than Wood, Pembroke Park, FL.

B. Backstops: Clayton Co., Louisville, KY or accepted equivalent.

C. Bicycle Racks:

1. Rail, Standard, Hoop, Stanchions, or Link models by Bike Security Racks, Co., Rumney, NH.
2. Wave Rack by Porter Athletic Equipment Company, Broadview, Illinois.
3. CycLoops by Columbia Cascade, Portland OR.
4. Racks by Tubular Forms, represented by Architectural Product Sales Inc., Palm Beach Gardens, FL.

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 equipment according to manufacturer's instructions, approved shop drawings, and the requirements of this section.

END OF SECTION

02900
LANDSCAPING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Furnishing, planting, watering, fertilizing, mulching, pruning, and transplanting plants of the species, size and quality in the locations indicated on Drawings and the installation of soil, fine grading, fertilizer, top soil, sodding, and top dressing in areas indicated on Drawings.

B. Related Sections:

1. 02200 - Earthwork.
2. 02221 - Excavating, Backfilling, and Compaction for Utilities.
3. 02810 - Irrigation System.
4. 02935 - Sodding.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM), latest edition of the following:

1. D2487 Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
2. E70 Standard Test Method for pH of Aqueous Solutions with the Glass Electrode.

B. "Grades and Standards for Nursery Plants", Part I and II by the Florida State Department of Agriculture, latest edition.

C. "Approved Planting Practices" by the American Association of Nurserymen.

D. "Hortus", by L.H. Bailey, Second Edition.

E. "Manual of Cultivated Plants" by L.H. Bailey.

F. "Standard Plant Names" by the American Joint Committee on Horticultural Nomenclature.

1.3 DEFINITIONS

A. Satisfactory Fill Materials: Materials classified in ASTM D2487 as GW, GP, SW and SP properly worked by Contractor to obtain optimum moisture and compaction.

B. Unsatisfactory Materials: Materials of any classification determined by testing laboratory as too wet or too soft for providing a stable foundation for pavement and walks will be classified as "unsatisfactory".

C. The words "plant materials" or "plants" refer to and include trees, hedge, ground cover, grass, or herbaceous materials.

D. Specimen: An exceptional, heavy, symmetrical, tightly knit plant, so trained or favored in its development that its appearance is unquestionably and outstandingly superior in form,

number of branches, compactness, and symmetry. Specimen shall comply with the standard for "Florida Fancy" according to the State of Florida, Department of Agriculture.

E. Ground Cover: Anything other than grass.

1.4 SUBMITTALS

A. Samples:

1. A sample of sand, and a sample of topsoil consisting of a 80/20 silica sand and Florida Peat mixture (by volume) shall be submitted to the City for approval before installation.

B. Contract Closeout Submittals:

1. Record Drawings: Provide blueprint with red line markings indicating changes made to the planting system layout during installation.
2. Manual: Deliver 1 copy giving complete instructions regarding maintenance of materials, complete nomenclature of items used, and a copy of the guarantee issued to A/E upon final completion of installation.

C. Certificates:

1. Submit certificates from supplier stating the delivered topsoil mix, sod, and other landscaping materials comply with requirements specified.
2. Deliver certificates upon final completion of the installation.
3. Certificates of Inspections: Shipments or orders of plant material shall be properly inspected at nursery or growing site by authorized federal and state authorities. Include certificates with shipment.

1.5 QUALITY ASSURANCE

A. Qualifications of Workers: Provide at least 1 person who shall be present at all times during execution of this portion of work thoroughly familiar with type of materials being installed and best methods for their installation and who shall direct the work performed under this section.

B. Obtain written acceptance from A/E for any variation from specified requirements before proceeding with work.

C. Planting Materials: Meet or exceed specifications of federal, state, and county laws requiring inspection for plant disease and insect control.

D. Sod Procurement: Comply with white fringed beetle and fire ants quarantine requirements. Sod shall be free of any weeds.

E. Before planting is installed, test topsoil and amend the topsoil as recommended by the testing lab to verify topsoil pH is between 6.0 and 6.5 and is suitable for intended use.

F. In the event that A/E suspects deficiencies in materials used on this project, such materials will be tested by the City of Miami contracted testing laboratory.

1. Cost of Testing:

    a. Initial Testing: By Contractor.
    b. Retesting: By Contractor.

2. Evidence of non-compliance will result in rejection of all work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Storage:

1. Deliver items to the site in original containers with labels intact and legible at time of A/E inspection.
2. Immediately remove from the site materials not complying with these specifications.
3. Use all means necessary to protect materials before, during, and after installation and to protect installed work and materials of all other trades.

B. Replacements: Upon damage or rejection, immediately make repairs and replacements necessary for the acceptance of A/E at no additional cost to the City of Miami.

C. Plant material shall be protected from weather, adequately packed to prevent breakage and drying out during transit. The use of anti-transparent protection, according to the manufacturer's specification, is encouraged.

D. Plants shall not be planted on job until they have been inspected at receiving site and accepted by A/E.

E. Legible identification tags shall be attached to at least one plant of each species. Packages, boxes, or bunches of plants shall also be identified with a similar tag. Plants showing improper handling, bruised trunks, broken branches, or root balls, or arrive on site in an unsatisfactory condition will be rejected.

F. Shipment and Delivery: Acceptance of plant material will be given by the A/E and the City of Miami only after the material is planted and after meeting all of the incidental requirements specified and on drawings.

1.7 SEQUENCING

A. Before grassing work begins the A/E is to be notified not less than 2 work days in advance.

B. Notify the A/E a minimum of 2 working days in advance of when plant material is to be delivered.

C. Construction Review: In addition to other progress construction reviews, the Contractor shall schedule and facilitate the following subtrade related reviews, giving notice to the A/E at least 2 working days in advance.

1. Review of proposed tree pit locations, as represented by staking.
2. Review, upon delivery, of plant materials at the site to verify species, vigor, size, condition, shape, quantity, according to specification and drawings.
3. Review of tree pit excavation and fine subgrade.
4. Review of backfilling for palm and tree pits and the placement of the soil blanket.

5. Review of work and materials after completion of planting. This review shall be scheduled sufficiently in advance and in cooperation with the A/E so that it may be conducted within 48 hours after completion of planting.
6. Review after a 30-day period of maintenance, upon written request by the Contractor. Request shall be received at least 5 days before anticipated date of review.
7. Review for final completion at the end of the warranty period.

1.8 WARRANTY

A. Contractor is to replace, at no additional cost to the City of Miami, grass areas in unsightly or damaged condition, for 90 days after final completion. Replace, at no additional cost to the City of Miami, dead grass, dead trees, palms, shrubs, and ground cover for one year.

1. Irrigate the newly planted grass, trees, palms, shrubs, and ground cover until final completion. Irrigation shall occur in sufficient quantity to insure the orderly establishment of the grass and planting.

B. Relocated Trees: Take every reasonable precaution to insure the survival of relocated trees. This shall include proper and established root pruning procedures before extraction of said tree. Replace non-surviving individual trees with equal canopy according to Section 02910 - Tree Relocation.

1. Any loss of plant materials due to the negligence of the Contractor shall result in the replacement of the material at no cost to the City of Miami. Said plant material shall be replaced with the same species of equal size.
2. Contractor shall not be responsible for the replacement of lost materials due to "Acts of Providence", theft, vandalism, or for reasons out of the control of the Contractor.

C. Warrant trees, shrubs, and ground covers for 1 year and sod for 90 days after final completion and the satisfactory conclusion of the maintenance period. Any planting that fails or dies within that period shall be replaced and replanted immediately without expense to the City of Miami, The Contractor shall not be held responsible for losses beyond his control arising from "Acts of Providence"; acts of vandalism, or loss arising from documented neglect by the City of Miami to properly care for planting after final completion.

D. Make periodic reviews of the grass and planting, at no extra cost to the City of Miami, during the warranty period to determine what changes, if any, should be made in the City of Miami's maintenance program. Proposed changes shall be submitted, in writing, to the City of Miami and, jointly by copy, to the A/E.

E. At conclusion of the 1 year and 90-day warranty periods, the A/E will make a construction review to determine the condition of planting and sodding. Plants or sod that have died or, in the opinion of the A/E, are in an unhealthy or badly impaired condition for reasons other than vandalism, "Acts of Providence", or documented neglect by the City of Miami, shall be replaced by the Contractor as soon as possible, except that replacement will not be required in any season definitely unfavorable for the kinds of plants involved.

F. At the end of the warranty period, remove saucers. Mulch and place sod around trees formerly saucered and mulched. Guying and bracing of trees shall remain in place until windfirm.

1.9 MAINTENANCE

A. Maintain sod and planting, starting at the time of planting and continuing for 90 calendar days after final completion.

B. Maintain and protect sodding and planting including incidental materials until end of maintenance period.

C. Tree Maintenance:

1. Maintenance shall begin immediately after each plant is planted and shall continue until final completion. Plants shall be watered, mulched, weeded, pruned, sprayed, fertilized, cultivated, and otherwise maintained and protected during time stated above.
2. Settled plants shall be reset to proper grade position, planting saucer rested and dead material removed. Guys shall be tightened and repaired.
3. Defective work shall be corrected as soon as possible after it becomes apparent and weather and season allows. Upon completion of planting, the Contractor shall remove from the site excess soil and debris, and repair damage to structures, etc., resulting from planting operations.

D. Sodding Maintenance:

1. Provide a complete maintenance cultural program until final completion.
2. Cultural program shall consist of watering, fertilizing, mowing insect and disease control, and weed control.

    a. Begin mowing program as soon as sod is firmly rooted. Mow sod with a rotary type mower at least twice per month at a 3-inch mowing height. Mowing program shall include weed-eating and edging of beds, and along walks, curbs, and buildings.

3. Final completion is contingent upon full coverage of the sodded area resulting in healthy, vigorous turf, free of insects, disease, and weeds.
4. Contractor shall submit a written schedule for proposed maintenance of sodded areas.

E. General Maintenance:

1. Maintenance shall include watering, weeding, fertilizing, cultivating, spraying, adjustment of guying, staking, and pruning necessary to keep plant materials in a healthy vigorous growing condition and to keep planted areas neat and attractive.
2. Provide equipment and means for proper application of water to those planted areas not provided with an irrigation system.

F. Replacements:

1. At the end of maintenance period, plant material shall be in a healthy growing condition.
2. During maintenance period immediately replace any plants showing weakness and probability of failure with a new healthy plant of the same type and size, without additional cost to the City of Miami.

G. Extension of Maintenance Period: Continue maintenance period, at no additional cost to the City of Miami, for additional 30 days after previously noted deficiencies have been corrected. Warranty extension period shall start upon acceptance of planting and at the end of the maintenance period.

H. The Contractor shall conclude maintenance (exclusive of replacement within warranty period) upon written acceptance of the A/E at the end of the maintenance period or, as provided for above, at the end of the extended maintenance period.

I. Protection:

1. Irrigate the newly planted grass until final completion.
2. Planting area shall be kept weed free with a herbicide program until final completion.

PART 2 PRODUCTS

2.1 MATERIALS

A. Planting Soil: An evenly blended mixture of 50 percent muck, 25 percent sand, 15 percent Sphagnum peat moss and 10 percent sheep manure. Add 2 pounds of fertilizer, as specified, to each cubic yard of soil and thoroughly mix. Planting soil shall have pH of between 6.0 and 7.0 after mixing and fertilizer amendment.

B. Topsoil Mixture (By Volume): 80 percent silica sand and 20 percent Florida Peat thoroughly mixed with a commercial shredder/blender or equivalent.

1. Material shall be proportioned by volume rather than weight.
2. Site mixing is not allowed.
3. Mixture shall be free of rocks greater than 1/2" in size, limbs, roots, and other deleterious matter.
4. The City of Miami reserves the right to reject topsoil, at any time, used during the execution of work not meeting specifications.

C. Sand:

1. Sand shall be free of silt and sludge.
2. Sand shall be well washed consisting coarse silica sand.
3. Cyclone sand is not acceptable.
4. Use unmixed sand for top dressing.

D. Muck.

1. Muck shall be peat material removed from areas marked "Florida Everglades Peat" on Soil Conservation Service Soils Maps.
2. Muck shall be capable of sustaining vigorous plant growth and specifically pulverized for agricultural use.
3. Muck shall be sterilized to be free of viable nut grasses and other undesirable weeds.

E. Peat:

1. Free of deleterious materials harmful to plant growth and free of nematodes.
2. Uniform in quality.
3. Peat shall have a pH between 5.5 and 6.5 as determined by ASTM E70.

F. Sludge: Fine residual from oolite rock crushing operation from rock processing plant.

G. Clay: Florida red clay, free from rocks, or accepted equivalent.

H. Top Dressing for Sodded Areas: Clean silica sand, mined from fresh water. Sand mined from salt water is unacceptable.

I. Commercial Fertilizers:

1. Commercial grade fertilizer, uniform in composition, dry, free flowing, and delivered to site in fully labeled, unopened containers, bearing name, trade name or trademark and warranty of producer.
2. Fertilizers shall comply with applicable State and Federal law.
3. At least 50 percent of the nitrogen content shall be derived from natural organic sources and potash derived from sulphate of potash.
4. At least 50 percent of the nitrogen content shall consist of slow release material.
5. Each container of fertilizer shall bear manufacturer's statement of analysis or a manufacturer's certificate of compliance shall be submitted to the A/E upon delivery to the site.
6. The following minimum percentages of available plant food by weight are required.
7. Fertilizer:

    a. Milorganite 6-2-0 is to be applied to sod beds before installation of sod.
    b. 30 days after the installation of sod or as directed by the A/E, apply a 12-4-8 granular blend.

8. 12-4-8 Fertilizer:

    a. Total Nitrogen, not less than 12.00 percent. 6.00 percent shall be slow release.
    b. Nitrate Nitrogen, not less than 1.5 percent.
    c. Ammoniacal Nitrogen, not less than 5.7 percent.
    d. Granular Blend Requirements:

        1) Water soluble organic nitrogen, not less than 1.3 percent.
        2) Water insoluble organic nitrogen, not less than 3.5 percent.
        3) Available Phosphoric Acid, not less than 4.0 percent.
        4) Water Soluble Potash, not less than 8.0 percent.
        5) Total primary plant food, not less than 24.0 percent.
        6) Chlorine, not more than 6.0 percent.
        7) Secondary Plant Foods:

OXIDE	ELEMENTAL	
Magnesium	2Mg	1.20%
Manganese	1Mn	.70%

        8) From F.T.E. 504 - 30 lbs. per ton to be composed of the following elements:

		ELEMENTAL		
Boron	B_2O_3	0.1845%	B	0.05%
Copper	CuO	0.1312%	Cu	0.10%
Iron	Fe_2O_3	0.3360%	Fe	0.26%
Manganese	MnO	0.1372%	Mn	0.10%
Molybdenum	MoO_3	0.0015%	Mo	
Zinc	ZnO	0.1312%	Zn	0.10%

9) Derived from this source materials:

a) Ammonium Nitrate
b) Sulfate of Ammonia
c) Ureaform or I.B.D.U.
d) Triple Superphosphate
e) Muriate of Potash
f) Sulfa-Mag
g) Manganese Sulfate

10) Materials shall be prilled or granular except Manganese Sulfate.

e. Statement of Analysis: Each container of fertilizer shall bear producer's statement of analysis or producer's certificate of compliance shall be submitted to A/E upon delivery of fertilizer to jobsite.

J. Solid Sod:

1. Installation of solid sod shall comply with the section 02935 – “Sodding”.

K. Trees:

1. Trees and shrubs shall be as noted on plans and as approved by the City of Miami and A/E.
2. Caliper measurement, height measurement, height relation to caliper, spread, bare root, ball dimensions, and ground covers, etc. shall comply with the applicable standards above and the requirements for this project.
3. Substitutions in plant species or sizes shall be made only after written authorization by the A/E and the City of Miami.
4. Materials or Work may be rejected if, in the opinion of the A/E, such work does not meet the requirements of the Specifications. Rejected materials shall be promptly removed from the site by the Contractor at no expense to the City of Miami or A/E.

L. Pruning:

1. Plants shall not be pruned before delivery except as authorized by the A/E.
2. Plants shall have been transplanted or root pruned at least once in the 3 years before delivery date.
3. Immediately upon selection by the Contractor and acceptance by the A/E, major trees shall be completely root pruned at the nursery site and held in that condition for 45 to 60 days. Plants shall not be further dug or transported without acceptance of A/E and the City of Miami.

M. Tree Guying:

1. Double strand, 12 gage galvanized steel wire, minimum 3/4", fiber bearing 2 ply, rubber garden hose.
2. Pressure treated 2-inch x 4-inch x 3 feet (deadman) Southern Yellow Pine free of knots, rot, or other weakening characteristics.
3. 3-inch galvanized steel turnbuckles.
4. Yellow plastic flagging.

N. Peat: Sphagnum peat moss for horticultural use.

O. Mulch: Shredded eucalyptus bark free of weed retardant. Mulch shall not be derived from processed wood. In the event that red mulch is required; the red dye shall consist of iron oxide. The red mulch shall be derived from natural non-processed wood and shall be free of any percentage of Chromated Copper Arsenate (CCA).

P. Anti-Transparent: "Dowax" or "Wilt-Pruf".

Q. Sand Screen: To consist of 4 inches of clean, salt and weed free, sharp sand over 2 inches of pearock.

R. Sand Screen Edging: Similar to Ryerson steel edging.

S. Water: Potable water shall be provided by the Contractor. Upon emergency or other loss of water supply, the Contractor shall be responsible for water supply.

T. Plant Material:

1. Plant species shall comply with those indicated on Drawings.
2. Plant Quality:

a. Plants shall be freshly dug, balled and burlapped nursery grown stock or container grown nursery stock. Plants shall be free of broken, damaged root balls or root bound conditions. Plants shall be sound, healthy, vigorous, free from plant diseases, insect pests or their eggs, and shall have healthy normal root systems.
b. Collected plants shall not be used unless authorized in writing by the A/E.
c. Existing trees indicated on the plans to be relocated shall be accepted for this purpose by the Contractor and any substantial defects in these trees shall be reported in writing to the A/E for verification before any digging of this material.
d. Plant material, not specified as "Specimen", shall be Florida No.1 or better quality, graded according to Grades and Standards for Nursery Plants, published by the State of Florida, Department of Agriculture. Plants judged to be not according to said standards will be rejected.

U. Tree Grates: Cast iron square gratings, expandable type.

1. Manufacturers:

a. Neenah Foundry Co. Model R-8708 180-degree square with 1/4" slot openings.
b. Josam Mfg. Co.
c. U.S. Foundry.

PART 3 EXECUTION

3.1 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. Inspect work of other trades and verify work is complete to the point landscape work may start. Verify planting may be completed according to Construction Documents.

C. Discrepancies:

1. In event of discrepancy, immediately notify A/E.
2. Do not proceed with installation of materials or plants in areas of discrepancy until such discrepancies have been fully resolved to the satisfaction of the A/E.

D. It shall be the Contractor's responsibility to thoroughly test the irrigation system before planting and report any malfunctions to the City of Miami. No planting shall be done until the irrigation system is operating properly.

3.2 PREPARATION

A. Stake the proposed location of trees to be planted.

B. Excavate planting pits and beds, prepare fine subgrade, place soil blanket.

C. Provide plants, fertilizer, sod, planting soil, and incidental materials as specified.

D. Place plants, backfill, and guy or brace plants as required.

E. Fine grade, sod lawn areas, and complete incidental work as specified.

3.3 PREPARATION OF ROUGH GRADING AND SUBGRADE

A. Rough grading and subgrade shall be correct and suitable materials and proper drainage shall exist before placing sod. Soil or drainage conditions detrimental to growth of plant material shall be corrected.

B. Existing subgrade shall be scarified to a minimum depth of 3 inches before spreading of topsoil. Subgrade shall be brought to true and uniform grade and shall be cleared of stones greater than 2 inches, sticks, and other extraneous materials.

C. Soil in compacted areas shall be tilled to a depth of 12 inches to produce a loose friable soil.

D. Sodding shall not begin if any areas exhibit ponded conditions.

3.4 SPREADING OF TOPSOIL

A. Subgrade shall be damp when topsoil is spread.

B. Areas where sod is to be planted shall have a subgrade 6 inches lower than the finish grade. A 4-inch layer of topsoil shall be added before the placing of sod.

C. Topsoil in areas to receive sod shall be fine graded with drag or rake. Remove sticks, stones, and extraneous matter. Grading shall round out breaks in grade, smooth down lumps and ridges, and fill in holes and crevices. Grade shall be maintained until placement of sod.

D. Topsoil shall be partially incorporated into the subsoil to avoid potential layering effect of different soil layers. Apply 1/3 topsoil depth. Roto-till, plow, or disk into subsoil, then apply remainder.

3.5 APPLICATION

A. Finish Subgrade: Upon acceptance of rough grading elevations, establish fine subgrade with smooth and even finish. Remove rocks more than 1-inch diameter, sticks, debris, and vegetation to a depth of 6 inches. Final subgrade shall be established as specified. Depths are relative to the elevation of the walkway, paving, the top of curb, or, in the absence of curbing, the top of roadway paving or the proposed finished contour:

AREA	SUBGRADE DEPTH (Minimum)
Topsoil	6"
Ground Cover & Vines	1'-2"
Shrub Bed	1'-8"
Hedge 1 Ft.	8"
Clay Baseball Field	4"

B. Planting Trees:

1. Excavation:

   a. Excavations identified as having potential utility or service line conflicts shall be excavated by hand tools to determine the location of any utilities.
   b. Excavate tree and palm pits as necessary to accommodate root balls of material when plant is set to finished grade, with a minimum of 6 inches of specified planting soil under the spread of bottom most roots. Diameter of pits for trees shall be at least 1 foot greater than diameter or spread of roots.
   c. Barricade or mark excavations to prevent hazards to mechanical vehicles and pedestrians.

2. Planting:

   a. Set trees in vertical position with the grade elevation of the previous container or field growth equal to finish grade.
   b. Set plant in upright position in center of hole and place specified planting soil around rootball.
   c. Thoroughly water each plant when hole is 2/3 twigs and branches. Cuts more than 3/4" diameter shall be painted with an accepted horticultural tree wound paint. Plant materials shall meet specifications after pruning.
   d. Earth shall be banked at edge of pit to form broad saucer not less than 4 inches in depth. Flush planting soil into place with slow hose stream until air pockets are eliminated and pit is filled with soil to saucer grade.
   e. Trees shall be guyed or staked in an upright position immediately after planting in one of the following ways:

      1) Guying shall be done with hose pieces placed around trunk immediately above the lowest branch. Each guy wire shall be put through the hose collar and secured back to turnbuckles placed at midspan. Guy wires shall also be attached to "deadmen", placed at a two-foot depth, equidistant around tree, outside planting pit and shall be extended back to the lower end of the turnbuckles. Turnbuckles shall be placed at midspan. The guy wires shall be tightened and plastic tape warning flags shall be placed midspan of guy wires.
      2) Guying shall be as noted above, except that guy wires shall be attached to stainless steel eye bolts placed in a horizontal position in the concrete slab at the edge of the paving, rather than to "deadmen".

3) Guying shall be as noted above, except that guy wires shall be extended horizontally and attached to wood stakes (2 x 4 pressure treated Southern Yellow Pine) driven into the bottom of the tree pit a minimum of 12 inches and extending above finished grade approximately 6 feet.

f. Pruning shall be limited to remove injured twigs and branches. Cuts more than 3/4" diameter shall be painted with an accepted horticultural tree wound paint. Plant materials shall meet specifications after pruning.
g. If planting is performed after sod placement, proper protection shall be provided and damage resulting from planting operations shall be repaired promptly.
h. Install and brace palms in a vertical position. Place a minimum of 5 layers of burlap around the trunk and, in turn, have a minimum of five wood battens placed vertically over it. The battens shall be retained in place by two 3/4" high carbon steel bands. Three wood braces, placed at a 60-degree angle equidistant around the plant, shall be nailed to the battens. No nails shall be placed into the palm trunk. Three bracing pads shall be placed below grade at the bottom of each brace.
i. Pits within which palms are planted shall be backfilled with clean, sharp coarse, salt-free sand.

3. Transplanting:

a. Transplanting shall consist of on-site transplanting of existing plant materials from proposed construction areas to permanent positions as noted on Drawings.
b. Materials to be transplanted shall be root pruned a minimum of six weeks before relocation. Contractor shall maintain transplanted materials during construction period by watering, weeding, mowing, spraying, fertilizing, pruning and other horticultural practices.
c. The City of Miami shall regularly inspect the relocated materials to ensure compliance with horticultural practices as noted. The City of Miami will submit a written report to Contractor of any deficiencies found during the maintenance period.

4. Removal of Burlap:

a. After the soil ball is in the hole, remove burlap from top and sides of the ball but not from beneath the ball. If removal of the burlap will cause soil crumbling, roll burlap back only from the top and slit along the sides.

5. Transplanting Operations: Take precautions to minimize shock of root pruning and transplanting according to nursery trade procedures including the following:

a. Root prune 1/3 of ball at a time.
b. Thin out the interior crown of dicots, in a similar sequence, to compensate for root loss, leaving the entire canopy intact.
c. Leave monocot leaves alone, allowing plant to balance itself. Protect growing point as required.
d. After root pruning, backfill with good organic rooting medium. Fertilize with organic fertilizer to promote root growth.
e. Mulch to reduce weeds, discourage foot traffic and its compacting effect, conserve moisture and minimize temperature fluctuation.
f. Brace trunk and leave in place until trees are windfirm for a maximum of 1 year.

g. Wrap trunks and structural branches of thin-barked trees to protect against sun scald and dehydration. Retain for at least 1 growing season, and through cold season.
h. Feed with a diluted solution of N-P-K in solution form with a soil needle, providing water, air, nutrients and a breaking up action of marl.
i. Where foliage is retarded, spray it with one of the soluble area types of foliage feeders.
j. At time of planting to fill air pockets and to keep roots, and feeder roots moist, live and healthy. Use soil needle for watering new transplant. Direct fine spray at foliage to help harden new leaves.

6. Pest Control: Set up spray program to guard against scales, borers, foliage feeders, aphids, mites, leaf-spot and dieback, nematodes and canker-producing fungi.
7. Provisional Inspection:

a. On completion of the work and upon receipt of the written request of the Contractor, the A/E shall inspect planting work for substantial completion. The request shall be received from the Contractor at least three work days before the anticipated date of provisional inspection.
b. The Contractor shall repair or replace defective work before substantial completion of the work.

8. Final Inspection: At the end of the warranty period, inspection of plants will be made by the A/E upon written notice requesting such inspection, submitted by the Contractor at least 3 days before the anticipated inspection. Defects discovered shall be repaired or replaced by the Contractor.

3.6 INSTALLATION OF SODDING

A. Install sod as soon as practical following placement and grading of topsoil mixture.

B. Fertilizer: Spread 30 pounds of 16-4-8 commercial fertilizer per 1,000 square feet of finished topsoil, lightly rake in and level.

C. Soil Testing and Amendment:

1. Obtain and test, one representative mixed sample, each, of planting soil and top soil materials intended for use on this project. These samples shall be blended mixes composed uniformly of materials taken from the stockpile of the two respective soil types.
2. Test soils for horticultural purposes and submit the test results to the A/E accompanied by a recommendation from the testing agency regarding the suitability of the samples and appropriate soil amendments required to correct any detrimental or deficient soil conditions.
3. Testing shall include, but not be limited to:

a. Tests required to determine soil pH and the identification and quantity of soluble salts or other common pollutants that may be in the samples. Soil pH range for sodded areas shall be 6.0-6.5.
b. The inorganic constituent of the soil mix shall be tested to verify that it consists of 100 percent coarse silica sand, not a Calcium Carbonate derivative such as coral rock or lime rock.

c. After application of topsoil and amendments, a representative soil sample shall be obtained by collecting 15 to 20 samples from the top 4 inches of soil from various areas.
d. Samples shall be combined and mixed thoroughly.
e. Submit samples to an independent testing firm for analysis.
f. Analysis shall provide pH and fertility levels of soil along with recommended actions for appropriate soil amendments to adjust pH levels and fertility levels.
g. Contractor shall amend soil according to analysis recommendations by roto-tilling the amendments thoroughly into the top 4 inches of soil.
h. A second soil sample shall be submitted for analysis after soil amendments have been incorporated into the soil.
i. Final soil testing analysis results shall be submitted to the City of Miami before any planting of sod.

D. Sod Placement:

1. Lift sod from trucks or storage piles and place by hand with closed joints and no overlapping.
2. Ground shall be leveled with the back of a rake and sod laid with joints closely butted so no voids are visible, keeping surface of sod flush with the adjoining pavements.
3. After laying, sprinkle sod thoroughly, and tamp sufficiently to incorporate sod with topsoil blanket and to insure tight joints between sections or strips.
4. After laying, cover sod with sufficient sand top dressing to fill voids remaining and then thoroughly water to wash top dressing into sodded surface.
5. Completed sod surface shall be true to finish grade indicated on plans, even and firm at all points and shall, after settlement, be flush with top of abutting walks, paving, concrete borders, catch basins and the like.
6. Keep new sod properly watered until final completion.
7. Protect sodded areas against trespassing and damage of any kind for the duration of maintenance period.

3.7 ADJUSTMENT AND CLEANING

A. Site Clean-Up:

1. Upon completion of any landscape project, thoroughly clean up the project site.
2. Remove equipment, unused materials, deleterious material, and surplus excavated material.
3. Fine grade disturbed areas and the areas adjacent to the new plantings to provide a neat and uniform site.
4. Damaged or altered existing structures, because of the landscape work, shall be corrected.

END OF SECTION

02910
TREE RELOCATION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Labor, materials, necessary equipment and services to complete the tree relocation work.

B. Related Section:

1. 02900 - Landscaping.

C. Before tree excavation, pruning, removal, or relocation of existing trees, contractor shall notify:

1. The City of Miami of schedule of operation.
2. Appropriate utility companies and the City of Miami for flagging and coordination of service disconnection as necessary to complete work.
3. Coordinate work with other trades.

1.02 REFERENCES

A. American National Standards Institute (ANSI): Z60.1 American Standard for Nursery Stock.

B. Florida Department of Agriculture and Consumer Services: "Grades and Standards for Nursery Plants".

C. National Arborist Association (NAA): Ref.1 Transplanting of Trees and Shrubs in the Southeastern United States.

1.03 DEFINITIONS

A. Toxic Substances:

1. Do not deliver any toxic substance or item as defined in Florida Statute 442.102(21) to the site without furnishing to the City of Miami a Material Safety Data Sheet (MSDS).
2. Provide current MSDS information with each initial shipment.

3. The MSDS shall contain the following information:

a. The chemical name and the common name of the toxic substance.
b. The hazards or other risks in the use of the toxic substance, including:

1) The potential for fire, explosion, corrosivity and reactivity.
2) The known acute and chronic health effects of risks from exposure, including the medical conditions which are generally recognized as being aggravated by exposure to the toxic

substance.

3) The primary routes of entry and symptoms of overexposure.

c. The proper precautions, handling practices, necessary personal protective equipment, any other safety precautions in the use of or exposure to the toxic substance including appropriate emergency treatment in case of overexposure.

d. The emergency procedure for spills, fire disposal, and first aid.

e. A description in lay terms of the known specific potential health risks posed by the toxic substance intended to alert any person reading this information.

f. The year and month, if available, that the information was compiled and the name, address, and emergency telephone number of the manufacturer responsible for preparing the information.

1.04 DESCRIPTION

A. Protect existing trees to remain during construction phases. Provide tree protection barriers for those existing trees adjacent to tree transplantation operations. Any trees scarred or destroyed, designated to remain, will be replaced at the Contractor's expense, with similar species, size, and quality.

B. Remove other vegetation as necessary and as directed by the A/E to accommodate new plantings. Prepare areas to be planted according to Section 02900.

C. Resulting tree pits of relocated material shall be backfilled with clean fill and brought back flush with surrounding grade, unless the pits are to be immediately replanted. Stabilize grade if required. Correct problems caused by erosion, wind, etc., in the reclaimed area. Pits to be quickly replanted shall be surrounded by safety barricades to prevent accidental falls into pits.

1. In areas where new plant material will replace relocated plant material, appropriate planting soil mix shall be used as backfill.

1.05 SUBMITTALS

A. Submit a list of equipment, procedure, and labor force anticipated for use for tree relocation for approval by the City of Miami.

B. Submit a schedule by day indicating units to be dug and relocated. Note materials requiring root pruning, and that the relocation schedule is to begin at the end of the specified root pruning period.

C. Obtain permits required by authority having jurisdiction.

D. Submit written certification that trees indicated to remain have been protected during the course of construction according to recognized standards of the industry. Certify that where damage did occur:

1. Trees were promptly and properly treated.
2. Indicate which damaged trees (if any) are incapable of retaining full growth

potential and are recommended to be replaced.

E. Submit for approval, proposed methods, and schedule for effecting tree and plant protection.

1.06 QUALITY ASSURANCE

A. The Contractor's crew used for the relocation of existing trees shall have minimum 10 years experience in relocation of existing plant materials and be recognized by the American Association of Nurserymen.

B. Unless otherwise specified, tree transplanting shall comply with NAA Ref.1.

C. Comply with NAA standards for pruning and remove branches from trees to remain to clear new construction.

D. Recommend procedures to compensate for loss of roots (if any) and perform initial pruning of branches and stimulation of root growth where removed to accommodate new construction.

E. Perform tree repair work for damage incurred by new construction.

F. Provide routine progress evaluation reports on relocated trees until the end of the maintenance period.

G. Evaluate existing trees and verify trees are free of disease and ready to survive relocation from the site to their new location on-site or off-site.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Properly handle trees and palms during moving so trunks will not be scarred or damaged and to avoid broken limbs. Broken limbs not causing the tree to be rejected shall be repaired as follows:

1. Properly prune dead, dying, or damaged branches with clean, sharp equipment.
2. Remove injured bark and wood of a tree would with a clean, sharp knife to a point where healthy bark and wood make contact at their margins.
3. Inspect and treat wound for insect and disease.
4. Seal wounds with bituminous base wound paint for all oak limbs greater than 3 inch diameter.

B. Transport trees on vehicles of adequate size to prevent overcrowding, broken limbs, foliage damage, or root ball damage.

C. Keep root balls moist during relocation.

D. Protect tree crowns with shade cloth to prevent desiccation and wind burn. Crowns shall be periodically sprayed with water to help ensure against desiccation.

E. Handle plant material only in ways and means accepted by the landscaping industry and accepted by the City of Miami.

F. Plant material shall be planted the same day it is dug. Coordinate preparation of planting pits or beds to ensure this schedule.

1.08 WARRANTY

A. Relocated plant material does not fall under the standard 12 month guarantee.

B. For relocated trees or palms that die, replace their canopy area with new trees as specified.

1. Canopy spread for all palms and trees shall be listed on proposal when submitted for relocation work.
2. Replacements (mitigation plantings) shall be provided at no additional cost to the City of Miami.
3. Submit the attached form to the City of Miami for review and approval.
4. Proposed replacement canopy tree species shall be City of Miami accepted trees and palms.
5. See list at the end of this section.
6. The specification requirements for these trees and palms are according to Section 02900.

C. Repair damage to other plants and lawn or construction work within the relocation area during tree transplantation at no cost to the City of Miami. This includes, but is not limited to, damage to curbs, walks, roads, fences, site furnishings, etc. Replacing and replanting of damaged trees, shrubs or turf shall be according to Section 02900.

1.09 MAINTENANCE

A. Maintain relocated plant materials immediately after each item is planted and continued until the 90-day watering period is completed, upon which time the City of Miami will take over maintenance of materials following procedures and recommendations of contractor and specifications.

B. During the maintenance period, maintain relocated plant materials according to procedures described in Section 02900.

PART 2 PRODUCTS

2.01 MATERIALS

A. Bone meal shall be readily available steamed bone meal, useable as a natural organic nitrogen fertilizer.

B. Peat moss, topsoil, planting soil, mulch, staking, and guying, shall be as specified in section 02900.

C. Fill materials shall be as specified in Section 02900.

PART 3 EXECUTION

3.01 TRANSPLANTATION

A. Transplanting shall consist of on-site or off-site transplanting of existing trees or palms from proposed school construction areas to permanent positions as noted on the drawings.

B. Digging, Wrapping, and Handling: Plants shall be dug and prepared for moving in a manner that will not cause damage to branches, shape, root system, and development.

C. Balled and Burlapped Plants:

1. Balls shall be firmly wrapped with burlap or accepted cloth substitute.
2. No balled plant will be acceptable if the ball is cracked and broken or if the stem or trunk is loose in the ball, either before or during transplanting.
3. Balled plants shall be lifted and handled from the bottom of the ball.
4. Protect ball and deliver to the site, plant immediately, and water thoroughly.
5. Ball sizes shall be as recommended in ANSI Z60.1

3.02 PLANTING

A. Relocated Material:

1. Relocated trees/palms shall be planted according to procedures described for new material, Section 02900. Verify final grades have been established before planting operations. Ensure proposed planting pits drain by test-filling with water before transplantation.
2. Continue watering and caring for relocated material as specified.
3. Mulch tree pit areas to reduce weeds, discourage foot traffic, conserve moisture, and minimize temperature fluctuations.
4. Brace trunk and leave in place for approximately one year until trees are wind firm.
5. Wrap trunks and structural branches of thin-barked trees to protect against sun scald and dehydration. Retain through at least one growing season, and through cold season.
6. Feed with a diluted solution of N-P-K in solution form with a soil needle, providing water, air, and nutrients.
7. Where foliage is retarded, spray with one of the soluble types of foliage feeders.
8. At time of planting, fill air pockets and keep roots, especially feeder roots, moist, live, and healthy. Use soil needles for watering new transplants. Direct fine spray at foliage to help harden-off new leaves.

3.03 STAKING AND GUYING

A. Stake and guy designated material according to procedures described for new plant materials, Section 02900.

3.04 WATERING

A. Following transplantation, water trees daily for the first two weeks, every other day for the next three weeks, and every third day for the balance of the three-month watering/maintenance period. Such watering shall thoroughly saturate the root ball to its full depth.

B. Following relocation, trees designated for transplanting shall be watered as specified in this section. Such watering shall thoroughly saturate the root ball to its full depth.

C. Provide manual watering of relocated plant materials for 90 days. If used, after watering period, Contractor shall be responsible for the complete removal of all temporary watering systems.

3.05 TAGGING

A. Trees within the designated areas for relocation shall be clearly marked by means of yellow plastic surveyor's ribbons and coordinated with, inspected, and accepted by the City of Miami before root pruning and digging.

3.06 ROOT PREPARATION

A. Trees to be relocated shall be root pruned at least 45 days before digging with clean, sharp equipment.

1. Maintain root pruned materials by watering, weeding, mowing, spraying, fertilizing, and other horticulture practices.
2. After root pruning, backfill with good rooting medium, fertilize with organic fertilizer to promote root growth.
3. Mulch to reduce weeds, discourage foot traffic, conserve moisture, and minimize temperature fluctuation.

B. Root Ball Size Chart: Root ball sizes shall be according to minimum standards set forth in Grades and Standards for Nursery Plants Part II, Palms and Trees, Florida Department of Agriculture.

1. Trees-Minimum Ball Sizes:

Caliper	Minimum Ball Diameter
3-1/2" to 4"	28"
4" to 4-1/2"	30"
4-1/2" to 5"	32"
5" to 5-1/2"	34"

Larger sizes increase proportionally.

2. Minimum Ball Depth:

Ball Diameter	Depth
Less than 20"	Not less than 75 percent of diameter.
20" to 30"	Not less than 65 percent of diameter.

30" to 48" Not less than 60 percent of diameter.

3.07 CROWN PREPARATION

A. Shade and Flowering Trees:

1. Shade Trees: Selectively prune and thin crown to remove approximately one third of the branches. Preserve the basic shape and form of the tree, eliminate cross-branching and dead or diseased branches.
2. Hand strip selected species of all leaves following pruning and before moving.

B. Palms: Follow standard procedure for transplantation of palms.

3.08 HAND DIGGING

A. Burlapping is required. Trees that are burlapped for relocation shall comply and be handled in same manner as new plant material specified in Section 02900.

3.09 SPECIAL CONDITIONS

A. Multi-Trunk Trees: Relocate multi-trunk tree as one unit. Measure unit by taking the aggregate total of all DBH measurements.

B. Multi-Trunk Palms: Relocate multi-trunk palms as one unit. Unit shall be measured as follows:

1. 50 percent of the value in dollars of the largest trunk in the grouping times the number of trunks in the clump.

C. On-site relocation:

1. On-site relocation shall include root pruning, canopy pruning, on-site transportation, hauling and dumping of debris, and 90-day maintenance.
2. If the tree or palm should die within the 90-day maintenance period, remove the tree, replace the material, and restore the site at no additional cost to the City of Miami.

3.010 CLEANING

A. Site Clean-up:

1. Upon completion of the work, thoroughly clean up the project site.
2. Remove equipment, unused materials, deleterious material, and surplus excavated material.
3. Fine grade all disturbed areas and the areas adjacent to the transplanted material to provide a neat and uniform site.
4. All damaged or altered existing structures, as a result of the landscape work, shall be corrected.

END OF SECTION

02931
TREE AND PLANT PROTECTION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Protection of existing trees and plants from damage because of Contractors operations including, but not limited to:

1. Protection of existing natural woodlands.
2. Marking of clearing limits.
3. Vegetation protective signage.
4. Tree protection fencing.
5. Boxing of tree trunks.
6. Root pruning, construction pruning, and root protection.

B. Related Sections:

1. 02200 - Earthwork
2. 02900 - Landscaping

1.02 SUBMITTALS

A. Proposed methods and schedule for tree and plant protection.

B. Proposed methods, materials, and schedule for root pruning, construction pruning, and tree fertilization.

1.03 QUALITY ASSURANCE

A. Comply with the most stringent applicable requirements of the following standards.

1. American National Standards Institute (ANSI) Zl33.1 - Safety Requirements for Pruning, Trimming, Repairing, Maintaining and Removing Trees, and for Cutting Brush.
2. International Society of Arboriculture (ISA) - Guide for Establishing Values of Trees and Other Plants.
3. National Arborist Association (NAA) - Ref.1, Pruning Standards for Shade Trees.
4. International Society of Arboriculture (ISA) - Construction Management Guidelines.

B. Damaged Trees/palms:

1. Trees scheduled to remain and are damaged during construction shall be replaced per canopy equivalency at no expense to the City of Miami. Refer to Section 02910 for tree replacement form and acceptable plant list.

C. If any shrubs designated to be saved are damaged and replacement is required, a number and diameter of shrubs of the same species and variety, as determined by the

A/E shall be furnished and planted by the Contractor. The total inch diameter of the replacement shrubs shall equal the diameter of the shrub to be replaced.

PART 2 PRODUCTS

2.01 COMPONENTS

A. Tree Protection Fencing:

1. Tree protection fencing shall be 4 feet high galvanized chain link fencing.

2. Stakes for fencing shall be 8 feet galvanized steel posts, driven a minimum of 3 feet into the ground. Posts shall be spaced 10 feet o.c. maximum.

B. Boxing (Fencing):

1. Boxing shall be 4 inch x 4 inch posts spaced 8 feet o.c., with 2 inch x 4 inch rails between bays approximately 24 feet x 24 feet centered on the tree trunk, to a height of approximately 5 feet.

C. Root Pruning:

1. Peat moss and mulch materials shall be as specified under Section 02900.
2. Liquid fertilizer applied to root pruned and construction pruned trees shall be Peters M77 Sequestered-Cleated Soluble Fertilizer by W.R. Grace and Co., Cambridge, MA, or accepted equivalent.
3. Dormant oil spray shall be a dormant miscible spray, Volck Oil, by Ortho or accepted equivalent.

PART 3 EXECUTION

3.01 INSTALLATION

A. Fencing:

1. Before start of demolition work and clearing and grubbing operations, tree protection fencing shall be installed at all trees designated to be protected. Fencing shall be installed a minimum of 15 feet beyond the drip line of trees to be protected, unless otherwise accepted by the A/E.

B. Boxing:

1. Box trees to remain and not within designated tree protection areas.

C. Root Pruning:

1. Where construction will occur close to existing trees designated to remain, roots shall be pruned. Proximity shall be as determined in the field by the A/E.
2. Root pruning is the physical cutting of tree roots to minimize root damage and

promote healing. Suitable means for root pruning include trenching, vibrating plow, or stump grinder. Any method capable of tearing roots or disturbing the soil beyond the grading limit is not allowed.

3. Root prune trees as noted to a depth of 24 inches by trencher, backhoe, or other approved means.
4. Backfill root pruning trench with existing soil mixed with peat moss or well-rotted sawdust to a mixture of approximately 75 percent soil and 25 percent humus. Tamp lightly to set soil.
5. Apply mulch to a depth of 4 to 6 inches at minimum dripline radius around tree to reduce compaction and increase moisture retention. Mulch depth shall be feathered to grade at base of trunk.

D. Construction Pruning and Root Protection:

1. To compensate for root zone damage by cut or fill work, prune top of tree to approximate percent of damaged root zone area.
2. Construction pruning shall consist of pruning the tree crown to compensate for root zone damage due to construction operations. Construction pruning shall include a fertilization/insecticide program.
3. Construction pruning shall comply with NAA Ref.1 for Class IV - Crown Reduction Pruning and ANSI Zl33.1.
4. For those trees remaining within construction zone to be protected, apply mulch to a depth of 6 inches within dripline radius around tree to reduce compaction and increase moisture retention. Mulch depth shall be feathered to grade at base of trunk. Remove protection mulch after completion of work as specified.

E. Fertilization and Insect Spraying:

1. Treat root pruned and construction pruned trees with liquid fertilizer, dormant oil spray, and insecticide.

    a. Liquid fertilizer shall be applied at a rate recommended by the manufacturer and as required by NAA Ref.2.
    b. Apply dormant oil spray, at a rate recommended by the manufacturer, in early spring before buds begin to swell.
    c. Apply insecticide spray twice to root pruned trees following application of dormant oil spray. Spray insecticide at rates recommended by spray manufacturer at intervals appropriate for effective insect control.

F. Clearing Within Protection Areas:

1. Selective clearing within tree protection areas shall only be performed when and as directed by A/E.

G. Removal of Protection:

1. Except as otherwise indicated or requested by A/E, temporary protection devices and facilities installed during course of the work shall be removed only after all work that may injure or damage trees and plants is completed.

END OF SECTION

02935
SODDING

PART 1 GENERAL

1.01 SUMMARY

A. Related Sections:

1. 02200 - Earthwork.
2. 02221 - Excavating, Backfilling, and Compaction for Utilities.
3. 02810 - Irrigation System.
4. 02900 - Landscaping.

1.02 SUBMITTALS

A. Soil Testing and Amendment:

1. Obtain and test, one representative mixed sample, each, of planting soil and top soil materials intended for use on this project. These samples shall be blended mixes composed uniformly of materials taken from the stockpile of the two respective soil types.
2. Test soils for horticultural purposes and submit the test results to the A/E OF RECORD accompanied by a recommendation from the testing agency regarding the suitability of the samples and appropriate soil amendments required to correct any detrimental or deficient soil conditions.
3. Testing shall include, but not be limited to:

    a. Tests required to determine soil pH and the identification and quantity of soluble salts or other common pollutants that may be in the samples. Soil pH range for sodded areas shall be 6.0-6.5.
    b. After application of topsoil and amendments, a representative soil sample shall be obtained by collecting 15 to 20 samples from the top 4 inches of soil from various areas.
    c. Samples shall be combined and mixed thoroughly.
    d. Submit samples to an independent testing firm for analysis.
    e. Analysis shall provide pH and fertility levels of soil along with recommended actions for appropriate soil amendments to adjust pH levels and fertility levels.
    f. Contractor shall amend soil according to analysis recommendations by roto-tilling the amendments thoroughly into the top 4 inches of soil.
    g. A second soil sample shall be submitted for analysis after soil amendments have been incorporated into the soil.
    h. Final soil testing analysis results shall be submitted to THE CITY before any planting of sod.

B. Certificates:

1. Submit certificates from supplier stating the delivered topsoil mix, sod, and other landscaping materials comply with requirements specified.
2. Deliver certificates upon final completion of the installation.

1.03 QUALITY ASSURANCE

A. Sod shall comply with Florida Department of Agriculture quarantine requirements.

B. The sod supplier shall certify on the invoice that the sod product is Bermuda Tifway 419 grass, Bermuda Tifway II grass, or Floratam St. Augustine grass.

C. Bermuda Tifway 419 sod shall be Florida or Georgia grown consisting of sand grown grass turf, certified as being true to variety and having healthy vigorous root system. Sod shall be grown in soils that contain a minimum of 70 percent grade sand.

D. Sod shall be healthy, thick turf having undergone a program of regular fertilization and a two-month pre-harvest fertilization program. Sod shall be a minimum of one year old at the time of installation.

E. Before sod is installed, test topsoil and amend the topsoil as recommended by the testing lab to verify topsoil pH is between 6.0 and 6.5 and is suitable for intended use.

F. In the event that A/E OF RECORD suspects deficiencies in materials used on this project, such materials will be tested by Contractor contracted testing laboratory.

1. Cost of Testing:

a. Initial Testing: Contractor.
b. Retesting: By Contractor.

2. Evidence of non-compliance will result in rejection of all work.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Protect solid sod before, during, and after installation from over-heating, drying out, and physical damage.

B. Replace damaged or rejected solid sod at no cost to THE CITY.

1.05 WARRANTY

A. Contractor is to replace, at no additional cost to THE CITY, grass areas in unsightly or damaged condition, for 90 days after final completion. Replace dead grass at no additional cost to THE CITY for one year.

1. Irrigate the newly planted grass until final completion. Irrigation shall occur in sufficient quantity to insure the orderly establishment of the grass.
2. Contractor shall not be responsible for the replacement of lost materials due to "Acts of Providence", theft, vandalism, or for reasons out of the control of the Contractor.

B. Warrant sod for 90 days after final completion and the satisfactory conclusion of the maintenance period. Any grass that fails or dies within that period shall be replaced and replanted immediately without expense to THE CITY, The Contractor shall not be held responsible for losses beyond his control arising from "Acts of Providence", acts of vandalism, or loss arising from documented neglect by THE CITY to properly care for planting after final completion.

C. Make periodic reviews of the grass, at no extra cost to THE CITY, during the warranty period to determine what changes, if any, should be made in THE CITY's maintenance program. Proposed changes shall be submitted, in writing, to THE CITY and, jointly by copy, to the A/E OF RECORD.

D. At conclusion of the 1 year and 90-day warranty periods, the A/E OF RECORD will make a construction review to determine the condition of sodding. Sod that has died or, in the opinion of the A/E OF RECORD, is in an unhealthy or badly impaired condition for reasons other than vandalism, "Acts of Providence", or documented neglect by THE CITY, shall be replaced by the Contractor as soon as possible, except that replacement will not be required in any season definitely unfavorable for the kinds of sod involved.

1.06 MAINTENANCE

A. Maintain sod, starting at the time of planting and continuing for 90 calendar days after final completion.

B. Maintain and protect sodding until end of maintenance period.

C. Sodding Maintenance:

1. Provide a complete maintenance cultural program until final completion.
2. Cultural program shall consist of watering, fertilizing, mowing, insect and disease control, and weed control.

    a. Begin mowing program as soon as sod is firmly rooted.

        1) Mow Floratam St. Augustine sod with a rotary type mower at least three times per month at a 3-inch mowing height.
        2) Bermuda grass shall be mowed with reel type mower a minimum of four times per month at a 1-inch mowing height.
        3) Mowing program shall include weed-eating and edging of beds, and along walks, curbs, and buildings.

3. Final completion is contingent upon full coverage of the sodded area resulting in healthy, vigorous turf, free of insects, disease, and weeds.
4. Contractor shall submit a written schedule for proposed maintenance of sodded areas.

D. General Maintenance:

1. Maintenance shall include watering, weeding, fertilizing, cultivating, spraying, adjustment of guying, staking, and pruning necessary to keep plant materials in a healthy vigorous growing condition and to keep planted areas neat and attractive.
2. Provide equipment and means for proper application of water to those planted areas not provided with an irrigation system.

E. Replacements:
1. At the end of maintenance period, plant material shall be in a healthy growing

condition.

2. During maintenance period immediately replace any plants showing weakness and probability of failure with a new healthy plant of the same type and size, without additional cost to THE CITY.

F. Extension of Maintenance Period: Continue maintenance period, at no additional cost to THE CITY, for additional 30 days after previously noted deficiencies have been corrected. Warranty extension period shall start upon acceptance of planting and at the end of the maintenance period.

G. The Contractor shall conclude maintenance (exclusive of replacement within warranty period) upon written acceptance of the A/E OF RECORD at the end of the maintenance period or, as provided for above, at the end of the extended maintenance period.

H. Protection:

1. Irrigate the newly planted grass until final completion.
2. Planting area shall be kept weed free with a herbicide program until final completion.

PART 2 PRODUCTS

2.01 MATERIALS

1. Soil/organic Component:

a. A muck type soil shall be used. The soil shall have a USDA soil texture classification of loam, Sandy clay loam, or sandy loam.
b. The soil shall contain 15 to 30 percent by weight organic matter (ASTM D 2974 Method C).
c. The soil shall have a pH between 5.5 and 7.5.
d. The soil shall have a soluble salt content less than 3.0 mmohs/cm.

B. Solid Sod:

1. St. Augustine Floratam: At right-of-ways and all other areas not occupied by structures, roadways, walkways, other plantings or sod, or parking lots.
2. Mow sod to a height not to exceed 1-1/2" before lifting.
3. Lifts shall have uniform thickness with not over 1-1/2" nor less than 1 inch of soil.
4. Sod shall be strongly rooted and free of pernicious weeds, 1-1/2" minimum root structure, freshly dug, brought to the site and placed immediately.
5. Sod showing discoloration or wilting will be rejected.
6. Sod containing nutgrass, lippia, water sedge, and dollar weed is not acceptable.

C. Commercial Fertilizers:

1. Commercial grade fertilizer, uniform in composition, dry, free flowing, and delivered to site in fully labeled, unopened containers, bearing name, trade name or trademark and warranty of producer.
2. Fertilizers shall comply with applicable State and Federal law.

3. At least 50 percent of the nitrogen content shall be derived from natural organic sources and potash derived from sulphate of potash.
4. Each container of fertilizer shall bear manufacturer's statement of analysis or a manufacturer's certificate of compliance shall be submitted to the A/E OF RECORD upon delivery to the site.
5. The following minimum percentages of available plant food by weight are required.
6. Fertilizer:
   a. Milorganite 6-2-0 is to be applied to sod beds before installation of sod.
   b. 30 days after the installation of sod or as directed by the A/E OF RECORD, apply a 12-4-8 granular blend.

7. 12-4-8 Fertilizer:
   a. Total Nitrogen: Not less than 12.00 percent.
   b. Nitrate Nitrogen: Not less than 1.5 percent.
   c. Ammoniacal Nitrogen: Not less than 5.7 percent.
   d. Granular Blends:
      1) Water Soluble Organic Nitrogen: Not less than 1.3 percent.
      2) Water Insoluble Organic Nitrogen: Not less than 3.5 percent.
      3) Available Phosphoric Acid: Not less than 4.0 percent.
      4) Water Soluble Potash: Not less than 8.0 percent.
      5) Total Primary Plant Food: Not less than 24.0 percent.
      6) Chlorine: Not more than 6.0 percent.
      7) Secondary Plant Foods:

OXIDE		ELEMENTAL
Magnesium 2	or	Mg 1.20 percent
Manganese 1	or	Mn 0.70 percent

      8) From F.T.E. 504 - 30 lbs. per ton shall be composed of the following elements:

ELEMENTAL				
Boron	B_2O_3	0.1845%	B	0.05%
Copper	CuO	0.1312%	Cu	0.10%
Iron	Fe_2O_3	0.3360%	Fe	0.26%
Manganese	MnO	0.1372%	Mn	0.10%
Molybdenum	MoO_3	0.0015%	Mo	
Zinc	ZnO	0.1312%	Zn	0.10%

      9) Derived from the following source materials:

         a) Ammonium nitrate.
         b) Sulfate of ammonia.
         c) Ureaform or I.B.D.U.
         d) Triple superphosphate.
         e) Muriate of potash.
         f) Sulfa-mag.
         g) Manganese sulfate.

      10) All materials shall be prilled or granular except the Manganese

Sulfate.

e. Statement of Analysis: Each container of fertilizer shall bear producer's statement of analysis or producer's certificate of compliance shall be submitted to A/E OF RECORD upon delivery of fertilizer to jobsite.

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. Inspect work of other trades and verify work is complete to the point landscape work may start. Verify planting may be completed according to Construction Documents.

C. Discrepancies:

1. In event of discrepancy, immediately notify A/E OF RECORD.
2. Do not proceed with installation of materials or plants in areas of discrepancy until such discrepancies have been fully resolved to the satisfaction of the A/E OF RECORD.

D. It shall be the Contractor 's responsibility to thoroughly test the irrigation system before planting and report any malfunctions to THE CITY. No planting shall be done until the irrigation system is operating properly.

3.02 PREPARATION OF ROUGH GRADING AND SUBGRADE

A. Rough grading and subgrade shall be correct and suitable materials and proper drainage shall exist before placing sod. Soil or drainage conditions detrimental to growth of plant material shall be corrected.

B. Existing subgrade shall be scarified to a minimum depth of 3 inches before spreading of topsoil. Subgrade shall be brought to true and uniform grade, and shall be cleared of stones greater than 2 inches, sticks, and other extraneous materials.

C. Soil in compacted areas shall be tilled to a depth of 12 inches to produce a loose friable soil.

D. Sodding shall not begin if any areas exhibit ponded conditions.

3.03 SPREADING OF TOPSOIL

A. Subgrade shall be damp when topsoil is spread.

B. Areas where sod is to be planted shall have a subgrade 6 inches lower than the finish grade. A 4-inch layer of topsoil shall be added before the placing of sod.

C. Topsoil in areas to receive sod shall be fine graded with drag or rake. Remove sticks,

stones, and extraneous matter. Grading shall round out breaks in grade, smooth down lumps and ridges, and fill in holes and crevices. Grade shall be maintained until placement of sod.

D. Topsoil shall be partially incorporated into the subsoil to avoid potential layering effect of different soil layers. Apply 1/3 topsoil depth. Roto-till, plow, or disk into subsoil, then apply remainder.

3.04 INSTALLATION OF SODDING

A. Install sod as soon as practical following placement and grading of topsoil mixture.

B. Sod shall be free of mesh before installation.

C. Fertilizer: Spread 30 pounds of commercial fertilizer per 1,000 square feet of finished topsoil, lightly rake in and level.

D. Sod Placement:
1. Lift sod from trucks or storage piles and place by hand with closed joints and no overlapping.
2. Ground shall be leveled with the back of a rake and sod laid with joints closely butted so no voids are visible, keeping surface of sod flush with the adjoining pavements.
3. All sprinkler heads shall be flagged by the playing field Contractor before laying of the sod. The sod supplier/installer shall cut sod away from all sprinkler heads.
4. After laying, sprinkle sod thoroughly, and tamp sufficiently to incorporate sod with topsoil blanket and to insure tight joints between sections or strips.
5. After laying, cover sod with sufficient sand top dressing to fill voids remaining and then thoroughly water to wash top dressing into sodded surface.
6. Completed sod surface shall be true to finish grade indicated on plans, even and firm at all points and shall, after settlement, be flush with top of abutting walks, paving, concrete borders, catch basins and the like.
7. Keep new sod properly watered until final completion.
8. Protect sodded areas against trespassing and damage of any kind for the duration of maintenance period.

3.05 ADJUSTMENT AND CLEANING

A. Site Clean-Up:
1. Upon completion of any landscape project, thoroughly clean up the project site.
2. Remove equipment, unused materials, deleterious material, and surplus excavated material.
3. Fine grade disturbed areas and the areas adjacent to the new plantings to provide a neat and uniform site.
4. Damaged or altered existing structures, because of the landscape work, shall be corrected.

END OF SECTION

03100
CONCRETE FORMWORK

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 03200 - Concrete Reinforcement
2. 03300 - Cast-in-Place Concrete
3. 04221 - Concrete Unit Masonry
4. 04222 – Concrete Unit Masonry (Unreinforced only)

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM), latest edition:

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.

1.3 QUALITY ASSURANCE

A. Codes and Standards: Comply with the following codes, specifications, and standards, except where more stringent requirements are shown or specified:

1.	ACI 117/117R	Tolerances Compatibility for Concrete Construction.
2.	ACI 301	Specifications for Structural Concrete.
3.	ACI 318	Building Code Requirements for Structural Concrete.
4.	ACI 347R	Guide to Formwork for Concrete.

B. Qualifications:

1. Formwork Engineer: Professional engineer, with Florida registration 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.

1.4 FORMWORK AND RESHORING DESIGN

A. Formwork:

1. Comply with Chapter 4 of ACI 301.
2. Formwork engineer shall perform or oversee design, drawings, erection, and removal.
3. Design 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. Natural rock formations maintaining a stable vertical cut may be used as side forms. 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.
7. Removal Strength:

    a. Wall forms and column forms may be removed 12 hours after pouring.
    b. Slabs supported by precast joists may have forms removed as follows:

        1) Joist spacing 4'-6" or less, 24 hrs.
        2) Joist spacing between 4'-6" and 6'-8", 48 hrs.
        3) Joist spacing between 6'-8" and 8'-8", 72 hrs.

    c. Beams and other slabs shall not have forms removed until the concrete has achieved 75 percent of its design strength. Beams shall be reshored immediately upon removal of forms.
    d. 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.

B. 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.

1.5 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.
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. Reshoring:

1. Submit shop drawings, signed and sealed by formwork engineer, for reshoring system showing:

    a. Arrangement and sequencing of reshores required.

b. Specific areas where reshores do not align vertically.
c. Required installation procedures.
d. Removal criteria.

2. Submit calculations showing:

a. Loading diagrams for each floor or differently loaded area showing maximum imposed loads at each critical sequence.
b. Ratio of total load to strength at actual age.
c. Verification of member strength where shores do not align vertically.
d. Verification of structure to resist required lateral loads.

D. Foundations for Formwork and Reshoring:

1. Submit shop drawings, signed and sealed by formwork engineer, or include with formwork and reshoring shop drawings, showing:

a. Subgrade 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.
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.

F. Form Coatings: Provide commercial formulation form-coating compounds 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" radius on outside corners of exposed-to-view concrete unless drawings show other size or shape.
3. Drips: 3/8" wide x 1/2" high drip groove placed 3/4" back from edge in cast-in-place exterior soffits.

H. Premolded Expansion Joint: ASTM D994, 1/2" thick.

I. Vapor Retarder:

1. Provide moisture retarder cover over prepared base material where indicated.
2. Use polyethylene sheet not less than 6 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.

B. Design formwork to be readily removable without impact, shock, or damage to cast-in-place concrete surfaces and adjacent materials.

C. Construct forms to sizes, shapes, lines, and dimensions shown to obtain accurate alignment, location, grades, and level and plumb work in finished structures.

1. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work.
2. Use selected materials to obtain required finishes.
3. Solidly butt joints and provide backup at joints to prevent leakage of cement paste.

D. 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.

1. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only.
2. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and for easy removal.

E. Provide temporary opening where interior area of formwork is inaccessible for clean out, for inspection before concrete placement, and for placement of concrete.

1. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar.
2. Locate temporary openings on forms at inconspicuous locations.

F. At chamfers exposed to view, provide corners and edges with 1/2" radius PVC accessories to produce uniform smooth lines and tight edge joints, unless otherwise indicated or accepted by A/E.

G. Form Ties:

1. Factory-fabricated, adjustable-length, removable or snapoff metal form ties, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal.
2. Unless otherwise indicated, provide ties so portion remaining within concrete after removal is at least 1- 1/2" inside concrete.
3. Unless otherwise shown, provide form ties that will not leave holes larger than 1 inch diameter in concrete surface.

H. Provisions for Other Trades:

1. Provide openings in concrete formwork to accommodate work of other trades.
2. Determine size and location of opening, recesses, and chases from trades providing such items.
3. Accurately place and securely support items built into forms.

I. Cleaning and Tightening:

1. Thoroughly clean forms and adjacent surfaces to receive concrete.
2. 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" 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.

E. Isolation Joints in Slabs-on-Ground:

1. 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.
2. Joint filler and sealant materials are specified in Division 7 sections of these specifications.

F. Contraction (Control) Joints in Slabs-on-Ground:

1. Construct contraction joints in slabs-on-ground to form panels of patterns as shown.
2. Use inserts 1/4" wide x 1/4 of slab depth, unless otherwise indicated.

G. 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.
1.
2. Contraction joints may be formed by saw cuts as soon after slab finishing as possible without dislodging aggregate.

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

03200
CONCRETE REINFORCEMENT

PART 1 GENERAL

1.1 QUALITY ASSURANCE

A. Codes and Standards: Comply with the latest edition of 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 318 Building Code requirements for Reinforced Concrete.
5. ACI 439.3R 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.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM), latest edition:

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 Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
7. A775 Specification for Epoxy-Coated Reinforcing Steel Bars.
8. C1116 Specification for Fiber-reinforced Concrete and Shotcrete.

1.3 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.

2. Shop drawings made from sepias (or other reproductive methods) of the structural drawings will not be accepted and shall be cause for resubmittal.

B. Selection of splices: Splices shall be full tension, unless noted otherwise.

1. Splices noted on the drawings to be compression splices shall be furnished by one of the following:

a. Compression lap splices according to ACI 315.
b. Mechanical compression only connectors according to ACI 439-3R, staggered 1/2 Class "C" lap length and maintaining not less than 1/4 the total tensile capacity of any column face.
c. Full penetration welds staggered not less than 18 diameters.

2. Splices shown on the drawings as either Class "A" or Class "B" may be one of the following:

   a. Class "B" lap splices.
   b. Class "A" (but not less than compression lap) lap splices staggered not less than one Class "B" lap length.

      1) 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.

   c. Appropriate mechanical connectors according to ACI 439-3R staggered not less than 24 diameters.
   d. Full penetration welds staggered not less than 24 diameters.

3. 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:

   a. Class "B" lap splices where only 1/2 of the total rebars are spliced at any one floor.
   b. Full penetration welds staggered not less than 36 diameters.
   c. Appropriate mechanical connectors according to ACI 439-3R staggered not less than 36 diameters.

4. Total steel at lap splices shall not exceed 8 percent for columns or shear wall cores containing the spliced bars.

   a. All bars may be lapped at one section for up to 4 percent steel.
   b. 1/2 of the bars may be lapped for up to 5.3 percent steel.
   c. 1/3 of the bars may be lapped for up to 6 percent steel.
   d. Above 6 percent steel, other splice choices shall be used.

5. Where staggered lap splices are used, provide a mixture of bar sizes as appropriate where vertical bar size changes on the drawings.
6. 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.
7. 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.
8. Increase laps for bundled bars according to ACI 318, with number based on total bars in group including lapped bars.

C. 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.

D. 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.

E. 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.

F. 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.

G. 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.

H. Flat Plates: Provide not less than 3 separate drawings of each plate separately showing bottom bars, top bars, and accessories.

I. 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.

1.4 SUBSTITUTIONS

A. 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. Welded wire fabric shall be galvanized at exterior exposed concrete.
4. Unless indicated otherwise the minimum concrete protective cover specified in Paragraph 5.7.1 of ACI 301 is the specified cover for this project unless indicated otherwise.

C. Epoxy-Coated Reinforcing Bars: ASTM A775.

D. 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:

1. Form Saver by Lenton.
2. DB-SAE Splices System by Dayton Superior.
3. Rebar Flange Coupler by Williams Form Engineering Corp.

E. Mechanical Connectors and Splice Devices: Proprietary products suitable for the use intended and listed in ACI 439-3R-83.

F. Steel Wire: ASTM A82, plain, cold-drawn, steel.

G. Fabricated Deformed Steel Bar Mats: ASTM A184.

H. Welded Steel Wire Fabric: ASTM A185.

I. Deformed Steel Wire: ASTM A496.

J. Welded Deformed Steel Wire Fabric: ASTM A497.

K. 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.

1. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.
2. 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.
3. Provide custom supports as required to support top layer of mats and other special conditions not provided for within CRSI standards.

L. Fiber Reinforcement:

1. Manufacturers:

a. Fibermesh by Protex
b. Forta-Ferro by Forta Corporation, Grove City, PA.

2. Comply for use in plain concrete as defined in ACI 318.1. and the following:

a. Fibers shall not be used as a replacement for any reinforcement required for structural purposes.
b. Blend fibers into the concrete mix according to manufacturer□s written instructions.
c. Provide control joints according to Section 5.2 of ACI 318.1.
d. Fibers shall comply with ASTM C1116-95.

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 CITY.

E. Place reinforcement to obtain at least minimum coverages for concrete protection.

1. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations.
2. 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.

1. Lap adjoining pieces at least one full mesh plus 2 inches and wire splices.
2. 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 CITY.

END OF SECTION

03210
REINFORCING STEEL

PART I GENERAL

1.01 SECTION INCLUDES

Structural concrete reinforcement and grouting of reinforcement dowel bars into hardened concrete.

1.02 UNIT PRICES

No separate payment will be made for reinforcing steel or grouting that is part of the Work as bid. Include payment in unit price for structural concrete.

1.03 SUBMITTALS

Conform to all provisions and sections in these specifications. Shop Drawings:

1. Submit shop drawings detailing reinforcement fabrication, bar placement location, splices, spacing, bar designation, bar type, length, size, bending, number of bars, bar support type and other pertinent information, including dimensions. Provide sufficient detail for placement of reinforcement without use of Contract Drawings. Information shall correspond directly to data listed on bill of materials.
2. Use of reproductions of Contract Drawings by Contractor, Subcontractor, erector, fabricator or material supplier in preparation of shop drawings (or in lieu of preparation of shop drawings) signifies acceptance by that party of information shown thereon as correct, and acceptance of obligation to pay for any job expense, real or implied, arising due to errors that may occur thereon. Remove references to Design Engineer, including seals, when reproductions of Contract Drawings are used as shop drawings.
3. Detail shop drawings in accordance with ACI 315, Figure 6.
4. Submit shop drawings showing location of proposed additional construction joints as required under Section 03250 - Joints in Concrete Structures, and obtain approval of the Owner’s Representative, prior to submitting reinforcing steel shop drawings.

Bill of Materials: Submit with shop drawings.
Product Data:

5. Mechanical Bar Splices: Submit manufacturer's technical literature, including specifications and installation instructions.
6. Epoxy grout proposed for anchoring reinforcing dowels to hardened concrete: Submit manufacturer's technical literature including recommended installation procedures.

Certificates:

7. Submit steel manufacturer's certificates of mill tests giving properties of steel proposed for use. List manufacturer's test number, heat number, chemical analysis, yield point, tensile strength and percentage of elongation. Identify proposed location of steel in work.

8. Foreign-manufactured reinforcing bars shall be tested for conformance to ASTM requirements by a certified independent testing laboratory located in

United States. Certification from any other source is not acceptable. Submit test reports for review. Do not begin fabrication of reinforcement until material has been approved.

1.04 HANDLING AND STORAGE

Store steel reinforcement above ground on platforms, skids or other supports. Protect reinforcing from mechanical injury, surface deterioration and formation of excessive, loose or flaky rust caused by exposure to weather. Protect epoxy-coated reinforcing from formation of any amount of rust.

1.05 QUALITY ASSURANCE

Notify the Owner's Representative at least 48 hours before concrete placement so that reinforcement may be inspected, and errors corrected, without delaying Work.

PART 2 PRODUCTS

2.01 MATERIAL

Reinforcing bars: Deformed bars conforming to ASTM A615, grade as indicated on Drawings, except column spirals and those shown on Drawings to be smooth bars. Where grade is not shown on Drawings, use Grade 60.

Smooth bars: Where indicated on Drawings, use smooth bars conforming to ASTM A36; ASTM A615, Grade 60; or ASTM A675, Grade 70.

Column Spirals: Bars conforming to ASTM A615, Grade 60, or wire conforming to ASTM A82.

Epoxy-Coated Deformed bars, Column Spirals and Smooth Bars: Conform to ASTM A775/A775M.

Welded Wire Fabric:

1. Welded Smooth Wire Fabric: Conform to ASTM A185.
2. Welded Deformed Wire Fabric: Conform to ASTM A497.
3. Provide wire size, type and spacing as shown. Where type is not shown on Drawings, use welded smooth wire fabric.
4. Furnish welded wire fabric in flat sheets only.

Tie Wire: 16-1/2 gage or heavier annealed steel wire. Use plastic-coated tie wire with epoxy-coated reinforcing steel.

Bar Supports: Provide chairs, riser bars, ties and other accessories made of plastic or metal, except as otherwise specified. Use bar supports and accessories of sizes required to provide required concrete cover. Where concrete surfaces are exposed to weather, water or wastewater, provide plastic accessories only; do not use galvanized or plastic-tipped metal in such locations. Provide metal bar supports and accessories rated Class 1 or 2 conforming to CRSI MSP-1 Manual of Standard Practice. Use epoxy-coated bar supports with epoxy-coated reinforcing bars. Slabs on Grade: Provide chairs with sheet metal bases or provide precast concrete bar supports 3 inches wide, 6 inches long, and thick enough to allow required cover. Embed tie wires in 3-inch

by 6-inch side.

Mechanical Bar Splices:

5. Conform to ACI 318; use where indicated on Drawings.
   a. Compression splices shall develop ultimate stress of reinforcing
   b. Tension splices shall develop 125 percent of minimum yield point stress of reinforcing bar.
6. Regardless of chemical composition of steel, any heat effect shall not adversely affect performance of reinforcing bar.

Welded Splices:

7. Provide welded splices where shown and where approved by the Owner's Representative. Welded splices of reinforcing steel shall develop a tensile strength exceeding 125 percent of the yield strength of the reinforcing bars connected.
8. Provide materials for welded splices conforming to AWS D1.4.

Epoxy Grout: High-strength rigid epoxy adhesive, conforming to ASTM C881, Type IV, manufactured for purpose of anchoring dowels into hardened concrete and the moisture condition, application temperature and orientation of the hole to be filled. Unless otherwise shown, depth of embedment shall be as required to develop the full tensile strength (125 percent of yield strength) of dowel, but not less than 12 diameters.

2.02 FABRICATION

Bending: Fabricate bars to shapes indicated on Drawings by cold bending. Bends shall conform to minimum bend diameters specified in ACI 318. Do not straighten or re-bend bars. Fabricate epoxy-coated reinforcing steel to required shapes in a that will not damage epoxy coating. Repair any damaged epoxy coating with patching material conforming to Item 4.4 of ASTM A775/A775M.

Splices:

1. Locate splices as indicated on Drawings. Do not locate splices at other locations without approval of the Owner's Representative. Use minimum number of splices located at points of minimum stress. Stagger splices in adjacent bars.
2. Length of lap splices: As shown on Drawings.
3. Prepare ends of bars at mechanical splices in accordance with splice manufacturer's requirements.

Construction Joints: Unless otherwise shown, continue reinforcing through construction joints. Bar Fabrication Tolerances: Conform to tolerances listed in ACI 315, Figures 4 and 5. Standard Hooks: Conform to the requirements of ACI 318.

Marking: Clearly mark bars with waterproof tags showing number of bars, size, mark, length and yield strength. Mark steel with same designation as member in which it occurs.

PART 3 EXECUTION

3.01 PREPARATION

Clean reinforcement of scale, loose or flaky rust and other foreign material, including oil, mud or coating that will reduce bond to concrete.

3.02 INSTALLATION

Placement Tolerances: Place reinforcement within tolerances of Table 03210A at the end of this Section. Bend tie wire away from forms to maintain the specified concrete coverage.

Interferences: Maintain 2-inch clearance from embedded items. Where reinforcing interferes with location of other reinforcing steel, conduit or embedded items, bars may be moved within specified tolerances or one bar diameter, whichever is greater. Where greater movement of bars is required to avoid interference, notify the Owner's Representative. Do not cut reinforcement to install inserts, conduit, mechanical openings or other items without approval of the Owner's Representative.

Concrete Cover: Provide clear cover measured from reinforcement to face of concrete as listed in Table 03210B at the end of this Section, unless otherwise indicated on approved permit drawings.

Placement in Forms: Use spacers, chairs, wire ties and other accessory items necessary to assemble, space and support reinforcing properly. Provide accessories of sufficient number, size and strength to prevent deflection or displacement of reinforcement due to construction loads or concrete placement. Use appropriate accessories to position and support bolts, anchors and other embedded items. Tie reinforcing bars at each intersection, and to accessories. Blocking reinforcement with concrete or masonry is prohibited.

Placement for Concrete on Ground: Support bar and wire reinforcement on chairs spaced at approximately 3 feet on centers each way. Use minimum of one support for each 9 square feet. Tie supports to reinforcing bars and wires.

Vertical Reinforcement in Columns: Offset vertical bars by at least one bar diameter at splices. Provide accurate templates for column dowels to ensure proper placement. Splices:

1. Do not splice bars, except at locations indicated on Drawings or reviewed shop drawings, without approval of the Owner's Representative.
2. Lap Splices: Unless otherwise shown or noted, Class B, conforming to ACI 318-89, Section 12.15.1. Tie securely with wire prior to concrete placement, to prevent displacement of splices during concrete placement.
3. Mechanical Bar Splices: Use only where indicated on Drawings or approved by the Owner's Representative. Install in accordance with manufacturer's instructions.
    a. Couplers located at a joint face shall be of a type which can be set either flush or recessed from the face as shown. Seal couplers prior to concrete placement to completely eliminate concrete or cement paste from entering.
    b. Couplers intended for future connections: Recess 1/2 inch minimum from concrete surface. After concrete is placed, plug coupler and fill recess with sealant to prevent contact with water or other corrosive materials.
    c. Unless noted otherwise, match mechanical coupler spacing and capacity to that shown for the adjacent reinforcing.

Construction Joints: Place reinforcing continuous through construction joints, unless noted otherwise.

Welded Wire Fabric: Install wire fabric in as long lengths as practicable. Unless otherwise

indicated on Drawings, lap adjoining pieces at least 6 inches or one full mesh plus 2 inches, whichever is larger. Lace splices with wire. Do not make end laps midway between supporting beams, or directly over beams of continuous structures. Offset end laps in adjacent widths to prevent continuous laps. Conform to WRI - Manual of Standard Practice for Welded Wire Fabric.

Field Bending: Shape reinforcing bent during construction operations to conform to Drawings. Bars shall be cold-bent; do not heat bars. Closely inspect reinforcing for breaks. When reinforcing is damaged, replace, Cadweld, or otherwise repair, as directed by the Owner's Representative. Do not bend reinforcement after it is embedded in concrete.

Epoxy-coated Reinforcing Steel: Install in accordance with Paragraph 3.02J, Field Bending, and in a manner that will not damage epoxy coating. Repair damaged epoxy coating with patching material as specified in Paragraph 2.02A, Bending.

Field Cutting: Cut reinforcing bars by shearing or sawing. Do not cut bars with cutting torch.

Welding of reinforcing bars is prohibited, except where shown on Drawings.

3.03 GROUTING OF REINFORCING AND DOWEL BARS

Use epoxy grout for anchoring reinforcing and dowel steel to existing concrete in accordance with epoxy manufacturer's instructions. Drill hole not more than 1/4 inch larger than steel bar diameter (including height of deformations for deformed bars) in existing concrete. Just before installation of steel, blow hole clean of all debris using compressed air. Partially fill hole with epoxy, using enough epoxy so when steel bar is inserted, epoxy grout will completely fill hole around bar. Dip end of steel bar in epoxy and twist bar while inserting into partially filled hole.

TABLE 03210A

REINFORCEMENT PLACEMENT TOLERANCES

PLACEMENT	TOLERANCE IN INCHES
Clear Distance –	
To formed soffit:	-1/4
To other formed surfaces:	±1/4
Minimum spacing between bars	-1/4
Clear distance from unformed surface to top reinforcement –	
Members 8 inches deep or less:	±1/4
Members more than 8 inches deep but less than 24 inches deep:	-1/4, +1/2
Members 24 inches deep or greater:	-1/4, +1
Uniform spacing of bars (but the required number of bars shall not be reduced):	±1
Uniform spacing of stirrups and ties (but the required number of stirrups and ties shall not be reduced):	±1
Longitudinal locations of bends and ends of reinforcement –	
General:	±1
Discontinuous ends of members:	±1/2
Length of bar laps:	-1
Embedded length -	
For bar sizes No. 3 through 11:	-1
For bar sizes No. 14 and 18:	-2

TABLE 03210B

MINIMUM CONRETE COVER FOR REINFORCEMENT

SURFACE	MINIMUM COVER IN INCHES
Slabs and Joists -	
Top and bottom bars for dry conditions –	
No. 14 and No. 18 bars:	1-1/2
No. 11 bars and smaller:	1
Formed concrete surfaces exposed to earth, water or weather; over, or in contact with, sewage; and for bottoms bearing on work mat, or slabs supporting earth cover -	
No. 5 bars and smaller:	1-1/2
No. 6 through No. 18 bars:	2
Beams and Columns –	
For dry conditions -	
Stirrups, spirals and ties:	1-1/2
Principal reinforcement:	2
Exposed to earth, water, sewage or weather –	
Stirrups and ties:	2
Principal reinforcement:	2-1/2
Walls –	
For dry conditions –	
No. 11 bars and smaller:	1
No. 14 and No. 18 bars:	1-1/2
Formed concrete surfaces exposed to earth, water, sewage or weather, or in contact with ground –	
Circular tanks with ring tension:	2
All others:	2
Footings and Base Slabs -	
At formed surfaces and bottoms bearing on concrete work mat:	2
At unformed surfaces and bottoms in contact with earth:	3
Over top of piles:	2
Top of footings – same as slabs	

END OF SECTION

03300
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SUMMARY

A. Related Sections:

1. 03100 - Concrete Formwork.
2. 03200 - Concrete Reinforcement
3. 03312 - Concrete Testing.
4. 07900 - Joint Sealers.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):

1.	A615/A-96a	Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
2.	C78-94	Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading).
3.	C150-96	Specification for Portland Cement.
4.	C260-95	Specification for Air-Entraining Admixtures for Concrete.
5.	C309-97	Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
6.	C494-92	Specification for Chemical Admixtures for Concrete.
7.	D1751-83(1991)	Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
8.	D1752-84(1996)	Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

1.03 SUBMITTALS

A. Submit shop drawings for reinforcement and accessories:

1. Detail beams and reinforcing in elevation and not in schedules.
2. Show slab reinforcing in plan view, similar to the structural drawings, not scheduled, and drawn to a minimum scale of 1/8" = 1'-0". Show reinforcing on the plan view along with size, quantity, marks, and spacing.
3. Detail walls and reinforcing in elevation and not in schedules.
4. Other items may be detailed as needed.
5. A/E will not review drawing submitted not complying with these requirements. Contractor shall verify detailing proceeds as specified to avoid untimely reinforcing arrival.

B. Materials and methods of curing.

C. Concrete materials and mix designs.

D. Certifications required for admixtures (chloride and solids).

E. Chlorides in concrete.

F. Test reports.

G. Waterstops and premolded joint fillers.

H. Curing compounds.

1.04 STANDARDS

A. Concrete work shall comply with requirements of ACI 301- Specifications for Structural Concrete for Buildings, except as specified.

B. The Contractor shall familiarize himself with the requirements of ACI 301 and this specification.

C. The requirements that follow are listed in the sequence of chapter numbers of ACI 301 for ready reference purposes.

D. Florida Building Code (FBC).

PART 2 PRODUCTS

2.01 MATERIALS

A. Comply with Chapter 1 of ACI 301.

2.02 MATERIALS FOR CONCRETE

A. Comply with Chapter 2 of ACI 301 and the following:
1. Cement: Type I or III complying with ASTM C150.
2. Admixtures:

a. Water Reducing Admixture: The admixture shall comply with ASTM C494, Type A, and not contain more chloride ions that are present in municipal drinking water.
1) Eucon WR-75 by Euclid Chemical Co.
2) Pozzolith 200N by Master Builders.
3) Plastocrete 160 by Sika Chemical Corp.

b. Water Reducing, Retarding Admixture: The admixture shall comply with ASTM C494, Type D, and not contain more chloride ions that are present in municipal drinking water.
1) Eucon Retarder-75 by Euclid Chemical Co.
2) Pozzolith 100XR by Master Builders.
3) Plastiment by Sika Chemical Corp.

c. High Range Reducing Admixture (Superplasticizer): The admixture shall comply with ASTM C494, Type F or G, and not contain more chloride ions than are present in municipal drinking water.
   1) Eucon 37 by Euclid Chemical Co.
   2) Sikament by Sika Chemical Corp.

d. Non-Chloride Accelerator: The admixture shall comply with ASTM C494, Type C or E, and not contain more chloride ions than are present in municipal drinking water.
   1) Accelguard 80 by Euclid Chemical Co.
   2) Darex Set Accelerator by W.R. Grace.

3. Air Entraining Admixture: Complying with ASTM C260.
4. Calcium Chloride: Calcium chloride or admixture containing more than 0.1 percent chloride ions are not allowed.

B. Certification: Written compliance to above-mentioned requirements and the chloride ion content will be required from the admixture manufacturer (include admixtures) before mix design review by the A/E.

2.03 PROPORTIONING

A. Comply with Chapter 3 of ACI 301 and the following:
1. Strength: Normal weight concrete - see drawings.
   a. Concrete slabs, designated as "Concrete Pavement": 28-day compressive strength not less than 4,000 psi and a flexural strength (modulus of rupture) of not less than 650 psi when tested according to "Method of Test for Flexural Strength of concrete (using simple beam with third point loading)", ASTM C78. Include curb or curb and gutters.

2. Durability:
   a. Pumped Concrete:
      1) Testing shall be completed at the final discharge location after pumping.
      2) Testing shall be completed at the truck before pumping.
      3) Samples shall include samples for both slump and strength tests.
      4) Adding of water to transit mixers/agitators.

         a) Contractor shall maintain a maximum time limit of 90 minutes on the introduction of water into the cement.
         b) Only 1 addition of water on the site to bring the mix to the producer's mix slump criteria is allowed.

   b. Design Mixes:
      1) Design mixes for concrete intended to be placed as-is from the truck shall be designed as such.
      2) Design mixes for concrete intended to be pumped shall be made on one of the following bases:

         a) The mix shall be designed as a truly plastic mix by proper proportioning. See ACI 304.2R - Placing Concrete By

Pumping Methods for guidelines for a pumpable plastic workable mix. Trial batches shall be made, and without a device to test pumping ability, results of field trials shall be used.

b) Water shall not be added at the pump. One addition of water at the truck to meet the design slump (at the truck) is allowed.

c) A super plasticizer may be used.

c. Concrete slabs placed at temperatures below 40 degrees F. shall contain the "Non-Chloride Accelerator".

d. Concrete required to be air entraining shall contain the "Air Entraining Admixture", and air content shall comply with table 3.4.1 of ACI 301.

e. Pumped concrete and concrete with a water/cement ratio less than 0.50 shall contain the "High Range Water Reducing Admixture".

f. The "Water Reducing", Type A, or "Water Reducing and Retarding", Type D admixtures complying with ASTM C494 may be used at the option of the Contractor.

g. Concrete containing the "High Range Water Reducing Admixture" (superplasticizer) shall have a maximum slump of 8 inches unless otherwise directed by the A/E. The concrete shall be proportioned for a slump of 2 to 3 inches, be verified, then the high range water reducing admixture added to increase the slump to the approved level.

h. All other concrete shall be proportioned to have a maximum slump of 4 inches.

3. Normal weight concrete shall be air-entrained. Amount of air-entraining shall be according to Table 3.4.1.

4. Requirements for Other Concrete: The requirements of Paragraph 2.03 D(1).

2.04 FORM WORK

A. Comply with Chapter 4 of ACI 301 and the following:

1. Earth cuts shall not be used as forms for vertical surfaces. Natural rock formations maintaining a stable vertical cut may be used as side forms. Comply with OSHA's "Trench Safety Act".

2. Design and Installation of Formwork: Form ties that leave through holes in the concrete are not allowed.

3. Removal Strength:

a. Wall forms and column forms may be removed 12 hours after pouring.

b. Slabs supported by precast joists may have forms removed as follows:

1) Joist spacing 4'-6" or less, 24 hrs.

2) Joist spacing between 4'-6" and 6'-8", 48 hrs.

3) Joist spacing between 6'-8" and 8'-8", 72 hrs.

c. Beams and other slabs shall not have forms removed until the concrete has achieved 75 percent of its design strength. Beams shall be reshored immediately upon removal of forms.

d. 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.

2.05 REINFORCEMENT

A. Comply with Chapter 5 of ACI 301 and Section 03200 - Concrete Reinforcement.

2.06 FIBER REINFORCEMENT

A. Comply for use in plain concrete as defined in ACI 318.1. and Section 03200 - Concrete Reinforcement.

2.07 JOINTS AND EMBEDDED ITEMS

A. Comply with Chapter 6 of ACI 301 and the following:

1. Expansion Joints:

a. Premolded joint fillers shall be preformed bituminous type, ASTM D1751 for joints without sealant.
b. Premolded expansion joint fillers for pavements, for joints with sealant and where indicated shall be non-extruding and resilient type of ASTM D1752, compatible with urethane joint sealant compounds.

2. Waterstops:

a. Waterstops and fittings shall be manufactured from PVC. The waterstops shall be as manufactured by Greenstreak or accepted equivalent.
b. For construction joints, 4 inches serrated typed with Centerbulb, RS 316-4 or RB316-4 shall be used.
c. For expansion joints, 6-inch serrated type with Centerbulb, RB38T6 or RSB386 shall be used.
d. Make splices using splicing unions according to manufacturer's instructions. Make waterstop intersections using factory molded fittings.
e. Provide #14 tie wire at 2'-0" center to center embedded in base pour for waterstop support.

3. Safety Nosings For Exterior Concrete Stairs:

a. Cast abrasive aluminum 3 inches wide, equipped with manufacturer's standard continuous anchors.
b. Length shall be 6 inches less than the full width of stairs.
c. Provide factory-applied reinforced protective tape on exposed surfaces of nosings.
d. Manufacturers:

1) Model No.101 by Wooster Products Inc.
2) Model "A" by American Abrasive Metals.
3) Model "AX" by Safety-T-Metal Co., Inc.

2.08 PRODUCTION OF CONCRETE

A. Comply with Chapter 7 of ACI 301 and following:

1. Ready-Mixed Concrete:

a. Provide copies of each delivery ticket to the A/E. Include mix designation on delivery ticket.
b. Do not place concrete over 90 minutes old from the time it was batched.

2. Weather Conditions:

a. Where the relative humidity is less than the corresponding concrete temperature as placed, or intended to be placed, as indicated in the following Table, the Contractor shall follow the recommendations of ACI 305R, "Hot Weather Concreting".

Concrete Temperature (F)	Minimum Relative Humidity
100°	80
95°	70
90°	60
85°	50
80°	40
75°	30

b. The above Table is based upon a wind speed of 10 mph. For ambient wind speeds more than 10 mph, the Contractor shall follow the recommendations of Fig.2.1.5 of ACI 305R if the relationships of air temperature, wind velocity, relative humidity, and concrete temperature indicate a rate of evaporation more than 0.2 pounds per sq.ft. per hour.
c. Concrete having a temperature more than 100 degrees F. shall not be placed.
d. The requirements of Paragraph 7.6.1.2 of ACI 301 (cooling of concrete ingredients are not waived).

2.09 PLACING

A. Comply with Chapter 8 of ACI 301 and the following:

1. Protection: When the temperature of the concrete exceeds the minimum relative humidity relationship specified in Paragraph "Production of Concrete", the requirements of Paragraph "Production of Concrete" shall control.

2.10 REPAIR OF SURFACE DEFECTS

A. Comply with Chapter 9 of ACI 301 and the following:
1. With prior approval of the A/E, as to method and procedure, repair defective areas according to ACI 301, Chapter 9, except that the bonding compound Euco Weld by the Euclid Chemical Company or Weldcrete by the Larsen Company must be used.
2. Defects designated as "structural" by the A/E shall be repaired with prior

approval of the A/E, as to method and procedure, using the epoxy adhesive epoxy mortar as furnished by the Euclid Chemical Company or Sika Chemical Corp.

2.11 FINISHING OF FORMED SURFACES

A. Comply with Chapter 10 of ACI 301 and the following:

1. Finishes:

a. All concrete shall be "rough form finish" according to Paragraph 10.2 of ACI 301, except concrete that will be exposed to view shall be "smooth form finish".

2.12 SLABS

A. Comply with Chapter 11 of ACI 301 and the following:

1. Finishes: Finishes shall be according to Paragraph 11.8 of ACI 301 except as specified.
2. Maximum allowable tolerances for floor slabs not receiving ceramic or quarry tile shall be 1/8" in a 10-foot radius.
3. Exterior slabs receiving tile, pavers, or similar covering shall be troweled finish.

2.13 CURING AND PROTECTION

A. Comply with Chapter 12 of ACI 301 and the following:

1. Preservation of moisture according to Paragraph 12.2 of ACI 301.
2. Curing and Sealing Compound: Super Floor Coat or Super Pliocure by the Euclid Chemical Company or Masterseal 66 by Master Builders. The compound shall comply with ASTM C309, Type 1 or Type 1D, 30 percent solids content minimum, and have test data from an independent laboratory indicating a maximum moisture loss of 0.030 grams per sq.cm. when applied at a coverage rate of 300 sq.ft. per gallon. Manufacturers certification required.
3. Curing and Hardening Compound: "Eucosil" by the Euclid Chemical Company or "Curetox" by Toch Brothers. The compound shall be sodium silicate type.
4. Apply compounds according to manufacturer's directions.
5. Slabs receiving carpet or are of exposed concrete in the finished structure shall receive the "Curing and Sealing Compound". Exclude exterior walks and pavements.
6. Slabs receiving resilient tile or cementitious or other toppings are to receive the "Curing and Hardening Compound".
7. Verify the compatibility of the compound with the applied coverings or toppings.
8. Submit manufacturer's data.
9. Application of Curing and Sealing and Curing and Hardening Compound: Apply compound to concrete floors and slabs according to manufacturer's directions and as follows:
   a. After fresh placed concrete surface has been finished and will not be marred by application, uniformly apply undiluted compound by spray, brush or squeegee without allowing compound to collect in low spots.
   b. Keep traffic off surface for 24 hours or until surface is completely dry.
   c. Within 1 week of a date set by the A/E, thoroughly clean and wash exposed concrete interior floors, then apply a second uniformly applied coat of the specified Curing and Sealing Compound without allowing compound to collect in low spots. Keep traffic off surface for 24-hours

following the second coat, or until surface is completely dry. Exclude walks, pavements, and exterior slabs.

B. Temperature, Wind, and Humidity: The requirements of "Production of Concrete" shall decide the conditions and precautions for hot weather concreting.

2.14 TESTING

A. Comply with Chapter 16 of ACI 301, Section 03312 - Concrete Testing, and the following:
   1. Testing Agencies: The cost of testing services unless specified otherwise, will be as follows:
   2. Services described in Paragraphs 16.3.1, 16.3.2, and 16.3.3 of ACI 301 (review or check test Contractor's materials and mix design, secure and test production samples at plants or stock piles) will be paid by the Contractor, as required by the A/E.
   3. Services described in Paragraphs 16.3.4, 16.3.5, and 16.3.6 of ACI 301 (strength, slump, and temperature tests of concrete) will be paid by the Contractor.
   4. If air entrained concrete is specified, tests according to Paragraphs 16.3.5 and 16.3.6 of ACI 301 (air content will be paid by Contractor.
   5. Services described in Paragraph 16.5 of ACI 301, additional testing and inspection because of changes proposed by Contractor, additional testing because of failure to meet specifications shall be paid by Contractor.

B. Testing Services:
   1. For strength test of concrete, mold, cure, and test 5 specimens. Test 1 at 3 days, 1 at 7 days, and 3 at 28 days.
   2. Make 1 strength test for each 50 cubic yards or fraction thereof placed in any 1 day.

2.15 EVALUATION AND ACCEPTANCE OF CONCRETE

A. Comply with Chapter 17 of ACI 301.

2.16 ACCEPTANCE OF STRUCTURE

A. Comply with Chapter 18 of ACI 301.

PART 3 - NOT USED.

END OF SECTION

03312
CONCRETE TESTING

PART 1 GENERAL

1.1 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.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM), latest edition:

1. C31 Practice for Making and Curing Concrete Test Specimens in the Field.
2. C39 Test Method for Compressive Strength of Cylindrical Concrete Specimens.
3. C42 Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
4. C94 Specification for Ready-Mixed Concrete.
5. C143 Test Method for Slump of Hydraulic Cement Concrete.
6. C173 Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
7. C231 Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
8. C494 Specification for Chemical Admixtures for Concrete.

1.3 QUALITY ASSURANCE

A. Comply with provisions of the latest edition of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:

1. ACI 301 Specifications for Structural Concrete for Buildings.
2. ACI 318 Building Code Requirements for Structural Concrete.
3. ACI 347 Guide to Formwork for Concrete.

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

3.1 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.

3.2 COMPRESSIVE STRENGTH TESTS

A. Comply with ASTM C39.

B. Time of tests:

1. 1 specimen at 7 days.
2. 1 specimens tested at 28 days and 1 reserve.

3.3 REPORTS

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.

3.4 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.

3.5 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

03600
GROUT

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 03300 - Cast-In-Place Concrete.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM), latest edition:

1. C109 Test Method for Compressive Strength of Hydraulic Cement Mortars.
2. C191 Test Method for Time of Setting Hydraulic Cement by Vicat Needle.
3. C531 Test Methods for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
4. C579 Test Method for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
5. C827 Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures.

1.3 SUBMITTALS

A. Manufacturer's literature including specifications and printed installation instructions.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Grouting Mortar:

1. Bonsal American, an Oldcastle Company.
2. Five-Star Products Inc.
3. Master Builder.
4. Mobil.
5. Thoro.

2.2 NONSHRINK CEMENTITIOUS GROUT

A. Exhibit no visible bleeding 2 hours after placement in a fluid consistency of 20 to 30 second flow through CRD C79 Flow Cone.

B. Grout shall show no shrinkage and a maximum of 4.0 percent expansion at any time before initial set and tested according to ASTM C827.

C. Grout shall show no shrinkage and a maximum of 0.2 percent expansion in the hardened state when tested according to CRD C588.

D. Compressive Strength: Minimum of 5,000 psi at 7 days and minimum strengths as listed below according to ASTM C109 modified.

1. 24 Hours: 2,000 psi.
2. 7 Days: 5,000 psi.

E. Grout shall show initial set time of not less than 60 minutes when tested according to ASTM C191.

F. Grout shall contain no metallic substances, water reducing agents, accelerators super plasticizers, or other materials.

G. Technical service shall be provided by the manufacturer of grout upon request of contractor.

H. Water shall be clean and free from injurious amounts of oil, alkalies, and other deleterious materials according to AASHTO T26.

2.3 EPOXY GROUT

A. Grout shall be flowable and a 100 percent solids system.

B. Grout shall show no shrinkage and a maximum of 4 percent expansion when tested according to ASTM C531 (Modified).

C. Compressive strength shall be determined by ASTM C579 attaining the minimum strengths listed below:

1. 24 hours: 5,000 psi.
2. 2 days: 8,000 psi.
3. 7 days: 11,000 psi.

D. Peak exotherm temperature of a *2*-inch diameter by 4-inch-high cylinder of grout shall not exceed 95 degrees F. when tested at 75 degrees F. material and air temperatures.

E. Grout shall not exceed a coefficient of thermal expansion of 30 x 10^{-6} in/in/degrees F. when tested according to ASTM C531.

2.4 GROUT STORAGE

A. Grout components shall be delivered to the construction site in moisture proof bags. Bags shall be stored in a dry weatherproof area within a temperature range of 40 to 90 degrees F.

B. Remove damp or defective material from the site at expense to the City of Miami.

C. Storage time of nonshrink cement grout mix shall be limited to 10 months.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

A. Concrete surfaces shall be prepared for grouting by removing all oil, grease, laitance, and other foreign substances.

B. Roughen surfaces to receive grout by chipping or nail raking of plastic concrete to assure a good bond of grout to existing concrete. Clean thoroughly with water and soak surface for 24 hours before placing cement grout. Surfaces shall be kept completely dry for epoxy grout.

C. Metal surfaces of equipment bases to be epoxy grout shall be thoroughly cleaned to bright metal.

3.2 FORMS

A. Forms for fluid grout shall be built of materials with adequate strength to withstand the placement of grout.

B. Forms for nonshrink cement grout shall be tight against all surfaces and joints shall be sealed with tape. Form oil shall be used for easy form release.

C. Forms for grout shall be watertight with chamfer strips in place. Caulking shall be used on all joints. Forms for epoxy grout shall be lined with polyethylene or waxed for easy form release.

D. Forms shall be 4 to 6 inches higher than the base plate on one side of forms when using hydraulic head pressure for placing.

E. Provide air relief holes at least 1/4" in diameter at every recessed base plate corner.

3.3 MIXING

A. Grout shall be mixed according to manufacturer□s recommendations.

B. Nonshrink cement grout shall be added to water to obtain the desired consistency.

C. Epoxy Grout:

1. Components shall be conditioned to a temperature of between 70 and 85 degrees F. before use.
2. Epoxy hardener shall first be added to resin and thoroughly mixed for 2 to 3 minutes without whipping air into the mix.
3. Low speed mixer or hand stirring shall be used.
4. Mixed resin and hardener shall then be put into clean mortar mixer and the entire bag of aggregate added.
5. Epoxy grout component ratios shall not be altered and no solvents or thinners added to the mix.

D. Mix nonshrink cement grout between 3 and 5 minutes for uniform consistency.

E. Epoxy grout shall be mixed until aggregate is uniformly wetted.

F. Mortar mixer shall be used instead of a concrete mixer for mechanical mixing of grout.

G. Remixing of grout by adding more water or remixing of stiffening grout is not allowed.

3.4 REINFORCEMENT

A. Reinforcement and joints for epoxy grout shall be provided when and by methods recommended by the manufacturer of the grout.

3.5 PLACEMENT

A. Grout shall be rapidly placed continuously from one side of baseplate only in one direction.

B. Grout under base plates to fill all spaces and completely fill anchor bolt sleeves.

C. Hydraulic head grouting pressure shall be maintained by keeping the level of grout in the head box above the bottom of the base plate. Head box shall be filled to the maximum level and grout worked down to top of base plate.

D. Shims used for temporary leveling of equipment and base plates shall be removed after the grout has obtained sufficient strength to carry the baseplate loading. Voids left by the removal of shims shall be filled with a second placement of grout.

3.6 FINISHING

A. Alter cement grout has reached final set, it shall be trimmed back to the level as shown on drawings.

B. Top surfaces of epoxy grout may be finished by troweling with a steel trowel moistened with oil before set.

3.7 CURING

A. Nonshrink Cementitious Grout:

1. Grout shall be cured according to manufacturer's specifications and recommendations.
2. Forms shall remain in place for 24 hours.
3. Temperature of base plates and supporting concrete shall be maintained between 40 and 90 degrees F. during grouting and for a minimum of 12 hours after placing.

B. Epoxy Grout:

1. Grout shall be cured according to manufacturer□s specifications and recommendations.
2. Forms shall remain in place for a minimum of 24 hours after placing grout.
3. Temperature of base plate and supporting concrete shall be maintained between 40 and 80 degrees F. during grouting and for a minimum of 24 hours after placing.

3.8 TESTING

A. Contractor shall be responsible for preparing, storing, curing, and transporting the test samples to the laboratory for testing.

B. Grout shall develop required compressive strength according to ASTM C109 (modified) for packaged grouts and ASTM C579 for epoxy grout.

C. Three test cubes shall be made for each day of grouting. Tests shall be made of one cube at the following intervals:

1. Cement Grout: 24 hours, 7 days, and 28 days.
2. Epoxy Grout: 24 hours, 2 days, and 7 days.

D. Test reports shall be submitted to the A/E immediately after the result of each age test is available.

END OF SECTION

04221
CONCRETE UNIT MASONRY

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

A. Coordinate concrete unit masonry (also termed “CMU” and “block”) work with work before and after, especially:

1. Dovetail assemblies in concrete, for anchoring masonry work
2. Concrete framing.
3. Welding masonry anchors to steel structure.
4. Insulation beneath interior wall finish at exterior walls
5. Wall vapor barrier (if used)
6. Anchoring devices for door frames, windows, entrances, louvers, curtain walls and other openings

1.2 OVERALL STANDARDS

A. Perform reinforced concrete masonry work in accordance with the latest edition of the following:

1. ACI 530 - Building Code Requirements for Masonry and.
2. ACI 530.1 - Specification for Masonry Structures, except as more stringently specified herein.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM), latest edition. Specifications for:

1. A153 Zinc Coating (Hot Dip) for Iron and Steel Hardware.
2. A615 Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
3. A951 Masonry Joint Reinforcement.
4. C33 Concrete Aggregates
5. C55 Concrete Brick.
6. C90 Loadbearing Concrete Masonry Units.
7. C91 Masonry Cement.
8. C94 Ready-Mixed Concrete.
9. C144 Aggregate for Masonry Mortar.
10. C150 Portland Cement.
11. C206 Finishing Hydrated Lime
12. C270 Mortar for Unit Masonry.
13. C476 Grout for Masonry.
14. C1019 Test Method for Sampling and Testing Grout.
15. C1142 Extended Life Mortar for Unit Masonry.

1.4 SUBMITTALS

A. Shop Drawings: Window/Louver opening shop drawing, detailing special profiles in concrete, masonry units, shapes or cast stone surrounds needed to accommodate and support the particular types of window and louvers that will be installed in this Work.

B. Product Data: Submit for fire-rated block, plain block, [textured block,] special shape, cast stone surround, horizontal joint reinforcement, and each metal accessory and plastic accessory – with special attention to the weight of galvanizing on steel items.

PART 2 PRODUCTS

2.1 CONCRETE BLOCK (CMU)

A. Description: Normal Weight (>125 lb/ft^3)] [Medium Weight (105 to 125 lb/ft^3)] loadbearing units including shapes as needed to execute details.

1. Texture: A uniform, medium texture that is neither very smooth nor very coarse. Face surfaces shall have a texture that will bond well to cementitious materials, yet not leave unpainted pits when painted by roller.
2. Linear shrinkage at time of delivery: 0.065% maximum
3. Solid units: Where shown, provide solid units with <25% voids.
4. Shapes: Provide appropriate shapes to execute each condition shown.
5. Prohibited: Block of non-loadbearing grade; also U-block.
6. Fire rating of masonry units: As will attain UL fire rating shown for each wall.

B. Standards:

1. Concrete Block: ASTM C90, Type II. Do not use ASTM C129 units.
2. Concrete Brick: ASTM C55.

2.2 MORTAR

A. Types and Uses.

1. Type S or RS, with 1800 lb/in^2 compressive strength, for use above grade.
2. Type M or RM, with 2500 lb/in^2 compressive strength, for use only below grade.
3. Mix: Portland cement, lime and sand, or, if proportions and test results are approved by structural engineer of record, portland cement, masonry cement and sand.
4. For filling cells in courses below structural loads, at jambs of openings, and elsewhere as shown on Drawings, Type S or RS may be used unless a mix of compressive strength greater than 1800 lb/in^2 is shown on the Drawings.
5. For sustainability, follow ASTM recommendation that mortar strength always be less than block compressive strength.
6. Compressive strength: Average measure when tested in 28 days.

B. Standards:

1. Mortar (site mixed): ASTM C270, S and M.
2. Extended life mortar: ASTM C1142, RS and RM.

2.3 GROUT

A. Description: Thoroughly transit-mixed portland / blended cement – lime – sand – water, high-slump, grout. Use coarse type if it can be verified at all hours of the day that it will flow to fully fill all voids given the conditions of air temperature, block temperature and moisture content, slump, and ease of rodding or vibrating. Otherwise use fine type.

1. Coarse Type: Containing Size 8 or 89 aggregate (1/2 in. to No.16).

2. Fine type: Containing Size 1 or 2 aggregate (3/8 in. to No.100).
3. Slump: 6 to 10 in. as will produce an ASTM C1019 compressive strength at 28 days of 3000 lb/in^2; ASTM C1019.

B. Standards:

1. Grout for masonry fill: ASTM C476.

2.4 MORTAR AND GROUT INGREDIENTS

A. Standards: Use no calcium chloride in any mix.

1. Portland cement: ASTM C150, Type I or II.
2. Hydrated lime: ASTM C206, Type S.
3. Masonry cement: ASTM C91.
4. Mortar aggregate: ASTM C144.
5. Grout aggregate: ASTM C404.
6. Mixing water: Potable.

2.5 LINTELS

A. Lintels: Precast concrete lintels except where cast-in-place concrete or steel is shown.

1. Precast concrete and CIP concrete lintels shall be of depth and with reinforcing sufficient to support superimposed live and dead loads.

2.6 REINFORCEMENT AND ACCESSORIES

A. Horizontal Joint Reinforcement: Welded 0.188 in. (9 ga) continuous deformed ASTM A951 hot dip galvanized steel side rods with 0.148 in. (12 ga) cross ties. Width shall be 1-1/4 to 1-3/4 in. less than wall thickness. Provide preformed corner pieces.

B. Steel Bar Reinforcement: ASTM A615, Grade 60, galvanized deformed bars.

C. Corrugated and Plain Anchors and Wall Ties in Masonry: Hot-dip galvanized steel; ASTM A153.

D. Masonry Anchors: 16 ga minimum, hot-dip galvanized steel; ASTM A153.

1. Check jamb anchors supplied with doors, windows and curtain walls to ensure that sufficient number and size have been provided and located in the frames so as to withstand design wind pressures when installed by block-masons.
2. Anchors for Fastening Masonry Walls to Concrete and Structural Steel.

a. Dovetail anchors, fitting the installed dovetail slots, are to be supplied to the block-mason as specified in the Concrete Forming and Accessories section.
b. Where no dovetail slots have been installed in concrete, use anchoring devices such as the following by Heckmann, or equal approved by A/E and THE CITY: 282, 315C, 315D, 316, 317C, fastened to concrete no more than 16 in. oc using shielded 1/4 in. bolts in drilled holes.
c. To fasten masonry to structural steel, use anchoring devices such as the following by Heckmann, or equal approved by A/E and City of Miami: 190, 193, 315, 316, 317B, 320 and 321. Weld 315, 316, 317B, 320 and 321 to steel.

E. In-Wall Flashings: Self-adhering SBS membrane, or 5 oz/ft^2 sheet copper bonded to fiber-reinforced asphalt treated kraft paper.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATORY ANCHORING

A. Dovetail Anchors: Where masonry walls will abut concrete walls or columns, check to see that properly positioned dovetail slots have been cast into the concrete. Also check to see that sufficient dovetail anchors (fitting the slots) have been supplied for use by the masons to bond the masonry walls to the concrete walls and columns.

1. If dovetail slots in concrete are found to be missing or are not properly positioned and installed, provide instead the anchors specified above, 16 in. oc, to take the place of dovetail slot & anchor bonding of the masonry walls to the concrete structure.
2. Fasten corrugated strap anchors to the concrete and place the corrugated portion in each horizontal masonry mortar joint.

B. Other Anchors: Prepare to anchor masonry walls to cast-in-place concrete and structural steel by providing the specified masonry anchors 16 in. oc the full height of each masonry wall along each line of contact.

3.2 INSTALLING MASONRY

A. Follow ACI 530 and 530.1 except as more stringently specified herein.

B. Environmental Conditions:

1. Temperature: 40 °F. minimum and rising.
2. Weather: Do not lay up masonry during rain. Overnight and when rain is imminent, cover walls and block piles. Design and construct temporary bracing against overturning by wind; remove and repair when no longer needed.

C. Worksite Tolerances: Maximum variances from shown dimensions (as selected from the more detailed list of permitted variances in ACI 530.1 3.3.G.):

1.	Bed joint thickness	± 1/8 in.
2.	Head joint thickness	± 1/4 in.
3.	Bed joint, from level, in 10 ft	± 1/4 in.
4.	Bed joint, from level, overall	± 1/2 in.
5.	Top surface of bearing walls, in 10 ft	± 1/4 in.
6.	Top surface of bearing walls, overall	± 1/4 in.
7.	Walls, from plumb line, in 10 ft	± 1/4 in.
8.	Walls, from plumb line, in 20 ft	± 3/8 in.
9.	Walls, from level line, in 10 ft	± 1/4 in.
10.	Walls, from level line, in 20 ft	± 3/8 in.
11.	Bearing walls, alignment bottom to top	± 1/8 in.
12.	Non-bearing walls, alignment bottom - top	± 3/4 in.
13.	Corners, from plan, in any direction	± 1/8 in.
14.	Wall waver in plan, from level line, in 20 ft	± 1/2 in.
15.	Wall waver in plan, from level line, overall	± 3/4 in.

3.3 OPENINGS AND SURROUNDS IN EXTERIOR WALLS

A. Window/Louver Openings: Because dimensions and perimeter details vary from producer to producer, and because the detail shown on the Drawings is only schematic in order to accommodate different producers' designs, prepare a masonry opening shop drawing showing how the block masonry opening will accommodate and support the specific window that will be used in the Work.

1. Obtain shop drawings by which to coordinate, prepare and get approval of the masonry opening shop drawing before the start of exterior wall masonry work.
2. The masonry opening shop drawing shall address at least the following :

    a. Providing the shim and blocking room needed for the producer's window frames,
    b. Fastening of window frame to transmit wind loads to wall,
    c. Providing a lip against which to seal the 1/2 to 3/4 in. wide window flange at sill, jambs and head,
    d. Providing space and access for a heavy bead of sealant around the entire perimeter of each window,
    e. Providing an outward sloping sill, and
    f. Providing a proper seat at the interior to support the window stool against live loads.

3. Construct openings to:

    a. Transmit wind loads on windows to surrounding masonry in such a way that design wind loads do not cause masonry failure.
    b. Ensure that water does not flank the window units and penetrate by way of the masonry construction.

B. Special Surround Shapes for Window and Louver Openings:

1. From the approved window opening shop drawings prepared by the mason, fabricate cast stone surrounds pieces (sills, jambs and heads) that will accommodate and support the window or louver unit that is in each opening.
2. Each part of the surround shall have a lip approximately 3/4 in. wide against which the flange at the window's perimeter can be sealed tight. See Drawings for schematic detail that is made generic to accommodate various producers' windows.
3. The sill piece, unless detailed differently on the drawings, shall extend from lip to a distance at least 1 in. beyond face of block and shall have drip cast in the overhang.
4. Extend #2 or #3 galvanized steel anchoring bars extending approximately 8 in. from each surround piece, no more than 16 in. oc, in sufficient quantity to transfer design wind loads from the opening to surrounding reinforced masonry structure.

C. Other Openings: Prepare other exterior wall openings, such as those for door frames, entrances, louvers and curtain walls, to transmit wind loads to surrounding masonry in such a way that design wind loads do not cause masonry failure and to ensure that water does not flank the opening units and penetrate by way of the masonry construction.

3.4 LINTELS

A. Coordinate installation of cast-in-place concrete lintels with masonry work so that lintels at window heads have the proper profile to receive the particular window that will be installed.

1. Do not use precast concrete lintels in exterior walls.

B. Where a window, door, louver, or other opening's head is not more than 14 in. below a cast-in-place concrete beam, coordinate with concrete installer to cause the beam to continue downward to form a lintel for the window or door.

1. Where a window, door, louver, or other opening's head is more than 14 in. below a cast-in-place concrete beam, coordinate with the structural engineer of record and the concrete installer to cast in place a separate beam that has sufficient depth, bearing, and reinforcing to support live and dead loads over the opening.

C. Precast concrete lintels are permitted in interior partitions unless cast-in-place is shown. Set lintels in full mortar beds with 8 in. minimum bearing each end.

3.5 REINFORCING

A. Horizontal Joint Reinforcement: Provide at least at every second course and at first joint above and below openings, for all masonry, interior or exterior.

1. In masonry areas shown 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. Cut and lap corners and intersections as recommended by reinforcing producer.
4. Extend reinforcement 6 in. into concrete tie columns and concrete encasement of steel columns cast 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 following reinforcement producer's published directions.
6. Lap splices in joint reinforcement no less than 6 inches. Reinforcement shall not be continuous through expansion joints.

3.6 ANCHORING

A. Corrugated Anchors: Place in every second block course for masonry walls and partitions abutting structural concrete and wherever dovetail anchors cannot be incorporated. Secure each upturned end to concrete with 2 heavy-duty screws in drilled shields.

B. Dovetail Anchors: Place in every second block course for masonry walls and partitions that abut cast-in-place concrete using the continuous dovetail anchor slots.

C. When anchors have been fastened to the concrete or steel structure, place the corrugated portion in the nearest horizontal masonry mortar joint.

3.7 BLOCK LAYING

A. Lay masonry plumb, true to line, with level and accurately spaced courses. Lay up units in common bond, unless stack bond is shown in certain areas.

1. Lay up only fully dry units. Cut units without using water.
2. Use masonry saws for cuts that will be exposed in the finished work.
3. Lay corners and reveals plumb and true. Line up vertical joints.
4. Fully bond and interlock masonry courses at corners and intersections.
5. Use concrete brick or soaps to course out walls concealed in the finished work.

6. Do not over-plumb corner and jamb units after they are set in position. If adjustment is needed after mortar starts to harden, remove mortar and replace with fresh mortar.

B. Steel Opening Frames: Fill door and other opening frames with mortar and embed the anchor straps, evenly spaced, in the mortar joints as block is laid up along the jambs.

C. Joint Treatment:

1. Joint Thickness: 3/8 in.
2. Tool joints until thoroughly compacted, pressing mortar hard against edges of units.
3. Joint finish at block exposed to view: Concave-tooled joints, unless flush float-finished joints are specifically shown. Do not rout joints or make reveals of any sort.
4. Joint finish at concealed block: Joints struck flush.
5. Point holes in mortar and block using mortar of matching color.
6. Cut out and point up defective joints.

D. Jointing Methods:

1. Where block cores are shown to be filled with grout, lay in full mortar beds with full mortared end joints.
2. Lay all other block with fully mortared joints at vertical and horizontal face shells.
3. Do not furrow mortar beds. Butter and shove vertical joints tight.
4. Finish tooled joints smooth and free of tool marks.
5. Joints between masonry and door frames: Rake to 3/8 in. depth suitable to receive a full bead of sealant.
6. Joints around electrical outlets in wet locations: Rake to receive full bead of sealant.

E. Opening Frames: Fill steel door frames with mortar and embed frame anchor straps in mortar courses as masonry is laid up along jambs.

F. Covering the Work: When stopping work, place waterproof covers over exposed wall tops outside as well as exposed block piles. .

3.8 WALLS

A. All Walls:

1. Grout dovetail slots and space between end of masonry units and concrete solid.
2. Wedge full height partitions and walls tight to soffit except for gap for firestopping where deflection can take place.
3. Set precast concrete (or steel) lintels in full beds of mortar with at least 8 in. bearing at each end.
4. Accommodate the forming, reinforcing and placing of cast-in-place concrete lintels, with care to see that concrete leakage does not ruin the look of exposed walls.
5. Fill the first block core in each block that adjoins an opening, and the last block core where a block wall terminates in a free end.
6. Fill voids around pipes, ducts and conduit penetrating walls except for space needed for the specified firestopping.
7. Point up joints solid and flush on both sides of partitions.

B. Load Bearing Masonry Walls:

1. Erect walls before reinforced concrete members that bear on walls, as well as tie beams and tie columns within walls, are cast in place.

2. Fill block cores in top course using mortar or concrete where slabs or beams bear on masonry.
3. Fill block cores in block adjoining openings.
4. Close bottoms of masonry top-course cores 8 in. below cast-in-place concrete beams unless more filled-block courses are shown. Close with metal or fiber-reinforced paper.
5. Do not use flush-end type units against columns and cast-in-place concrete walls. Butter both shell ends to columns and walls.

C. 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 cast-in-place concrete walls, provide corrugated dovetail type anchors
4. Grout dovetail slots and space between end of masonry units and concrete solid.
5. Point up joints solid and flush on both sides of partitions.

D. Partition Heights:

1. Make partitions continuous from floor to underside of structural or fire-rated floor and roof construction above unless otherwise shown.
2. Wedge full height partitions and walls tight to soffit except for gap for firestopping where deflection can take place..
3. Where there are suspended ceilings on both sides of partitions, partitions other than those shown as continuous may be stopped 6 to 10 in. above the ceiling level.
4. Use concrete brick or solid units (soaps) for top masonry course.

3.9 REINFORCED BLOCK MASONRY

A. Concrete Fill for Cored Masonry Units:

1. Coordinate masonry work to allow placing of pea rock concrete as indicated and as specified in Concrete section.
2. Fill top courses of concrete masonry walls with concrete before placing or use concrete brick for top courses to assure solid masonry.
3. Pipe chase walls and partitions: Erect after pipes are in place, tested, and accepted.
4. Slots, chases, recesses, openings: Provide as needed for other work or equipment.
5. Setting of items supplied under other sections: Set anchors, bolts, sleeves, access panels, door frames, and other items occurring in masonry as the work proceeds.
6. Steel door frames: Set frames on floor, with floor clips fastened and frames braced in proper position. Grout anchors into masonry joints as walls are erected.

B. Fill the Following Voids with Mortar:

1. First cell of blocks abutting door jambs 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, conduit, wires, cable trays and other items passing through masonry work, leaving only a small, uniform, smooth aperture to receive firestopping as specified in the Firestopping section.
5. Steel door frames and elevator hoistway door frames in masonry walls and partitions: Grout solid with mortar as masonry is laid. Fill tops of door frames with mortar.

C. Grouting Reinforced Masonry:

1. Grout reinforced concrete unit masonry following ACI 530.1 except as more stringently specified herein.
2. Balance slump of grout with size of cores, amount of reinforcement and obstructions, air temperature, dryness of block, and means of rodding or vibrating to attain full columns of grout without voids.
3. Do not grout if the ambient air temperature on sunny days is above 85° F.
4. Check to see that grout appears at each weep hole at the bottom of each column of cores. Plug holes and clean up mess.
5. Provide consolidation by rodding of vibrating as needed to ensure no voids.

3.10 BLOCK MASONRY IN TIE BEAM AND TIE COLUMN CONSTRUCTION

A. In concrete tie column construction, stagger alternate block courses 8 in. back from tie column dimension, and terminate block courses at tie columns with field block, not flush-end units.

1. Provide weep hole at bottom of each column of cores that is to be filled with grout or concrete.

B. Layout: No column of grouted cores shall exceed 8 ft. in height. No tie column shall exceed 12 ft in height below or above a tie beam unless approved by structural engineer of record.

END OF SECTION

04530
MASONRY PATCHWORK

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 09000 - Patching and Finishes.
2. 09905 - Component Epoxy Resin Wall Finish.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM), latest edition:

1. C55 - Specification for Concrete Brick.
2. C90 - Specification for Loadbearing Concrete Masonry Units.
3. C91 - Specification for Masonry Cement.
4. C144 - Specification for Aggregate for Masonry Mortar.
5. C150 - Specification for Portland Cement.
6. C270 - Specification for Mortar for Unit Masonry.

1.3 SUBMITTALS

A. Properly identified manufacturer's literature before starting work.

B. Samples: Properly identified samples of masonry units and each type of metal anchor and accessory.

1.4 QUALITY ASSURANCE

A. Submit unit masonry manufacturer's "CM-2" Certificate of Compliance issued by the Florida Concrete and Products Association for each type of unit masonry specified.

B. U-block is not allowed.

1.5 PROJECT CONDITIONS

A. Environmental Conditions:

1. Temperature: 40 degrees F. minimum and rising.
2. Weather: No application during precipitation.

PART 2 PRODUCTS

2.1 LOAD BEARING AND NON-BEARING CONCRETE UNIT MASONRY

A. Weight: Normal.

B. Size: 8 inches x 16 inches x 8 inches thick or as indicated on drawings, 2 cell stretcher type.

C. Texture: Medium.
D. Grade: ASTM C90; Grade N-1, amended to allow a maximum moisture content of 50 percent total absorption.

2.2 CONCRETE BRICK

A. Grade: ASTM C55, Grade N-1, amended to allow a maximum moisture content of 50 percent total absorption.
B. Size: Appropriate to suit conditions.

2.3 MORTAR

A. Portland Cement: ASTM C150, Type I, domestic.
B. Masonry Cement: ASTM C91, domestic.
C. Sand: ASTM C144.
D. Water: Potable.
E. Mortar Mix: ASTM C270, Type S, 1800 psi. Mix accurately in following proportions by volume:

    1. Type S:
        a. 1 part masonry cement.
        b. 1/2 part Portland cement.
        c. 4 parts sand.

PART 3 INSTALLATION

3.1 PATCHING

A. Remove existing mortar from new opening.

    1. Fill in as required with new concrete masonry units and fresh mortar.

B. Laying Units:

    1. Lay masonry plumb, true to line, with level and accurately spaced courses.
    2. Keep bond plumb throughout.

        a. Where adjustment must be made after mortar has started to harden, remove mortar and replace with fresh mortar.

    3. Cut masonry units dry.
    4. Joints: 3/8" thick thickness, strike flush.

C. Jointing Methods:

    1. Lay concrete block with full beds of mortar on vertical and horizontal face shells.

        a. Furrowing of mortar is not allowed.

D. Pointing: Point holes in masonry. Cut out and point up defective joints.

3.2 MORTAR FILLED ITEMS

A. Where necessary and where indicated on drawings.

B. Voids around penetrations through block work.

END OF SECTION

05120
STRUCTURAL STEEL

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 03342 - Insulating Cellular Concrete.
2. 05210 - Steel Joists.
3. 09900 - Painting.

1.2 REFERENCES

A. America Society for Testing and Materials (ASTM), latest edition:

1.	A36/	Specification for Carbon Structural Steel.
2.	A53	Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
3.	A123	Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
4.	A307	Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
5.	A325	Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
6.	A385	Practice for Providing High Quality Zinc Coatings (Hot Dip).
7.	A490	Specification for Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength.
8.	A500	Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
9.	A501	Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

1.3 QUALITY ASSURANCE

A. Florida Building Code (FBC).

B. American Institute of Steel Construction, Inc., (AISC): Manual of Steel Construction, latest edition.

1. Specification for Design, Fabrication and Erection of Buildings.
2. Code of Standard Practice for Steel Buildings and Bridges.
3. Structural Joints Using ASTM A325 or ASTM A490.

C. American Welding Society (AWS); Structural Welding Code, AWS D1.1.

D. Steel Structures Painting Council (SSPC).

E. Where requirements of AWS are in conflict with requirements of AISC, requirements of AISC shall take precedence.

1.4 SUBMITTALS

A. Submit both shop and erection drawings with indexes for structural steel for review before starting work.

PART 2 PRODUCTS

2.1 MATERIALS

A. Rolled Shapes and Plates: ASTM A36.

B. Anchor Bolts: ASTM A307, with regular series hexagonal head nuts, unless otherwise specified, hot dipped galvanized where noted.

C. Nuts and Bolts Except Anchor Bolts: ASTM A325, washers as required. Bolts connecting galvanized members shall also be galvanized.

D. Electrodes: E70 or F7 Series, as appropriate.

E. Shop Paint: Manufacturer's standard, compatible with finish coats. Refer to Section 09900.

F. Structural Tubing: ASTM A500, Grade B, Fy=46KSI.

G. Pipe: ASTM A501, Fy=36 ksi or ASTM A53, type E or S, Grade B, Fy=35 ksi.

PART 3 EXECUTION

3.1 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.

3.2 INSTALLATION

A. Unless otherwise specified, comply with AISC specifications and "Standards" for fabrication and erection.

B. Connections:

1. Shop connections shall be welded or bolted at the option of the Contractor, unless otherwise indicated.
2. Field connections shall be bolted except where specifically indicated to be welded. Field moment connections may be welded.
3. Bolts shall be ASTM A325, friction type, unless otherwise indicated.
4. Connections shall be as generally indicated where the complete connection is shown.
5. Connections not detailed will be designed by the Contractor for the controlling stresses indicated using AISC requirements.
6. Minimum connection is two 3/4" diameter ASTM A325, bolts or equivalent in weld, (15.5K).

7. For framed connections in non-composite construction and for beams without concentrated loads, where reactions are not indicated, design the connection for one-half of the total uniform load capacity of the beam shown in "Tables for Allowable Loads on Beams", AISC.
8. Where moment connection or continuous framing is indicated, design connections for the moment indicated, but not less than 50 percent of the moment capacity, however, where the design moment is not given, design the connection for 100 percent of the moment capacity. Moment connections shall be Type 1, rigid frame.
9. Columns shall be detailed as indicated, bearing surfaces shall be finished (planed).
10. Moment connections, shop or field, shall not have bolts through the top flange plates to avoid interference with the metal decking.
11. Stiffened seats, unless indicated, are not allowed unless the Contractor verifies architectural clearances are maintained and interferences with any elements of the building will not occur.

C. Shop Cleaning: Clean steel to the requirements of SSPC-SP2.

D. Shop Painting: Shop paint steel except steel intended to be encased in concrete and steel to be hot dipped galvanized.

E. Erection Marks:

1. Column marks shall be the column number assigned on the structural drawings supplemented by tier or level number.
2. Beam marks shall be prefixed by floor or level number.

F. Hot Dip Galvanize After Fabrication: According to ASTM A123, ASTM A385, and ASTM A123, all steel exposed to the weather, *namely at all exterior door/louver entries*. Erect those members with galvanized ASTM A325 bolts. Seal weld all members to be hot dipped galvanized.

G. Camber: Shop or mill camber beams indicated.

3.3 TESTING

A. The City of Miami may elect to inspect work in shop or field or both by nondestructive means as specified.

1. Contractor shall make no claim for extra work or delay using as a basis the inspection of work by the City of Miami.

B. Welding Inspection:

1. Inspector designated by the City of Miami will assume the duties and responsibilities of "Inspector" specified in Chapter Six of AWS D1.1-79.
2. Acceptance Criteria:

a. Visual: AWS D1/1, Para.3.7 and 8.15.
b. Radiographic, Ultrasonic, Magnetic Particle, and Dye Penetrant: AWS D1.1, Para.8.15.
c. Where more than one type of testing is used, acceptance criteria is "passing" all testing procedures used.

3. Inspector will spot inspect by ultrasonic means, 100 percent (one spot per weld) of all tension groove welds and 50 percent of all compression groove welds shop and field.

    a. Where metal thickness is less than 5/16", radiographic spot testing will be used.

4. Inspector will inspect welds by visual rules.
5. Inspector may use radiographic means where ultrasonic testing is not feasible.
6. Inspector may supplement any testing with dye penetrate, magnetic, radiographic, or ultrasonic plans.
7. Contractor shall be responsible for associated costs of inspections including handling, surface preparation and repair of discontinuities.

C. Provide ladders or other appropriate means for inspecting personnel to properly gain access to field joints.

D. Bolting Inspection: Inspector will test bolts both in the shop and in the field by methods specified in "Structural Joints Using ASTM A325 or ASTM A490 Bolts".

END OF SECTION

05400
LIGHT GAGE METAL FRAMING

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 05500 - Metal Fabrications.

2. 08110 - Steel doors and Frames.

3. 09200 - Metal Studs, Suspension Ceilings, Plaster, and Stucco.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM), latest edition:

1. A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

1.3 SUBMITTALS

A. Submit properly identified manufacturer's literature and technical data including specifications and installation instructions before starting work.

B. Submit calculations for door rough framing to resist additional dynamic loads of acoustical doors.

C. Samples:

1. Metal framing.
2. Required accessories.

1.4 QUALITY ASSURANCE

A. Florida Building Code (FBC).

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Light Gage Metal Framing:

1. ClarkDietrich Building Systems
2. Dale Industries (Dale Inc.)
3. Marino/WARE
4. Other A/E approved manufacturer of equal quality and performance.

2.2 MATERIALS

A. Steel Studs:

1. 3-5/8", 22 gage, (minimum), galvanized.
2. 4", 20 gage (minimum), galvanized.
3. 6", 20 gage (minimum), galvanized.
4. 8", 18 gage (minimum), galvanized.

B. Steel Runner Track:

1. 22 gage for 3-5/8" studs.
2. 20 gage for 4" studs.
3. 18 gage for 6" and 8" studs.

C. Coating: Steel studs and runner track shall comply with ASTM A653 and have a G-60 galvanized coating.

D. Steel Studs, Runner Track, and Accessories:

1. 12, 14, and 16 Gage: Form of steel meeting the requirements of ASTM A653, Grade D, with a minimum yield of 50,000 psi.
2. 18 and 20 Gage: Form of steel meeting the requirements of ASTM A653, Grade A, with a minimum yield of 33,000 psi.

E. Metal Screws: According to steel stud manufacturer's recommendations.

PART 3 EXECUTION

3.1 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.

3.2 INSTALLATION

A. Powder and pneumatic actuated (shot-type) fasteners shall not be used to provide support for construction elements located overhead.

B. Stud Spacing: Maximum 16 inches on center, unless otherwise indicated on the drawings.

C. Runner Track: Securely anchor to floor and overhead structure.

D. Seat studs squarely in runner track with stud web and flanges abutting track web, plumbed and aligned, and securely attached to flanges or web of both upper and lower runner tracks.

END OF SECTION

05500
METAL FABRICATIONS

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 03300 - Cast-In-Place Concrete.
2. 03420 - Precast, Prestress Concrete Sections.
3. 04221 - Concrete Unit Masonry.
4. 09900 - Painting.
5. 10400 - Identifying Devices.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM), latest edition:

1. A36 Specification for Carbon Structural Steel.
2. A53 Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
3. A123 Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
4. A307 Specification for Carbon Steel Bolts and Studs, Threaded Rod 60,000 psi Tensile Strength.
5. A325 Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
6. A385 Practice for Providing High-Quality Zinc Coatings (Hot-Dip)
7. A501 Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
8. B209 Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
9. B221M Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).

B. American National Standards Institute (ANSI) A14.3 for fixed ladders.

C. Occupational Safety and Health Administration (OSHA).

1.3 SUBMITTALS

A. Shop and erection drawings for review before starting work.

PART 2 PRODUCTS

2.1 MANUFACTURED UNITS

A. Steel Canopy Structures – refer to Permit/Contract Drawings.

B. Security Grilles:

1. Able to withstand a 200-pound force applied to any point from any direction and reject a 1/2" diameter sphere.
2. 16 gage, powder coat finish, G-90 galvanized steel, with 50 percent minimum open area.
3. Manufacturers:

    a. Crime Shield Barriers by Exeter, Wyoming, PA.
    b. Other A/E approved equivalent.

C. Security Grilles - Missile Impact Resistant:

1. Certified missile impact resistant.
2. 14 gage, powder coat finish, A40 galvannealed steel, with 50 percent minimum open area.
3. Manufacturers:

    a. Storm Shield Barriers by Exeter, Wyoming, PA.
    b. SureGuard Hurricane Barriers by Phoenix Architectural Products, Smyrna, GA.

D. Security Screens - Missile Impact Resistant:

1. Certified missile impact resistant.
2. Type 304 stainless steel, No. 12 mesh, 0.028" diameter, with aluminum alloy frame.
3. Manufacturers:

    a. Protect Series by Protech Screens, Pearland, TX.
    b. Select Security Screen Co., Cleveland OH.

E. Aluminum Alloy Sheet and Plate: ASTM B209, 5050-H32 or temper best suited.

F. Structural Steel Shapes, Plates, Flat Bars, and Rods: ASTM A36M, Grade 36.

G. Steel Pipe: ASTM A53.

H. Columns:

1. Steel Tube: ASTM A501.
2. Other Columns: As shown.

I. Welding Electrodes for Steel: AWS A5.1-69, Class E60 and E70 for manual welds.

J. Bolts, smaller than 1/2" diameter: ASTM A307.

K. Bolts, 1/2" diameter and larger: ASTM A325.

L. Concrete Expansion Bolts: Galvanized steel self-drilling type as manufactured by:

1. Philips Drill Co., Michigan City, IN.
2. Rawl Plug Co., Inc., New Rochelle, NY.
3. Star Expansion Industries Corp., Mountainville, NY.

M. Galvanized Metal Repair Compound:

1. Hot Applied: Federal Specifications O-G-93.
2. Cold Applied: Galvaneal, Galvicon, or Z.R.C.

N. Shop Prime Coat: Zinc chromate primer.

O. Stainless Steel Shapes and Plates: Type 304 with stainless fasteners.

P. Isolation Coating: Zinc chromate paint or acceptable non-conductive tape.

Q. Fastenings, Anchors and Bolts:

1. Provide required cast-in-place or built-in anchor bolts for miscellaneous metal items of galvanized steel, complete with matching washers and nuts.
2. Where not practical to prelocate bolts, provide self-drilling or toggle type concrete anchors.

R. Hot Dip Galvanizing: Where specified or indicated, hot dip galvanize ferrous items according to ASTM A385 and ASTM A123, minimum 2.0 ounces per square foot.

2.2 FABRICATION

A. Repair to Galvanized Surfaces: Repair damaged galvanized surfaces with hot or cold applied compound.

B. Shop Painting of Ferrous Metal Items: Provide 1 coat of shop primer unless indicated or specified to be hot dip galvanized.

C. Contact with Dissimilar Materials: Provide isolation coating where dissimilar metals are in contact or where aluminum contacts masonry, concrete, plaster, or mortar.

D. Fabricate ferrous items according to AISC Specifications and approved shop drawings.

1. Grind and buff smooth rough edges, sharp corners, and welded joint of exposed steel and miscellaneous ferrous items.

E. Concrete filled metal filled pan stairs may have treads precast and delivered to job site integral with pan at option of Contractor. Landings shall be engineered to have a live load capacity of 100 psf.

PART 3 EXECUTION

3.1 INSTALLATION

A. Coordination: Coordinate miscellaneous metal items, including field dimensions where required with masonry openings and various other trades as applicable so items fit and function as intended.

B. Erect and install miscellaneous metal items at proper locations and elevations, plumb, level, in alignment and not distorted by fastenings, according to approved shop and erection drawings, manufacturer's directions, and as specified. Provide adequate temporary supports to allow field connections of members without misalignment.

C. Supplementary Parts: Furnish and install necessary to complete each item.

D. Conform to best quality and accepted standard practice.

E. Weld on back or bottom side so welds are not visible.

F. Provide acceptable fasteners, inserts, and expansion anchors for supports placed in shear position where possible.

G. Powder and pneumatic actuated (shot-type) fasteners shall not be used to provide support for construction elements located overhead.

H. Install interior stair nosings to full step length.

3.2 FIELD QUALITY ASSURANCE

A. Touch up abrasions to shop prime surfaces and welds with specified primer after erection and installation operations are complete.

END OF SECTION

05520
METAL HANDRAILS AND RAILINGS

PART 1 GENERAL

1.1 SUBMITTALS

A. Properly identified manufacturer's literature, including shop and erection drawings before starting work.

B. Railing Assemblies or Railing Components: Submit shop drawings prepared under direction of an engineer licensed in the State of Florida showing compliance to the Florida Building Code (FBC).

PART 2 PRODUCTS

2.1 HANDRAIL AND RAILING COMPONENTS

A. Wall Brackets: Malleable iron or aluminum as manufactured by Julius Blum & Company, Inc., Carlstadt, NJ, or other A/E accepted equivalent.

1. Material:

a. Aluminum, Model #384 for use with aluminum pipe handrail section.

B. Pipe Handrail Sections:

1. Handrails:

a. Size:

1) Handrail (Typical handrail at 34 to 38 inches): 1-1/4" to 1-1/2" outside diameter.

b. Aluminum:

1) Schedule 80, Alloy 6061-T6 of design and dimensions indicated with smooth bends and welded joints ground smooth and flush.
2) Schedule 40, Alloy 6061-T6 of design and dimensions indicated with smooth bends and joints using bolted or fastener connections of tamper-resistant fasteners.

2. Vertical Members (Posts):

a. Aluminum:

1) 1-1/4" nominal pipe size, Schedule 80, Alloy 6061-T6 of design and dimensions indicated with welded joints ground smooth and flush.
2) Alternate 1-1/4" nominal pipe size, Schedule 40 alloy 6061-T6 of design and dimensions indicated with smooth bends and joints using bolted or fastener connections of tamper-resistant fasteners.

3. Design and construct to withstand 200-pound concentrated load applied at any point, from any direction.
    a. Wall brackets and other points of support are shown to indicate general appearance. Submit shop drawings to indicate accurate location of necessary brackets and other points of support to show compliance with load requirements.
4. Provide complete with necessary sleeves, brackets, tamper-resistant bolts, and tamper-resistant fastening devices as required for a complete installation.

2.2 FINISHING

A. Aluminum Handrail and Railing Components and Assemblies:
    1. Finish with clear anodizing according to Aluminum Association Standard AA-C22-A21.
        a. Anodizing: 200R1 clear with a typical coating of 0.15 mil thickness produced in a 15 percent solution of H2SO4 at approximately 70 degrees F at 12 amps per sq. ft.

2.3 FASTENINGS, ANCHORS, AND BOLTS

A. Provide required cast-in-place or self-drilling anchor bolts as indicated or as recommended by the handrail and railing assembly manufacturer, complete with matching washers and nuts.

PART 3 EXECUTION

3.1 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.

3.2 INSTALLATION

A. Erection:
    1. Erect metal handrail and railing components and metal handrail and railing assemblies at proper locations and elevations as indicated, plumb, level, in alignment, and not distorted by fastenings.
    2. Erect according to accepted shop drawings and manufacturer's directions or as specified in this section.

B. Supplementary Parts: Provide as necessary to complete each item.

C. Contact with Dissimilar Materials:
    1. Apply isolation coatings where dissimilar metals are in contact or aluminum components contact dissimilar metals or concrete or lime mortar surfaces.
    2. Select coatings appropriate to the condition from materials specified in this section.

D. Expanding Grout: Apply according to manufacturer's printed instructions to clean and dust free surfaces to ensure proper mechanical bond.

END OF SECTION

05590
STEEL FRAMED EQUIPMENT SUPPORTS

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

A. Coordinate framed equipment supports with other parts of the Work.

1. Roof Assembly components Div 07
2. Air Cooled Condensing Units 15670
3. Roof Mounted Single Packaged Air Conditioning Units 15770
4. Air Handling Units 15855

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM) Specifications, latest edition. Standard Specifications for:

1. A123 Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
2. A307 Carbon Steel Bolts and Studs, and Threaded Rod 60,000 psi Tensile Strength.
3. A325 Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
4. A500 Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
5. A501 Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
6. A992 Structural Steel Shapes.

1.3 DEFINITIONS

A. Roof Assembly: Defined in 07522.

B. HVHZ: High velocity hurricane zone, defined in FBC to include Miami-Dade County,

C. Equipment support: Open structural steel structures of beams and flashable legs that hold equipment a distance above the roof membrane sufficient for both roofing maintenance and for servicing the equipment and its piping from below.

D. Piping supports, specified in 07721: Flashable curb-like structures that securely support pipes and conduit crossing the roof.

1.4 QUALITY ASSURANCE

A. Wind pressure diagrams: Tables on the Drawings, prepared by the A/E (a professional engineer registered in Florida) show maximum positive and negative (±) wind pressures based FBC and American Society of Civil Engineers (ASCE) 7, Minimum Design Loads for Buildings and Other Structures.

B. Equipment shapes, sizes, weights and heights above grade: Provide to A/E. A/E will follow ASCE 7 requirements in its calculations, which will be supplied to the Contractor.

C. Design and fabricate steel equipment supports for resistance to overturning from HVHZ winds, following calculations of A/E for each item of rooftop equipment.

1. Follow American Institute of Steel Construction (AISC) Manual of Steel Construction, latest Edition.
2. Follow American Welding Society (AWS) Structural Welding Code, AWS D1.1.
3. Shop Painting: Follow Society for Protective Coatings (SSPC) SP, PS, CS & PA Standards and Specifications.

1.5 SUBMITTALS

A. Shop Drawings: Design and detail each equipment support to support rooftop equipment and to resist the calculated overturning wind forces at its location,.

1. Show method of fastening to structural deck to counter wind forces.
2. Show the shape and method of fastening vertical members to structure below.
3. Show the roof insulation depth where each support is located. Also show the resulting clear dimension from top of the roof membrane to the bottom of the lowest horizontal member of the equipment support.
4. Submit for approval of Contractor and equipment installer before fabricating.

PART 2 PRODUCTS

2.1 FRAMED ROOF EQUIPMENT SUPPORTS

A. Function and Performance: Provide open-sided structural steel frames with round or square tubular legs that support items of rooftop equipment at least 18 in. clear above the roof membrane, with ample clearance for roof maintenance and for installing and maintaining piping, ducts, conduit and wiring that serves rooftop equipment.

1. Roof equipment supports, when fastened to supported equipment, shall withstand the calculated wind uplift and toppling effect of HVHZ wind forces.

B. Description:

1. Horizontal members: Bolted galvanized steel shapes. ASTM A992 (60,000 lb/in2 yield point, min.) or ASTM A36 (36,000 lb/in2 yield point, min.). Welding may be used in sub-assemblies within the support assembly
2. Vertical members: Round galvanized structural tubing steel, welded to horizontal members, with welded base plates drilled for bolting to roof structure: ASTM A501 or ASTM A500, Grade B or C (42,000 lb/in2 yield point, min.) or ASTM A501.
    a. Vertical members shall accommodate circular (or square) stainless steel roof flashings. Do not use angle, WF, or other steel shapes for vertical members in roof equipment support assemblies.
3. Restraint brackets and base flange attachments: Galvanized steel; ASTM 7.
4. Welding electrodes: AWS A5. 1-69, Class E60 and E70 for manual welds.
5. Galvanizing: Hot dip after fabrication; ASTM A123, Grade 75 to 95, 3.0 oz/ft2 min.
6. Bolts: ASTM A325 (105 lb/in2 yield point, min.), at least 5/8 in. diameter, with nuts and washers, hot dip galvanized.

2.2 ACCESSORIES

A. Repair of Galvanizing: Compound with high metallic zinc content such as Galvaneal, Galvicon, or Z.R.C.

B. Shop prime coat: SSPC SP 1 solvent cleaning and SP 12.01 zinc-rich primer.

C. Isolation sheets: Provide neoprene or EPDM separators between dissimilar metals that are in contact.

D. Concrete expansion bolts for fastening to concrete structure: Galvanized steel self-drilling type as produced by Philips Drill or Rawl Plug.

2.3 FABRICATION

A. Fabricate ferrous items following the A/E's calculated loads, AISC Manual, AWS Code, SSPC standards, and approved shop drawings.

1. Grind and buff smooth rough edges, sharp corners, and welded joints. Repair damaged galvanized surfaces with hot or cold applied galvanizing repair compound.
2. Shop painting: Shop-prime zinc coating with 1 coat of primer, ready for field painting.

PART 3 EXECUTION

3.1 INSTALLATION

A. Erect and install steel framed supports following approved shop drawings and producer's directions. Touch up cleaned welds, galvanizing, and abrasions to shop coat.

END OF SECTION

06100
CARPENTRY

PART 1 GENERAL

1.1 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. 06300 - Wood Treatment.
2. 07210 - Building Insulation.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM), latest edition:

1. A153 Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
2. D226 Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.

1.3 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.

1.4 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.

1.5 SITE CONDITIONS

A. Gunpowder activated fastening systems may be used on City of Miami Projects only on a limited-basis. They shall not be used as the main support for construction elements located overhead. Approval must be obtained from City of Miami Facilities Design and Standards on a per project basis. In Remodeling Projects, gunpowder actuated fastening systems shall not be used when the public, staff and students are in the immediate area of construction.

PART 2 PRODUCTS

2.1 MATERIALS

A. Exterior Plywood:

1. Conform with US Department of Commerce PS 1-66, bearing APA grade mark.
2. Grade: APA rated sheathing, EXT, span rating to suit rafter spacing.

3. Thickness: Indicated on drawings.

B. Interior Plywood (Concealed): Where plywood will be concealed by other work, provide exterior type plywood C-D plugged grade, unless otherwise specified.

C. Interior Plywood (Painted Finish): Same as concealed, except with hardwood plywood or medium density overlay, Grade MDO EXT-101; smooth surface with no grooves.

D. 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).

E. 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.

F. Framing Lumber:

1. Lumber complying with grading rules according to requirements of National Grading Rule for Dimension Lumber of American Lumber Standards Committee established under PS-20.
2. Light Framing (2 inches to 2 inches thick and 2 inches to 4 inches wide): "Stud" grade lumber for stud framing and "standard" grade for other light framing.

G. 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.

H. 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.

I. Treated Wood: Refer to Section 06300, "Wood Treatment".

PART 3 EXECUTION

3.1 PREPARATION

A. Protect installed carpentry work from damage by work of other trades until accepted by the City of Miami.

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.

3.2 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. Attachments and Anchors:

a. Closely fit and accurately set members to required lines and levels, and rigidly secure in place.
b. Nail size and nail spacing shall be sufficient to develop adequate strength for connection without splitting the member.
c. Countersink nailheads on exposed carpentry work and fill holes.
d. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish material(s).
e. Make tight connections between members.
f. Install fasteners without splitting wood, pre-drill as necessary.

2. 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 toilet partition doors, wall-mounted lavatories, wall-mounted water closets, etc.
    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.

3. Roof Sheathing: Nail or staple to framing and use spacer clips at edges for expansion/contraction control.

END OF SECTION

06300
WOOD TREATMENT

PART 1 GENERAL

A. Related Sections:

1. 06100 - Carpentry.
2. 06400 - Architectural Woodwork.

1.2 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.

1.3 QUALITY ASSURANCE

A. Wood treatment shall comply with Florida Building Code (FBC), and all applicable requirements.

1.4 MATERIALS

A. 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.

B. 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 2 EXECUTION

2.1 APPLICATION

A. Place treated lumber and plywood as detailed.

END OF SECTION

06400
ARCHITECTURAL WOODWORK

PART 1 GENERAL

1.1 SUMMARY

A. Provide necessary services, tools, equipment, material, and labor required to furnish and install millwork and cabinet work. Install cabinet hardware specified. Do all finishing work in the shop.

B. Related Sections:

1. 08710 - Finish Hardware.

1.2 REFERENCES

A. ANSI/AHA A135.4 - Basic Hardwood.

B. American Society for Testing and Materials (ASTM), latest edition:

1. D1037 Test Methods for Evaluating the Properties of Wood-Base Fiber and Particle Panel Materials.

1.3 SUBMITTALS

A. Manufacturer's Data: Submit 8 copies of manufacturer's data for each item furnished under this Section.

B. Shop Drawings:

1. Submit 8 copies of shop drawings showing plans, elevations, and large scale details for each fabricated item. Identify locations of each item. Show plastic laminate colors, patterns, and inserts.

C. Samples:

1. Submit samples of each wood species to receive transparent finishes.
2. Submit a finished sample of each finish.
3. Submit samples of milled paneling and trim items.

1.4 QUALITY ASSURANCE

A. Built-ins and casework shall be constructed and installed to carry intended loads, not have sharp corners, splinters, or any construction features or projections that would be hazardous to occupants and users. Casework and cabinets shall be constructed in conformance with applicable state and federal accessibility requirements.

B. Cabinet work shall follow minimum requirements described in the latest edition of the Architectural Woodwork Institute (AWI) following "Custom Grade" standards.

C. Particle board is not allowed.

D. Casework shall be "Custom Grade" overlay design with plastic laminate finish.

E. Only manufacturers with financial stability and 5 years' experience in casework manufacture and installations of similar scope will be considered.

1. The installer must be a company whose primary business is the manufacturing of plastic laminate casework.
2. The installer shall have adequate physical facilities and personnel for this size project with a qualified engineering department to provide layout and shop drawings for review before fabrication.

F. Evidence of qualifications shall include product catalog, descriptive literature, and specifications for the proposed product. Submit a sample cabinet, complete with drawer, door hardware, and corner sample of counter top with the product literature.

1.5 PRODUCT DELIVERY AND STORAGE

A. Deliver casework when the building is secure and weather tight.

B. The air circulation control system shall be operating and maintaining humidity and temperature conditions similar to the conditions to be maintained by THE CITY.

C. Interior plaster and plaster veneer work shall be complete and dry.

D. Painting and other finish work shall be complete in immediate and adjacent areas within the building where millwork/cabinet work/casework is stored.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Plastic Laminate:

1. Nevamar.
2. Formica.
3. Micarta.
4. Pionite.
5. Wilson Art.

2.2 MATERIALS

A. Case members, tops, bottoms, sides, dividers, shelves, door fronts, and drawer fronts shall be 3/4" thick 7 ply closed grain hardwood plywood.

B. Case backs shall be 1/4" thick closed grain hardwood plywood.

C. Plywood shall have type II water-resistant glue.

D. Plywood: Provide manufacturer's association stamp except where exposed to view.

E. Plywood exposed to view unless otherwise specified shall be hardwood plywood with exterior glue.

F. Plastic Laminate: High pressure laminate conforming to NEMA specification LD3 latest edition. Laminate the plastic laminate sheets to the core stock under pressure with water resistant adhesive to achieve a Type II bond.

1. Material Thickness:

a. 0.050" - Exposed surfaces and edges of drawer fronts, door fronts, counter tops, backsplash, and all other remaining exposed exterior horizontal and vertical surfaces.

b. 0.027" - Exposed interior surfaces of door backs, cabinet sides, backs, and shelving and all other remaining exposed interior horizontal and vertical surfaces.

c. Concealed Surfaces: Not applicable.

2. Colors and Patterns:

a. Colors and patterns shall be judged equivalent, as determined by the A/E, to those preselected or above specified colors and patterns.
b. Any preselected colors and patterns shown on the drawings or in the specifications shall govern.
c. Where colors or patterns are not shown, plastic laminate equivalent in cost to standard solid colors shall be bid upon, assuming not more than 10 colors.
d. 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.

G. Wood trim, cabinet stiles and rails, and wood door frames:

1. Soft wood: Clear "C" or better when covered by laminated plastic.
2. Hardwood: AWI "Custom" Quality.
3. Where hinges or other attachment requiring screws for holding power in concealed wood are required, lumber shall be one of the following:
   a. Southern Yellow Pine.
   b. Gum.
   c. Birch.
   d. Beech.

4. Where screw holding power is not required, concealed lumber shall be:

a. Southern Yellow Pine.
b. Gum.
c. Birch.
d. Beech.
e. Ponderosa.
f. Pine.
g. Poplar.

5. Lumber scheduled or detailed to be covered with plastic laminate shall be one of the following:

a. Southern Yellow Pine.
b. Gum.
c. Poplar.
d. Birch.
e. Beech.
f. Fir.
g. Virola/Tek Ply.

6. Lumber used for construction of bins or shelving supports located in storage rooms, or janitor closets shall be, unless otherwise shown on the drawings, finished under Painting Section with "natural finish" and shall be of one of the following:

a. Southern Yellow Pine.
b. Gum.
c. Poplar.
d. Birch.
e. Beech.

7. Lumber scheduled or detailed to be transparent finished (varnished, stained, oilrubbed, gloss, or satin polyurethane finish) shall be the following:

a. Birch.
b. White Oak.
c. Red Oak.

8. Lumber scheduled to be painted or enameled shall be one of the following. Do not use fir plywood in this application:

a. Southern Yellow Pine.
b. Gum.
c. Poplar.
d. Birch.
e. Beech.

H. Fiberboard: Class 1 Tempered, smooth face hardboard, with 6,000 psi average modulus of rupture. Comply with ANSI/AHA 135.4 and ASTM D1037.

1. Use fiberboard only where specifically scheduled or called for on drawings or in specifications.
2. Fiberboard as backs for wall supported cabinets is not allowed.

I. Adhesives: Use adhesives meeting Strength and Rate of Loading, Moisture Resistance, and Heat Resistance requirements set forth in AWI 100-G-11. Do not use glues containing formaldehyde.

1. For interior work:

a. Modified Polyvinyl Acetate: For normal use except items requiring high moisture resistance.
b. Casein Glue: For normal use except waterproofed items.
c. Contact Cements (not the solvent type): For bonding high water pressure laminates only.

2. For exterior work or in toilets or other rooms with moisture:

a. Phenolic Resin: Generally for moisture resistance of fully waterproof bond.

J. Wood Paneling:

1. Fabricate with solid lumber to configuration shown on the drawings.

2. Quality: Hardwood meeting AWI Custom Grade.
3. Species: Birch.
4. Type sawing: Plain sawn.
5. Type matching: Random.
6. Type finish: Transparent.

K. Large Hollow-core Doors in Cabinet Work: Comply with requirements of Section 08210 - Wood Doors.

L. Finish Hardware:

1. Hinges for 3/4" Thick Doors:

a. US26D satin chrome plated steel, 5 knuckle, wrap around type allowing 270 degree swing at end of cabinet work unit, mounted with minimum 4 plated No.8 self-tapping screws per hinge leaf. Concealed European type hinges are not allowed.
b. For doors up to and including 48 inches high: Provide 2 hinges.
c. For doors over 48 inches high: Provide 3 hinges.
d. Manufacturers:
1) RPC 376-26D.

2) Other A/E accepted equivalent.

2. Pulls: 5/16" wire pull, 4" long, solid brass, US26D satin chrome plated.

a. Stanley 4484.
b. Epco MC.
c. Colonial 753

3. Door Catches: Stanley SP45.

a. For doors up to and including 38 inches high: Provide 1 heavy duty magnetic type catch, slotted for adjustment. Attach with screws.
b. For door 38 inches high and over: Provide 2 heavy duty magnetic type catches, slotted for adjustment. Attach with screws.

4. Surface bolts for inactive doors in cabinet door pairs with locks indicated:

a. Ives 40 x US26D x 6 inches.
b. Quality B-6 x US26D x 6 inches.
c. Baldwin 0324 x US26D x 6 inches.

5. Locks for 3/4" doors with plastic laminate finish: (Where indicated on drawings). Satin chrome or nickel plated steel 6 tumbler lock with grooved key.

a. KV 987, with strike.
b. Yale 9660, with strike.
c. Corbin 0764L, with strike.

6. Drawer Slides: Zinc plated cold rolled steel. Grant or KV 1300 rated for 75 pound capacity.

7. Steel Standards: KV 233ZC with zinc plated finish, 5/8" screw nails, and KV 237ZC shelf clips. Surface mount.

2.3 FABRICATION

A. Construct cabinet work as shown on the drawings and meeting the following requirements:

1. Cabinet members, bottoms, sub-top, sides, and back shall be joined by dado and rabbeted joints secured with glue and concealed mechanical fasteners. Case backs shall have a 3-inch anchor cleat the full width of the unit at the top.
2. Case construction of butt joins with dowel pins is not allowed.
3. Construct the toe space base from solid lumber and separately framed.
4. Drawers: Lock shouldered.
5. Drawer Sides and Backs:
    a. Well sanded Southern Yellow Pine, Poplar, Gum, or Birch, with corners rounded and natural finish.
    b. Plastic laminate on 1/2" plywood with plastic laminate interior and exterior.
6. Drawer Bottoms: 1/4" tempered fiberboard with factory applied gloss surface of color approved by A/E.
7. Cabinet interior sides drilled to receive shelf pins leaving exposed core are not acceptable.
8. Shelving:
    a. 3/4" plywood for lengths less than 36 inches.

    b. 1 inch plywood or 3/4" plywood with 3/4" x 1-1/2" hardwood edges at front and rear of shelf for lengths 36 inches or greater.

9. Adjustable Shelving: Use surface mounted standards and notched shelving ends.

10. Exposed Shelving: In storage rooms, utility rooms, mechanical or electrical rooms, or in janitor closets, shall be "natural finish" constructed of plywood with edges banded of similar material and have outside face veneers of similar material of either:

a. Gum.
b. Poplar.
c. Beech.
d. Birch.

B. All other Shelving: Hardwood plywood with bonded edges, finished "transparent" and of plywood with veneers meeting the following criteria:

1. Cabinet and casework hardware will be supplied under the finish Hardware Section and shall be installed by the cabinet and casework fabricator. Locate hardware accurately on shop drawings.
2. Species: Birch, APA grade marked MDO 1 face/2 face, interior grade.
3. Where normally exposed to view (behind cabinet doors): Birch, AWI Custom Quality.
4. Where normally concealed from view (behind cabinet doors): Birch, AWI Economy Quality.

C. When specifically called for on the drawings as laminated plastic faced cabinets doors, ends, drawer fronts, dividers, and backs (except against walls):

1. Provide plywood with laminated plastic on all surfaces not occurring against building walls or fixed partitions.
2. Provide stiles and rails of laminated plastic covered lumber.

D. All other cabinets not specifically called for on the drawings as laminated plastic faced shall be constructed of "transparently finished" hardwood plywood doors, ends, drawer fronts, dividers, and backs (except against walls) with lumber stiles and rails of same species, as follows:

1. Species: Birch or White Oak APA grade marked MDO 1 face/2 faced, interior grade.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which the millwork/ cabinetwork is to be installed, and notify the Contractor in writing of conditions detrimental to the proper and timely completion of this phase of the Work. Do not proceed with this phase until the unsatisfactory conditions have been corrected. Commencement of work shall be construed as acceptance of the conditions.

B. Contractor shall take accurate field measurements and adjust the shop drawings accordingly before fabrication. The A/E shall be informed in writing of any dimension changes resulting from such field measurement before fabrication.

C. The casework shall be set in place, leveled, and secured to walls and floors as normal and standard to the trade. Fillers shall be used between casework and walls and shall be accurately scribed to walls for a neat installation. Casework shall be caulked where meeting walls, floors and soffits. Seal all counter joints and where backsplash meets counter top.

D. The casework installer shall accurately cut openings required for sinks or other equipment as indicated on plans.

3.2 INSTALLATION

A. Provide first quality construction following best trade practices.

B. Cuts, miters, joints, etc. shall be well sawn and joined. Nail heads or holes shall not be exposed in finish work. Drive nails and screws true and straight. Glue joints securely together. Sand all surfaces thoroughly, leaving clean and ready for finishing.

C. Bond plastic laminate to surfaces with technique and contact cement approved by laminated plastic manufacturer.

D. Install cabinet hardware according to requirements of the finish hardware as specified and in accurate positions as indicated on the drawings.

END OF 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. 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. Foil-Faced Blanket Insulation:

1. Manufacturers:

a. CertainTeed.
b. Owens Corning.
c. Thermal-Shield.

2. Physical Data:

a. "R" Value:____ minimum at 75 degrees Fahrenheit mean.
b. For use between wall furring.
c. Spun mineral foil faced fiber or fiberglass blankets; ___ inches thick x _ inches wide x lengths as long as practicable.

B. Foil Faced Low Density Polyethylene Foam Insulation:

1. Manufacturers:

a. Low "E" by Environmentally Safe Products, Inc., New Oxford, PA.
b. Accepted equivalent.

2. Physical Data:

a. "R" Value: ___ minimum at 75 degrees Fahrenheit mean.
b. Single layer of low density polyethylene foam with highly polished aluminum foil on both sides.
c. ASTM E96 Water Vapor Transmission: 0.02 perms maximum.

C. Polyisocyanurate Roof Insulation.

1. Manufacturers:

    a. Energy 2 by NRG Barriers.
    b. Accepted equivalent.

2. Physical Data:

    a. "R" Value: 5.6 per inch minimum at 75 degrees Fahrenheit mean.
    b. Board Thickness: 1/2 inch minimum (12.7mm), 2 inches (51mm) maximum.
    c. Board Size: 4'-0" x 4'-0" maximum.
    d. ASTM D1622 Board Density: 2.0 pcf.
    e. ASTM D1621 Compressive Strength: 23 psi minimum.
    f. ASTM C209 Water Absorption: 1 percent by volume, maximum.
    g. ASTM E-96 Moisture Vapor Transmission: 1 perm, maximum.
    h. Dimensional Stability: 2 percent maximum linear change when conditioned at 158 degrees F. And 97 percent relative humidity for 7 days.
    i. Curing Time: 24 hours minimum, plus an additional 24 hours minimum per inch (25mm) of thickness at a minimum of 60 degrees F. before shipment from manufacturer.

3. Protection: Provide 1/2" minimum Dens Deck Type X 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 the accepted insulation according to the manufacturer's printed instructions for the specific product.

END OF SECTION

07262
VAPOR AND RADON RETARDER

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

A. Follow regulations of Florida Dept. of Health (FL DoH), 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 Home Radon Reduction System, SubSlab Depressurization for Low Permeability Fill Material.

B. American Society for Testing and Materials (ASTM), latest edition:

1. D1709 Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method.
2. E154 Test Method for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
3. E1745 Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.
4. F1249 Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor.

1.2 SUBMITTALS

A. Product Data: Details and properties of sheet and accessories; installation instructions.

B. Samples: Two 11 in. long vapor-radon retarder sheets 7-1/4 in. wide, lapped 6 in. and taped to form an 8-1/2 x 11 in. joint sample. Also submit sample of pipe collar and tape.

PART 2 PRODUCTS

2.1 VAPOR / RADON RETARDER SHEET

A. Description: For interior slabs-on-grade, provide either two layers of polyolefin film laminated to and sandwiching a polyester reinforcing grid, or a tough single extruded polyolefin sheet, minimum of 15 mils thick, suitable for both water vapor and radon gas protection. Provide retarder sheets in rolls a minimum of 10 ft wide, with 6 in. wide selfadhering joint tape; polyolefin pipe collars and tape for penetrations as sufficient for this project.

1. Puncture resistance: No puncture at 120 lb; ASTM D1709, or no puncture at 2200 g;
2. Perm rating: No more than 0.018 perms; ASTM F1249.
3. Class A per ASTM E1745.

B. Product / Producer.

1. Vaporblock Plus 20, by VaporBlock Plus.
2. Stego Wrap, 15 mils thick, by Stego.
3. Equal product as approved after review by A/E.

2.2 VAPOR RETARDER SHEET

A. Description: At exterior slabs and walks on grade only, provide 10 mil thick polyolefin sheets, tape and collars. At Contractor's option, the interior sheet product may be used.

2.3 SEALANT

A. Description: For sealing turn-ups against walls, columns and other penetrations too large to collar: One-part polyurethane; ASTM C920, Type S, Grade NS, Class 25.

PART 3 EXECUTION

3.1 HORIZONTAL INSTALLATION

A. Make surface of soil or gravel substrate smooth. Compact soil enough that a person does not make more than a 1/4 in. impression with shoe. Remove rocks and sharp objects that could puncture retarder sheets.

B. Lay retarder sheets over entire area to receive concrete, with 6 in. laps.

1. Place in longest lengths feasible, to minimize number of cross seams.
2. Lay out with seams perpendicular to direction of concrete placement and shingle any lapped cross seams so as to not lift when wet concrete is moved over sheets.
3. Where joint fillers occur at walls and columns, run retarder sheets behind pre-molded joint filler strips (as provided under Concrete Formwork) and seal against the walls.
4. Where no filler strips are required, turn sheets up at walls and tape in place.
5. Tape sheets: make vapor-tight. Seal penetrations with taped pipe collars.
6. Place retarder sheet edges even with top of slab and seal to walls; vapor-tight.

C. Do not permit screed supports or other objects to pierce retarder sheet. Provide pads.

1. Repair punctures and tears with taped retarder sheet material before placing concrete. Extend the repair sheets at least 12 in. beyond the damage and tape all edges. Do not use tape alone to seal punctures and tears.

3.2 VERTICAL INSTALLATION

A. Spread retarder sheets over framing or walls that bound air-conditioned spaces.

1. Place retarder sheets with 6 in. laps, in longest lengths feasible.
2. Tape retarder sheets to make vapor-tight.
3. Protect sheets from piercing. Use pipe collars and tape to seal penetrations.
4. Repair punctures and tears before applying finish material.

3.3 FIELD QUALITY CONTROL

A. When interior retarder sheets on soil are in place and taped, and 2 full work days before covering them, send a message to the A/E requesting inspection of the installation.

1. Do not place concrete over retarder sheets until this inspection is either made or waived and approval is obtained from the A/E.

B. Check retarder installation before concrete is placed. Repair punctures and tears.

END OF SECTION

07410
METAL ROOF ASSEMBLY

PART I GENERAL

1.01 SUMMARY

A. Section includes: Factory-formed metal roofing or soffits, including flashing and accessories. Metal roofing includes:

MRS System

B. Related Sections: Section(s) related to this
1. Metal Roof Deck: Division 5 Metal Deck Sections.
2. Wood Framing and Decking: Division 6 Rough Carpentry Section. Flashing and
3. Trim: Division 7 Flashing and Sheet Metal Section.
4. Coping and Gravel Stops: Division 7 Roof Specialties and Accessories Section.
5. Sealants: Division 7 Joint Sealers Sections.

1.02 REFERENCE

A. American Society for Testing and Materials
B. Underwriters Laboratories (UL Classified Tests):
C. Sheet Metal and Air Conditioning Contractors National Association (SMACNA):

1.03 SYSTEM

A. Performance Requirements: Provide sheet metal roofing that has been manufactured, fabricated and installed to withstand structural and thermal movement, wind loading and weather exposure to maintain manufacturer's performance criteria without defects, damage, failure of infiltration of water.

1. Wind-Uplift: Roof panel assembly shall comply with UL Classification 580 for UL Classified 90 rated assemblies
2. Static Air Infiltration: Completed roof system shall have a maximum of .06 cfm/sf with 6.24 kPa air pressure differential as per ASTM E283/1680.
3. Water Infiltration: No evidence of water penetration at an inward static air pressure differential of not less than 6.24 psf (43 kPa) and not more than 12.0 psf (83 kPa) as per ASTM E331/1646.

1.04 SUBMITTAL

A. General: Submit listed submittals in accordance with *Conditions of the Contract* and Division 1 Submittal Procedures Section.
1. Product Data: Submit product data, including manufacturer's SPEC-DATA product sheet, for specified products. (Make Spec-Data link to information located in the product section.

B. Shop Drawings:
1. Submit complete shop drawings and erection details, approved by the metal

roofing manufacturer, to the architect (owner) for review. Do not proceed with manufacturer of roofing materials prior to review of shop drawings and field verification of all dimensions. Do not use drawings prepared by the architect (owner) for shop or erection drawings.

2. Shop drawings show roof plans, elevations, methods of erection, and flashing details.

C. Performance Tests:
   1. Submit certified test results by a recognized testing laboratory in accordance with specified test methods for each panel system.

D. Samples: Submit each section and verification samples for finishes, colors and

E. Quality Assurance Submittals: Submit the following:
   1. Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and physical requirements.
   2. Manufacturer's Instructions: Manufacturer's installation instructions.

F. Closeout Submittals: Submit the following:
   1. Operation and Maintenance Date: Operation and maintenance date for installed products in accordance with Division 1 Closeout Submittals, Maintenance Data and Operation Data Section. Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance.
   2. Project Warranty: Warranty documents specified herein.
      A: Manufactures warranty: Submit, for owner's acceptance, manufactures standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to and not limited of, other rights the owner may have under the contract documents.

      Warranty Period: (specify term) years commencing on Date of Substantial Completion.

   3. Record Documents: Project record documents for installed materials in accordance with Division 1 Closeout Submittals, Project Record Documents Section.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Installer experienced in performing work of this section who has specialized in the installation of work similar to that required for this project.
B. Sheet Metal Industry Standard: Comply with Sheet Metal and Air Conditioning Contractors National Association(SMACNA) *Architectural Sheet Metal Manual*.
C. Pre- Installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, Manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Division 1 Managements and Coordination, Project Meetings Section.

1.06 DELIVERY, STORAGE AND HANDLING

A. General: Comply with Division 1 Product Requirements Sections.
   1. Ordering: Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.

B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact. Identify fabricated components with UL 90 Classified label where appropriate.

C. Storage and Protection: Store materials protected from exposure to harmful conditions. Store material in dry, above ground location.

   1. Stack prefinished material to prevent twisting, bending, abrasion, scratching and denting. Elevate one end of each skid to allow for moisture to run off.
   2. Prevent contact with material that may cause corrosion, discoloration or staining.
   3. Do not expose to direct sunlight or extreme heat trim material with factory applied strippable film

1.07 PROJECT CONDITIONS

A. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements, fabrication schedule with construction progress to avoid construction delays.

1.08 WARRANTY

A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.
B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to and not a limitation of, other rights Owner may have under the Contract Documents.

1. Warranty Period: (Specify Term) years commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.01 SHEET METAL ROOFING

A. Manufacturer: Metal Roofing Systems

1. Contact: 7670 Mikron Drive, Stanley, NC 28164; Telephone (704) 820-3110; Fax (704) 820-0113

B. MRS SYSTEM 2500 panels and trim
   1. Seam Height: 2" (50.2 mm) minimum seam height.

2. Material: (24 ga.), (22 ga) G-90 Hot-dipped Galvanized Steel
3. Material: .032" ga (.8mm), .040" ga (.1mm) alloy 3105-H14 aluminum
4. Panel Dimensions: 12" (305 mm), 14" (356 mm), 16" (406 mm), 18" (457 mm) o.c.
5. Texture: (Smooth) (Stucco embossed texture) (Striations) (Stress Ribs).
6. Rating: UL Classified 90 rated (wind uplift) panel assembly.
7. Flashing and Trim: (Aluminum, (.032" ga, .040" ga, .050" ga (.8mm, .1mm, .13mm) (Steel, (24 ga, 22 ga)
8. Fastners: Standard galvanized steel, non-penetrating high-performance clips for roofing application and UL Classified 90 rated (wind uplift) assemblies and standard clips for mansard and fascia applications.
9. Sealant Bead: Factory applied sealant bead.

C. Panel Finish:
   a. Panel Topside: MRS SYSTEM 2500 finish' color selected from Metal Roofing Systems. standard colors:
   b. Panel Underside: Polyester washcoat with dry film thickness of 0.3 mils.

D. MRS System 2500 Flashing and Trim: Manufacturer's standard flashing and trim profiles, factory formed, gauge as recommended by manufacturer, color and finish to match metal roofing panels.

E. Substitutions: No substitutions permitted.

2.02 RELATED MATERIALS

A. General: Coordinate use of related materials:
   1. Underlayment: ASTM D226, Type II No. 30 asphalt saturated organic roofing felt. Refer to Division 7 Roofing Sections.
   2. Plywood Deck: 5/8" (16 mm) nominal thickness. Refer to Division 6 Rough Carpentry Section.
   3. Nailable Insulation: 1" (25 mm) minimum to 3 ½" (89 mm) maximum nominal thickness classified polyisocyanurate foamed plastic, 2 pct density, with factory laminated 7/16" (11 mm) thick APA rated Oriented Strant Board (OSB). Refer to Division 7 Insulation Sections or Division 6 Rough Carpentry Section.
   4. Sealants: Elastometic joint sealants. Refer to Division 7 Joint Sealers Sections.
   5. Bituminous Coating: Cold-applied asphaltic mastic. Provide compound free of asbestos fibers, sulfur components and other harmful impurities. Refer to Division 7 Damp proofing Section.

2.03 FABRICATION

A. General:
   1. Continuous Length: Fabricate panels 55' (16.2 m) and less in one continuous length.
   2. Trim and Flashings: Fabricate trim and flashings from same material as roof system material.
   3. Portable Roll Former: Panels fabricated by portable roll former shall not be approved.

2.04 FINISHES

A. MRS SYSTEM 2500 Factory Applied Finish:
   1. Topside: Full-strength fluoropolymer (70% Kynar□ 500 or Hylar□ resin) system of 1.0 mil (.025 mm) total dry film thickness.
   2. Underside: Wash coat of 0.3 - 0.4 mil dry film thickness.
   3. Texture: (Smooth texture, dull matte specular gloss 25 - 35% at 60□) (Standard E-5 stucco embossed pattern).
   4. Protective Film: Strippable vinyl film applied during panel fabrication and finishing.

PART 3 EXECUTION

3.01 MANUFACTURERS INSTRUCTIONS

A. Compliance: Comply with manufacturer's product data, recommendations and installations instructions for substrate verification, preparation requirements and installation.
   1. Strippable Film: Remove manufacturer's protective film, if any, from surfaces of roofing panels.

3.02 EXAMINATION

A. Site Verification of Conditions: Verify substrate conditions, which have been previously installed under other sections, are acceptable for project installation in accordance with manufacturer's instructions.

3.03 PREPARATION

A. Coordination: Coordinate metal roofing with other Work (drainage, flashing and trim, deck substrates, parapets, copings, walls) and other adjoining work to provide a non-corrosive and leak-proof installation.
B. Dissimilar Metals: Prevent galvanic action of dissimilar metals.

3.04 INSTALLATION

A. General: Install metal roofing panels to profiles, patterns and drainage indicated and required for leak-proof installation. Provide for structural and thermal movement at work. Seal joints for leak-proof installation.
   1. Seams: Provide uniform, neat seams.
   2. Fastners: Conceal fasteners where possible in exposed work. Cover and seal fasteners and anchors for watertight and leak-proof installation.
   3. Sealant-Type Joints: Provide sealant-type joint where indicated. Form joints to conceal sealant. Comply with Division 7 Joint Sealants Section for Sealant installation.

3.05 FIELD QUALITY REQUIREMENTS

A. Site Tests (Post Installation Testing): Owner reserves right to perform post installation testing of installed sheet metal roofing.

B. Manufacturer's Field Services: Upon Owner's request, provide manufacturer's field service consisting of product use recommendations and periodic site visit for inspection of product installation in accordance with manufacturer's instructions

3.06 CLEANING

A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.

3.07 PROTECTION

A. Protection: Protect installed product from damage during construction.

07500
ROOF ASSEMBLY (RA)

1.1 GENERAL

A. This section 07500 is the lead section that specifies overall requirements common to and governing all Roof Assembly (RA) sections of the Specifications.

B. Coordinate all Roof Assembly components with work before and after. See especially:
   1. Items of rooftop-mounted equipment Mechanical and electrical sections

C. List of Roof Assembly governing and component sections.
   2. 07500 Roof Assembly (RA)
   3. 07501 RA Special Warranty Forms
   4. 07522 RA Modified Bitumen Roofing
   5. 07600 RA Flashing and Sheet Metal
   6. 07721 RA Supports for Rooftop Equipment

1.2 DEFINITIONS APPLYING TO COMPONENTS OF ROOF ASSEMBLY

A. Roof Assembly: Thermal and moisture protection work above and beyond each structural roof deck, as needed for optimal performance of the roof membrane and its flashings and to prevent the entry of moisture, air, heat, high winds, rain and storm-driven water.
   1. Roof Assembly work includes providing and warranting of such items as roof insulation, steel roof blocking (SRB), SBS modified bitumen roof membrane and base ply flashings, vents, walkway treads and pads, counterflashing's, surface-mounted flashings, stucco stops, edge strips, copings, cleats, cants, crickets, scuppers, roof drains, gutters, conductor heads, downspouts, roof drain flashings, expansion joint assemblies, rooftop penetration flashings, rooftop umbrellas & hoods, loose curbs and rooftop pipe supports, and flashing for items that pass through the roof membrane.
   2. Roof Assembly work also includes the roof membrane producer's and installer's coordinating, supplying, setting, fastening, making waterproof and warranting of roof-related work such as roof drains, roof hatches, smoke vents, edge guards, as well as PVC rainleaders that carry roof water to the storm sewer or other point of discharge.
   3. Roof Assembly work also includes the roof membrane producer's and installer's coordinating and flashing of roof-related work such as rooftop equipment supports and curbs, penetrating items (such as pipes, ducts and conduit), the setting of rooftop equipment such as fans, screens and antennas, and the setting of rooftop equipment having integral curbs, all in such a way that the waterproof quality of their installation is covered in the Special Warranty of the roof assembly.
   4. Special Warranty. The Roof Assembly Producer and producers of Roof Assembly components shall warrant the Roof Assembly to the extent specified in the Roof Assembly sections.

B. Terminology.
   1. HVHZ: High-Velocity Hurricane Zone, as defined in FBC 202 for Miami-Dade and Broward Counties.
   2. SBS mod bit: Styrene-butadiene-styrene modified bitumen plies as specified in 07522.
   3. Torched: Heat welded.
   4. S/s or s/s: Stainless steel.

5. Steel roof blocking (SRB): S/s-clad galvanized steel roof items such as roof edge blocking, copings, scuppers, and expansion joints, and s/s accessory, cover, or extension items such as umbrella closures, 2-piece and 3-piece expansion joint closures, surface mounted counter flashings, as specified in 07620.
6. Other roofing sheet metal (SM): Sheet metal for roof assembly and exterior walls other than SRB and RPF items, including such work as
   a. S/s window and door head flashings, door hoods, stucco stops, stucco stops with counter flashings, crickets;
   b. S/s flashings and counter flashings for canopy structures;
   c. Custom s/s penetration flashings not made by SBC;
   d. Roof drain flashings;
7. Roof penetration flashings (RPF): S/s flashings for such penetrations of the roof membrane as vents, piping, conduit, ducts, roof equipment supports..
8. Product Approval: Certificate of product acceptance from the authority having jurisdiction (AHJ) for use in Miami-Dade County.
9. Repair or replace defects or defective work (products, installation or both) to follow the requirements of the Construction Documents without diminishing warranty provisions.
10. Work that is of poor or damaged quality, incomplete, substituted without approval, not functional, not properly performing, rejected by the A/E, or which otherwise does not follow requirements of the Construction Documents.

1.3 REFERENCES APPLYING TO COMPONENTS OF ROOF ASSEMBLY

A. American Society for Testing and Materials (ASTM): Specifications or Test Methods for:
1. A240-04a Stainless Steel, Chromium and Chromium-Nickel Plate, Sheet and Strip.
2. A653-04a Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot Dip Process.
3. B32-04 Solder Metal.
4. B370-02 Cold-Rolled Copper Sheet.
5. C138-01a Density, Yield, and Air Content (Gravimetric) of Concrete.
6. C150-04a Portland Cement.
7. C332-99 Lightweight Aggregates for Insulating Concrete.
8. C495-99a Compressive Strength of Lightweight Insulating Concrete.
9. C518-04 Steady State Thermal Transmission Properties by Heat Flow Meter.
10. C578-06 Rigid, Cellular Polystyrene Thermal Insulation.
11. C612-04 Mineral Fiber Block and Board Thermal Insulation.
12. C869-99 Foaming Agents for Preformed Foam in Cellular Concrete.
13. D41-05 Asphalt Primer Used in Roofing.
14. D312-00 Asphalt Used in Roofing.
15. D1785-06 PVC Plastic Pipe, Schedules 40, 80 and 120.
16. D2027-04 Cutback Asphalt (Medium Curing Type)
17. D4586-06 Asphalt Roofing Cement, Asbestos Free.
18. D4601-04 Asphalt-Coated Glass Fiber Base Sheet Used in Roofing.
19. D6152-05 SEBS-Modified Mopping Asphalt Used in Roofing.
20. D6162-05 SBS Modified Bituminous Sheet Matls, Polyester & Glassfiber Reinfcd.
21. D6164-05 SBS Modified Bituminous Sheet Materials, Polyester Reinforced.
22. E108-04 Fire Tests of Roof Coverings.

1.4 OVERALL STANDARDS OR COMPONENTS OF ROOF ASSEMBLY

A. Roofing Application Standards (RAS) of the Florida Building Code (FBC). Follow:

1. 111 Attachment of Perimeter Wood Blocking and Metal Flashing.
2. 117 Mechanical Attachment of Base Sheets to Substrate.
3. 128 Determining Applicable Wind Design Pressures for Low Slope Roofs.

B. Test Application Standards (TAS) of the FBC. Follow:
1. 105 Field Withdrawal Resistance Testing.
2. 110 Roof Membranes and Other Roofing Components.
3. 114 Roof Assemblies in High Velocity Hurricane Zone (HVHZ) Jurisdiction.
4. 117 A, B and C: Withdrawal, Pull-Through and Pull-Off Performance of Mechanical Fasteners Used in Roof Assemblies.
5. 121 Roofing Adhesives, Mastics and Coatings.
6. 132 Sealants.

C. Miami-Dade County Test Protocols. Follow PA 105, 114, 117, and Appendices A, B.

D. American Society of Civil Engineers (ASCE) 7, Minimum Design Loads for Buildings and Other Structures.
1. ASCE 7 has been followed in the A/E's calculations (signed and sealed by a Florida registered professional engineer) of required positive and negative (±) wind load resistances shown in the Drawings' wind pressure diagrams which are based on. wind speed of 146 mph; exposure category C; wind load classification III, and wind load importance factor of 1.15.
2. The A/E will follow ASCE 7 procedures for calculating gravity, uplift, overturning loads, and hold-down fastenings for items of rooftop equipment and their supports.

E. Factory Mutual Research Corp. (FM, FMA, FMG). Follow:
1. Standard 4470, Approvals Standard for Class I Roof covers.
2. 1-49, Loss Prevention Data Sheet for Perimeter Flashings.
3. 1-29, Loss Prevention Data Sheet for Above-Deck Roof Components.
4. Loss Prevention Data Sheets 1-7, 1-28, 1-28R, 1-29, 1-29R, 1-49.
5. Windstorm Classification 1-150.
6. Combustibility Class A.

F. Underwriters Laboratories, Inc. (UL): Follow:
1. Roofing Materials and Systems Annual Directory, 2008.
2. Fire Resistance Directory, 2008.

G. National Roofing Contractors Association (NRCA): Follow Roofing and Waterproofing Manual, 2008, where not in conflict with the above standards.

H. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA): Architectural Sheet Metal Manual, 2007.

1.5 QUALITY ASSURANCE

A. Qualifications of each Roof Assembly installer. Each installer of each component of the Roof Assembly in sections 07503 through 07727 shall:
1. Have 5 years of successful experience in the installation of that roof component.
2. Be currently listed in THE CITY Pre-Qualified Roofing Contractor List.
3. Be currently licensed or certified by the producer of that part of the Roof Assembly.

B. Insurer Certification. Assist THE CITY in preparing roofing acceptance certification as needed for the fire and extended coverage insurance on the Roof Assembly.

C. Pre-Installation Meeting. At least 6 weeks before installation of Roof Assembly, the Contractor shall conduct a meeting at the worksite with installers of each component of the Roof Assembly, affected installers of other work, A/E, AHJs, and THE CITY. representatives.
   1. Contractor shall require attendance by each subcontractor performing part of the Roof Assembly work.
   2. Contractor shall notify the following THE CITY staff and representatives: Roofing Division Director, Roofing Division technicians and inspector, Building Code Inspectors, Project Manager, THE CITY Testing Lab.
   3. A/E shall record discussion, agreements and action items, and shall supply a copy of the meeting minutes to each participant within 1 week after meeting.

1.6 SUBMITTALS Follow 01330

A. Roof Assembly Producer's Notice of Intent to Issue Special Warranty (NOI).
   1. Prepare the NOI following the form shown in Specifications 07501, in duplicate, with signatures.
   2. Submit the NOI for to A/E for approval, no more than 30 days after Contractor's receipt of Notice to Proceed, for approval by A/E and THE CITY.

B. Statement of Producer's Bonding Capacity.
   1. The Roof Assembly's SBS roof membrane producer shall certify that it has the bonding capacity not just for provision of the membrane component but for the total amount of all Subcontracts in the Roofing Assembly.
   2. This letter of certification shall be approved by the Contractor and submitted by the Contractor to the A/E and THE CITY within 45 days after the Contractor's receipt of Notice to Proceed with the Work:

C. Producer's Proposed Roof Assembly Warranty.
   1. Prepare the Roof Assembly Special Warranty for this Project, including provisions of the Special Warranty specified in 07501, in duplicate, with signatures.
   2. Insert the Required Additions and Required Modifications specified in Special Warranty from Roof Assembly Producer below into the Producer's customary warranty.
   3. For reference and comparison, attach a sample of the Producer's customary roofing warranty.
   4. Submit the proposed Special Warranty to A/E for approval, no more than 60 days after Contractor's receipt of Notice to Proceed, for approval by A/E and THE CITY.

D. Special Warranties from Producers and Installers of Roof Assembly components. See Special Warranties from RA Component Producers and Installers and other Roof Assembly sections for the Special Warranty obligations for major components.

E. Approval of Component Installers. Submit letter from RAP approving producers and installers of lightweight insulating concrete, SBS roof membrane, steel blocking / sheet metal, rainleaders, and roof hatches/smoke vents.

F. Submittals at Time of Closeout.
   1. Report of producer's representative present during installation of Roof Assembly.

2. Signed Special Warranties on producer's letterhead.

1.7 SPECIAL WARRANTY FROM ROOF ASSEMBLY PRODUCER Follow 01790, 01500

A. By Roof Assembly Producer (RAP). Provide a 20-year written Special Warranty from the roof membrane producer covering correction of defects in the Roof Assembly.

B. Edit the typical limited warranty text shown in 07501 to Include the following additions in the Special Warranty for the Roof Assembly.
   1. Conditions at Worksite. State that the Producer's Representative is aware of Miami-Dade County weather conditions, the Project's surroundings and environment, and the design for construction underlying and adjacent to the roofing.
   2. Construction Documents. State that the Producer's Representative has examined THE CITY's Construction Documents (Drawings, procurement requirements, Conditions of the Contract and Specifications) for the Project before the bid date.
   3. Repairs by Owner. THE CITY shall have the right to make emergency repairs to stop leaks (active or incipient) to prevent damage to building and its contents without voiding this Roof Warranty.
   4. Notification. THE CITY will notify the Producer's roofing installer of its requests for both leak repairs and non-emergency repair of defects. THE CITY will keep a record of such notifications.
   5. Eleventh month inspection by Producer. Producer's Representative and Roofing Installer shall conduct a post-construction field inspection between 11 and 12 months after date of Substantial Completion of the Project, in the presence of the A/E and THE CITY. Producer shall submit copies of the written report within 7 days of inspection to THE CITY's Maintenance Department.
   6. Participation of Surety. The Producer's Surety shall participate in ensuring execution of this Roof Assembly Producer's Intent to Issue Roof Warranty as well as the Roof Assembly Producer's Warranty.
   7. Approval of Installer for this Project. The Producer states that the installer listed below has been approved as qualified to install steel blocking, roof membrane and sheet metal parts of the Roof Assembly and to coordinate the installation of other parts such as insulation, hatches, curbs, supports, and penetrations.

C. Edit the typical limited warranty text shown in 07501 to make the following modifications for the Roof Assembly's Special Warranty.
   1. Delete uplift-resistance limitations for gale-, hurricane-, and tornado winds up to146 mph. Only damage from winds above 146 mph may be excepted from warranty.
   2. Retain criteria Category C, Wind Load Classification III, and 1.15 Importance Factor (all as defined in ASCE 7 wind uplift resistance requirements).
   3. Delete restrictions to use of lightweight concrete. Delete restriction against application of roofing over the lightweight insulating concrete / styrene board assembly. (The properties of the LWIC assembly are specified in section 07503 of the Specifications.)
   4. Include 20 year warranty on Roof Assembly. Provide 20 year warranty, with no dollar limit, no deductibles, with single source responsibility, and that includes all products, accessories, equipment and labor needed to repair or replace defects in Roof Assembly.
   5. Include list of components of Roof Assembly as listed in Definition of Roof Assembly above.
   6. Include extent of warranty. Cover total labor, equipment and material for the limited warranty period, including cost of repairing or replacing damage to the Roof

Assembly, down to the roof deck, for such damage as from water leaks, wind uplift, and any other causes except those specifically excluded below.

7. Include causes of damage that are NOT included in extent of limited warranty repair. The Producer may, in its limited warranty, add any or all of the following exclusions of responsibility for:
   a. Major repairs or modifications to the Roof Assembly after installation for which the Producer has not been notified nor given approval
   b. Failure of THE CITY to give Producer written notice within 30 days after a leak or major defect is discovered or should have been discovered exercising normal diligence.
   c. Failure of THE CITY to exercise ordinary care to limit damage after a leak or major defect is discovered and before the Producer can reasonably be expected to assess damage and make repairs.
   d. Failure of THE CITY to maintain the Roof Assembly by regularly removing plants, vegetation, leaves, trash, debris and other foreign objects, failure to keep drains unclogged, failure to prevent more than necessary traffic across the roof, failure to maintain flashings in watertight condition.
   e. Defects, movement and failures in structure that harm roof performance.
   f. Damage from accident, fire, lightning, chemical / oil / grease attack, abuse, misuse, vandalism, rodent / insect infestation, and lack of maintenance.
   g. Damage to the roof membrane caused by falling objects, dropped heavy equipment, or objects that are blown on the roof by winds over146 mph.
   h. Damage to roof membrane resulting from installation of non-Roof Assembly structures, insulation, machinery or equipment without notification of and approval by Producer.
   i. Damage to roof membrane resulting from THE CITY's use of the roof as a storage, eating, instructional, or recreational area.
   j. Change in a facility's use to storage or industrial purposes.
   k. Consequential damages to building interior from roof leaks and storms.
   l. If repair by Producer is needed, THE CITY shall bear the expense of removing and replacing structures, equipment and traffic surfaces built over the roof membrane.

1.8 SPECIAL WARRANTIES FROM ROOF ASSEMBLY COMPONENT PRODUCERS AND INSTALLERS

A. By each of the Roof Assembly Component Producers and Installers: Provide Special Warranties covering correction of defects in Roof Assembly components as follows. Sign and submit to Roof Assembly Producer (provider of the roof membrane) for transmittal to the A/E.

B. Lightweight concrete roof insulation.
   1. Scope: Repair or replace when notified by THE CITY that any of these defects appears in LWIC products or installation:
      a. Actual resistance to heat flow through the insulation is less than 80% of specified R-value (thermal resistance) a measured at the average insulation thickness;
      b. The insulation does not remain intact and in place after a windstorm, even if the roof membrane sustains wind damage;
      c. The insulation softens, crumbles, loosens or if it lifts in rain, from dampness, or in winds of less than 146 mi/hr;
      d. The insulation is not in re-roofable condition when the roof membrane needs replacement, exclusive of damage caused by removing fasteners.

2. Duration of Special Warranty: From time of installing insulation until 10 years after date of Substantial Completion of the Work.
3. Response time: As soon as extent of defect is known and overlying roofing has been removed, in time to prevent further damage to building interior, but in no case more than 15 days after notification..
4. Limit of insulation producer and installer's responsibility: No dollar limit; no deductible amount.

C. Steel blocking and sheet metal under 07620:
1. Scope: Repair or replace SRB, SM, and RPF when notified by THE CITY that a defect in products or installation has appeared.
2. Duration of special warranty: From time of installing roofing assembly steel blocking and sheet metal until 10 years after date of Substantial Completion of Work.
3. Response time: As soon as extent of defect is known and overlying roofing has been removed, repair in time to prevent damage to building interior, but in no case more than 15 days after notification.
4. Limit of roof assembly steel blocking and sheet metal producer and installer's responsibility: No dollar limit; no deductible amount.

D. PVC rainleaders to sewer under 07630.
1. Scope: Repair or replace PVC rainleader assembly when notified by THE CITY that a defect in products or installation has appeared.
2. Duration of special warranty: From time of installing PVC rainleader assembly work until 10 years after date of Substantial Completion of Work.
3. Response time: As soon as extent of defect is known and installer has been notified, correct within 15 days.
4. Limit of PVC rainleader assembly installer's responsibility: No dollar limit; no deductible amount.

E. Supports for rooftop equipment:
1. Scope: Repair or replace defects as soon as notified of their appearance, in time to prevent further damage to the interior of the building.
    a. Structural failure;
    b. Leaks or entry of water in any manner through support;
    c. Failure of protective coatings that allows rusting of steel;
    d. Failure of resilient seals to remain flexible and leak-free.
2. Exceptions:
    a. Steel framed roof supports are not covered by this special warranty.
    b. Integral curbs fabricated as part of items of rooftop equipment shall be part of the warranty of those items of equipment are not covered by this special warranty.
    c. Condensate line supports are only partly covered by this special warranty.
3. Duration of special warranty: From time of installation of supports until 5 years after date of Substantial Completion of the Work.
4. Response time: As soon as extent of defect is known and installer has been notified, repair in time to prevent damage to building interior, but in no case more than 15 days..
5. Limit of supports producers and installer's responsibility: No dollar limit; no deductible amount.

END OF SECTION

07522
RA MODIFIED BITUMEN ROOFING

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

A. Coordinate RA modified bitumen roofing with work before and after. See especially:
   1. RA Steel Blocking and Sheet Metal 07600
   2. RA Supports for Rooftop Equipment 07721

1.2 DEFINITIONS, REFERENCES, AND OVERALL STANDARDS

1.3 QUALITY ASSURANCE

A. Early Certifications. In addition to the qualifications in B. following, the Roof Assembly's SBS roof membrane producer, through the GC, shall certify within 28 days after the GC's Notice to Proceed with the Work:
   1. That the SBS membrane producer has the bonding capacity not just for provision of the membrane component but for the total amount of all Subcontracts in the Roofing Assembly.
   2. That the GC and the SBS modified bitumen membrane producer who execute the Roof Assembly Producer's Special Warranty agree to jointly issue the Roof Assembly Producer's Special Warranty that is part of this Specifications section.

B. Qualifications of each Roof Assembly installer. Each installer of each component of the Roof Assembly shall:
   1. Have 5 years of successful experience in the installation of that roof component.
   2. Be currently licensed or certified by the producer of that part of the Roof Assembly.

Pre-Installation Meeting. At least 6 weeks before installation of Roof Assembly, the GC shall conduct a meeting at the worksite with installers of each part of the Roof Assembly, affected installers of other work, A/E OF RECORD, AHJs, and THE CITY representatives.
   3. GC shall require attendance by each subGC performing part of the Roof Assembly work.
   4. GC shall notify the following THE CITY staff and representatives: Building Code Inspectors, Project Manager.
   5. GC shall record discussion, agreements and action items, and shall supply a copy of the meeting minutes to each participant within 1 week after meeting.

1.4 SUBMITTALS

A. Warranties.
   1. Submit Roof Assembly Producer's Notice of Intent to Issue Warranty NOI within 30 days after GC's Notice to Proceed.
      a. Submit in duplicate on copies of the form attached as part of this Specifications section, signed by GC, roof assembly producer (RAP), roof membrane installer, and RAP's surety.
   2. Submit draft of text of Roof Assembly Producer's Warranty within 60 days after GC's Notice to Proceed, on RAP's corporate letterhead, with spaces for required signatures of corporate officers and RAP's surety.

a. Submit also a sample of the Producer's customary roofing warranty for comparison.
b. Obtain approval of proposed Warranty text from A/E OF RECORD and THE CITY before making other submittals for Roof Assembly work.

3. Warranties from other producers of Roof Assembly components. See other Roof Assembly sections for their Warranty requirements.
4. Approval of lightweight insulating concrete, SBS roof membrane, and steel blocking / sheet metal Installers. Submit letter from RAP, approving the firms who will actually install these components.

B. Product Data. Description of each product, including standards met, and the following:
1. Miami-Dade Product Notice of Approval (NOA) number and expiration date.
2. FMA 1-150 Wind Resistance Classification.
3. Fasteners for mechanical attachment of base ply to each substrate, with withdrawal force test figures.
4. List of roofing ply, base flashing, and walkway products for torch installation, and for hot mopped installation if applicable.
5. Producer's installation instructions.

C. Shop Drawings. Roof plan showing roofing, base flashing, slopes, crickets, penetrations, traffic pads, and details for proper roofing and flashing installation.
1. Show any areas where hot mop application is may be needed and for which A/E OF RECORD and THE CITY approval is requested instead of the preferred and intended 100% torched application of both roof membrane and base flashing.
2. Show openings such as drains, hatches, vents, equipment curbs, and edge guards.
3. Show negative pressures on each part of the roof along with modifications to producer's roofing design, such as number and pattern of fasteners, as needed to withstand negative pressures, calculated by a Florida registered professional engineer following TAS 117.
4. Show details of interface between roofing, blocking, base ply flashings, metal flashings, cants, movement joints, drains, penetrations (such as piping, ducts, conduit and wires), hatches, vents, supports, curbs, portals and edge guards.

D. Samples. Two cap sheet samples no larger than 8 x 11 in. with granule colors as will be used for roofing and contrasting walkway color.

E. Closeout Submittals.
1. Report of producer's representative present during installation of Roof Assembly.
2. Signed Special Warranties on producer's letterhead.

PART 2 PRODUCTS Follow 01600

2.1 PROPERTIES OF SBS MODIFIED BITUMEN ROOF MEMBRANE ASSEMBLIES

A. Description: Two-ply polyester or polyester-glass mat-reinforced SBS roofing sheets over an impermeable base ply, mechanically fastened to a substrate of lightweight concrete insulating concrete or LWIC fill course.

B. Standards:
1. UL Class A roof membrane; ASTM E108.
2. FMRC roof membrane Combustibility Class A
3. FMRC roof membrane assembly Windstorm Classification 1-150.

4. Miami-Dade BCCO Product Approval of roof membrane assembly for uplift class.

2.2 SBS MODIFIED BITUMEN ROOF MEMBRANE ON LIGHTWEIGHT INSULATING CONCRETE (LWIC), TORCHED

A. Description. 3-ply assembly for use over 32 - 40 lb/ft^3 lightweight insulating concrete.
1. Base ply: Venting-type, impermeable asphalt coated polyester or polyester-glass sheet, mechanically fastened, ASTM D4601.
2. Interply: Smooth, polyester or polyester-glass hybrid reinforced modified bitumen sheet, torched to base ply; ASTM D6162 or D6164.
3. Cap ply: White granule-surfaced, polyester or polyester-glass hybrid reinforced modified bitumen sheet, torched to interply; ASTM D6162 or D6164.
4. Ply thickness is not specified. Instead, Mat Thickness in the table below specifies the minimum thickness of the reinforcing mat within each ply.

B. Base Ply

	Mat Thickness	Ply Weight	Product	Producer
1.	0.030 in.	32 lb	MB Base SA	Firestone.
2.	0.047 in.	60 lb	Parabase FG	Siplast.
3.	0.047 in.	66 lb	SopraBase TG	Soprema

4. Equal product in quality and record of performance in THE CITY projects as reviewed and approved by A/E OF RECORD and THE CITY.

C. Interply

	Mat Thickness	Ply Weight	Product	Producer
1.	0.120 in.	85 lb	SBS Poly Torch Base	Firestone.
2.	0.138 in.	96 lb	Paradiene 20 PR TG	Siplast.
3.	0.118 in.	81 lb	Sopralene FLAM 180	Soprema.

4. Equal product in quality and record of performance in THE CITY projects as reviewed and approved by A/E OF RECORD and THE CITY.

D. Cap Ply

	Mat Thickness	Ply Weight	Product	Producer
1.	0.160 in.	103 lb	SBS Premium PR	Firestone.
2.	0.154 in.	94 lb	Paradiene 40 FR TG	Siplast.
3.	0.157 in.	110 lb	Sopralene.FLAM FR GR 250	Soprema

4. Equal product in quality and record of performance in THE CITY projects as reviewed and approved by the A/E OF RECORD, THE CITY and its Roofing Dept.

2.3 BASE FLASHINGS

A. Description: Base flashing, consisting of a base ply and a cap ply of membrane by same producer as SBS modified bitumen roof membrane, for torching base ply directly to concrete, masonry, steel, stucco, and other exterior finishes in the Work, and then torching the cap ply to the base ply..
1. Parapet flashing. Where shown on the Drawings or specified herein, and within the specified limits, also use base flashing to flash the face of a parapet.
2. The top ply of any base flashing, parapet flashing, or cover strip shall always be the cap ply specified herein.

B. Base Ply

	Mat Thickness	Ply Weight	Product	Producer
1.	0.120 in.	85 lb	SBS Poly Torch Base	Firestone.

2.	0.138 in.	96 lb	Paradiene 20 PR TG	Siplast.
3.	0.118 in.	81 lb	Sopralene FLAM 180	Soprema.

4. Equal product in quality and record of performance in THE CITY projects as reviewed and approved by A/E OF RECORD and THE CITY.

C. Cap Ply

	Mat Thickness	Ply Weight	Product	Producer
1.	0.160 in.	103 lb	SBS Premium PR	Firestone.
2.	0.154 in.	94 lb	Paradiene 40 FR TG	Siplast.
3.	0.157 in.	110 lb	Sopralene.FLAM FR GR 250	Soprema

4. Equal product in quality and record of performance in THE CITY projects as reviewed and approved by the A/E OF RECORD, THE CITY and its Roofing Dept.

2.4 ACCESSORY PRODUCTS

A. Fasteners: As approved by roofing membrane producer for cured LWIC or CIP concrete for each negative pressure in different parts of the Work, with adequate flanges or plates to prevent tearing of membrane at high pressures.
   1. Follow the principles of RAS 113 and 128, and TAS 105,110,114,117 A,B & C, and 121, to meet the HVHZ wind pressures shown in the Contract Documents.
   2. Corrosion resistance: Follow FMG 4470.

B. Asphalt: Styrene-ethylene-butylene-styrene-modified; ASTM D6152.
   1. Softening point, before and after heat exposure: 185 to 240 °F.
   2. Penetration units at 77 °F: 20 to 60.

C. Roof Vents: Solar-powered, spun aluminum flanged cylinder, approximately 4 in. diameter, with one-way valve at top, capped by a rain shield that vents vapor arising from LWIC horizontally at least 8 in above the roof membrane surface.
   1. Integral flange of roof vent: 12 to 16 in. diameter, suitable for torching to cap ply of roof membrane beneath and for receiving 2 plies of torched flashing above.

D. Roofing Granules: Ceramic coated, No.11 screen size, color matching cap sheet.

E. Walkways and Pads. Using the same cap sheet used for roofing, provide walkways the width of a cap ply roll, but in a color that – to define the walkway and pad limits – Is different from the color of the granules in the roofing cap sheet.

PART 3 EXECUTION

3.1 COORDINATING ROOFING WITH OTHER PARTS OF ROOF ASSEMBLY.

A. Coordinate installation of roof membrane, base ply flashings, roof penetrations, and walkways with roof insulation, steel roof blocking, roofing sheet metal fabrications, roof hatches, smoke vents, equipment curbs and portals, rooftop equipment, and supports for rooftop equipment, edge guards, and screens in a manner that ensures that the entire Roof Assembly is watertight, high velocity wind-resistant, and warrantable as specified in the Special Warranty text attached to this section.
   1. Pitch pans or molded “curbs” shall not be used in place of properly providing the specified roof curbs and flashing at any kind of roof penetration or rooftop-mounted equipment.

B. Fasteners for the attachment of base sheets to LWIC or other deck or wall surfaces: Following the principles of RAS 113 and 128, and TAS 105, 110, 114, 117 A,B & C, and 121, augment the producer's published requirements for securing roofing to surfaces as needed to meet the HVHZ wind pressures shown in the Contract Documents. Also torch (or mop with hot asphalt if torching is not possible) so as to develop full uplift resistance.

C. Crickets and Obstructions: At rooftop equipment and other obstructions to free drainage, do not install roofing until cricket material has been installed over the top of the LWIC or other deck surface so that at least a 1/2 in./ft slope diverts water to each side of the obstruction, toward drains.

D. Penetrations. In order to avoid present and future improper penetrations of the roof membrane and the crowding of base flashings (which must be periodically maintained), check the roof area before starting roofing and base flashing work. Do not start work until other trades have corrected the following potential membrane-penetration problems:
   1. Ladders, stairs, equipment and equipment supports that touch or protrude from the roof structure that is to be roofed.
   2. Piping, conduit, drains, equipment supports or equipment that is installed closer than 24 in. from walls or other obstructions that will receive base flashing. 18 in. clearance is acceptable if the base flashing can be easily accessed by mechanics for maintenance and replacement.
   3. Antennae for which no guy cable anchor structures have been provided at least 8 in. above roof level.
   4. Any condition in which a pitch pan might be introduced contrary to these Specifications because of perceived difficulty in executing the specified curbing and base flashing.

E. Torching Throughout. Torch-apply all roof membranes, base flashings and walkways unless the producer recommends and the A/E OF RECORD and THE CITY approve hot mopping in asphalt at specific locations where hot mopping will perform better.
   1. Supply products only in formulations that are designed for and will best perform with torching (except in locations where hot mopping has been approved).

3.2 EXAMINATION AND TESTING

A. GC shall examine substrates, areas, and conditions with roofing installer and membrane producer's representative present, for conditions affecting performance of the Roof Assembly, including but not limited to the following:
   1. Verify that SRB items, hatches, vents, equipment curbs and portals are securely anchored to roof deck and that SRB blocking matches the thickness of the insulation.
   2. Do not use wood nailers or blocking anywhere in the Roof Assembly.
   3. Verify that hatches, curbs and penetrations have been placed fully 18 in. away from other vertical surfaces, and that the roof drains are securely clamped in place.
   4. Verify that penetrating piping, ducts and conduit are in place, at least 18 in. away from other vertical surfaces or penetrations and are securely supported.
   5. Verify that there are adequate slopes for drainage and that there are no conditions in the deck that may impair adhesion of roofing components to roof substrate.
   6. Verify that substrate is visibly dry and free of moisture before start of work.
      a. Before start of roofing, test for capillary moisture by plastic sheet method, following ASTM D 4263.
      b. Before start of work each day, pour 1 pint of the specified hot asphalt on concrete and let cool. Do not start work if asphalt foams or can be easily stripped from concrete surface.

7. Verify that substrate is securely fastened with no projecting fasteners and with no adjacent units more than 1/16 in. out-of-plane relative to adjoining deck field.

B. Roofing installer shall inspect surfaces to be roofed in the presence of GC and A/E OF RECORD and shall accept surfaces and repairs in writing before starting roofing installation.
   1. Installer shall not start roofing work until GC has caused unsatisfactory conditions to be repaired and each substrate is made smooth, plane, firm, dry, free from dirt and oily or other bond-breaking substances
   2. Starting roofing work constitutes acceptance of substrates by the roofing installer and the first step in its ensuring a watertight job and provision of the required Special Warranty.

3.3 OVERALL ROOFING PROCEDURES

A. Construct the roofing assembly following
   1. FM or FMRC Standard 4470, FMG 1-49, FMG 1-29, Loss Prevention Data Sheets 1-7, 1-28, 1-28R, 1-29, 1-29R and 1-49, to qualify for FM Classification 1a-150.
   2. UL Roofing Materials and Systems Annual Directory and Fire Resistance Directory.
   3. NRCA and Waterproofing Manual.

B. Delivery, Storage, Handling, and Worksite Conditions. Move, handle, wrap, segregate, store, and handle products to protect them from temperature, moisture, bacteria, dirt, deformation, impact and other physical damage.
   1. Store rolled membranes on end, wrapped, and protect from rain and cold.
   2. Install roofing in dry weather over dry substrates. Do not install if wet or stormy weather is anticipated.

C. Preparation.
   1. Surfaces. Properly prepare substrate surfaces and penetrations just before roofing
   2. Recess anchor bolts and nuts and cut off projecting bolt ends flush.
   3. Clean exposed metal surfaces of paint, rust, scale, oil, and bond-breaking matter.
   4. Remove and discard temporary protection and seals to adjoining work each day.
   5. Clean deck surface just before roofing, using brooms, vacuum and compressed air.

D. Procedures for All Roofing Work.
   1. Continuous installation. Do not break the roofing or flashing work into phases. Install each ply following the preceding ply within 48 hours, if weather is dry.
   2. Equipment. Provide as needed to perform the work in the most efficient manner, with particular attention to maintaining EVT temperatures in any bitumen usedas required in roofing producer's instructions.
   3. Protect other work. Protect building and adjacent surfaces from damage from bitumen spillage. Repair or replace surfaces so damaged.

3.4 INSTALLING MODIFIED BITUMEN ROOF MEMBRANE AND BASE FLASHINGS BY TORCHING

A. Installing SBS Modified Bitumen Roof Membrane by Torching
   1. Install roof membrane assembly following the membrane producer's current published instructions, except as more stringently specified herein.
   2. Anchor ply. Mechanically fasten anchor ply to substrate.
   3. Installing plies. Stagger and lap plies as recommended by producer.
      a. Set plies without tears, fishmouths, air pockets or voids.

b. Fully adhere edges and seams and trowel-seal squeeze-out to make watertight.
c. Apply roofing granules to exposed bitumen, while it is hot, at seams and edges.
d. Run membrane to fit tightly against vertical surfaces and projections.
e. Lay each ply in shingle fashion, from low to high points, to shed / drain water.
f. Carry roofing plies fully over top surface of steel roof blocking (SRB), up cants, and over the flanges of sheet metal fabrications.

4. Waterstops.
   a. Protect roof deck and partially completed roofing from moisture by providing waterstops and seals to adjoining work at end of each day's work or when weather is threatening.
   b. When the day's work stops and partially completed roofing is not ready to resist rain, install a temporary waterproof membrane over it.
   c. Upon failure of installer to protect deck, roof insulation, and roofing, remove and replace the damaged materials and materials containing excessive moisture.
   d. Remove waterstops before continuing work.
5. Uniform mineral surfacing. Over roofing and flashing areas that show bare bitumen, embed mineral granules in roofing cement to match mineral surfaced cap sheets.
6. Keep roof area clear. Do not store materials or equipment on completed roofing.

B. Installing SBS Modified Bitumen Base Flashings.
1. Install base flashing assembly by torching where roofing terminates in a vertical or sloped obstacle or metal cap following the membrane producer's current published instructions, except as more stringently specified herein.
2. Unless otherwise shown, install parapet flashings as specified for base flashings. Always terminate the topmost edge of base flashing (and parapet flashing) beneath a sheet metal wall flashing that has a seated bead of sealant at its top edge.
3. Run base flashing at least 6 in. out onto roof membrane, seal and add granules.
4. Priming. Coat surfaces that will receive base flashings with modified roofing cement or primer.
5. Asphalt heating. If hot mopping of some flashings should prove necessary, and if mopping is approved by A/E OF RECORD and THE CITY, heat asphalt as specified following.
6. Installing plies. Stagger and lap plies as recommended by producer

3.5 INSTALLING MODIFIED BITUMEN ROOF MEMBRANE BY HOT MOPPING

A. Install SBS modified bitumen membrane by hot mopping ONLY where torching cannot be employed, or as approved in writing by A/E OF RECORD and THE CITY.
1. Install roof membrane assembly following the membrane producer's current published instructions, except as more stringently specified herein.
2. Priming. Coat surfaces that will receive membranes with modified roofing cement or primer.
3. Asphalt heating. Heat SEBS-modified asphalt to equiviscous temperature (EVT), 125 centipoise for mop-applying and 75 centipoise for mechanical spreader applying, ± 25 °F measured at point of application. Do not let asphalt temperature go above producer's recommended limits during heating and applying, nor to within 25 °F of flash point.
   a. Equip tanks and kettles with accurate, properly working and readable thermometers in plain sight.
4. Installing plies. Stagger and lap plies as recommended by producer. Set plies in recommended weight of hot bitumen.
   a. Set plies without tears, fishmouths, air pockets or voids.

b. Set plies in 25 lb/sq of SEBS-modified asphalt at a temperature (at point of application) of not less than 425 °F
c. Fully adhere edges and seams and trowel-seal to make watertight.
d. Apply roofing granules to exposed bitumen, while it is hot, at seams and edges.
e. Run membrane to fit tightly against vertical surfaces and projections.
f. Lay each ply in shingle fashion, from low to high points, to shed / drain water.
g. Carry roofing plies fully over top surface of steel roof blocking (SRB), up cants, and over the flanges of sheet metal fabrications.

5. Waterstops.
   a. Protect roof deck and partially completed roofing from moisture by providing waterstops at end of each day's work or when weather is threatening.
   b. Upon failure of installer to protect deck, roof insulation, and roofing, remove and replace the damaged materials and materials containing excessive moisture.
   c. Remove waterstops before continuing work.
6. Uniform mineral surfacing. Over roofing areas that show bare bitumen, embed mineral granules in roofing cement to match mineral surfaced cap sheets.
7. Keep roof area clear. Do not store materials or equipment on completed roofing.

B. Install SBS modified bitumen base flashings by hot mopping ONLY where torching cannot be employed and with written approval of A/E OF RECORD and THE CITY. .
1. Hot mop base flashings following the membrane producer's current published instructions, except as more stringently specified herein.
2. Priming. Coat surfaces that will receive base flashings with roofing cement or primer.
3. Asphalt heating. Heat asphalt as for SEBS-modified bitumen membrane installation.
4. Installing plies.
   a. Stagger and lap plies as recommended by producer.
   b. Set plies without tears, fishmouths, air pockets or voids.
   c. Set plies in 25 lb/sq of SEBS-modified asphalt at a temperature (at point of application) of not less than 425 °F
   d. Fully adhere edges and seams and trowel-seal to make watertight.
5. Run base flashing plies so as to fit tightly against vertical surfaces and projections.
6. Uniform mineral surfacing. Over areas that show bare bitumen, embed mineral granules in roofing cement to match mineral surfaced cap sheets.

3.6 VERTICAL RUNS

A. At Vertical or Sloping Applications of Roofing Membrane and Base Flashings.
1. Where a roofing membrane or a base flashing carries more than 18 in. above the top surface of the roofing, apply a bar at its termination and flash edge with sheet metal
2. Where a roofing membrane or a base flashing runs up any steep slope (greater than 2-1/2 in 12) surface, apply horizontal termination bars 24 in. oc to keep the membrane from sagging or sliding.
3. Coordinate all terminations on sloped or vertical surfaces with the installation of stainless steel counterflashings.

3.7 BASE PLY FLASHING AT OTHER LOCATIONS

A. At Cants, Crickets. Edge Drips, Expansion Joints,
1. Install 2-ply base flashings following the membrane producer's current published instructions, except as more stringently specified herein.
2. Carry roofing plies and base flashings fully over top surface of steel roof blocking (SRB), up cants, and over the flanges of sheet metal fabrications.
3. Run base flashing at least 6 in. out onto roof membrane, seal and add granules.

B. At Wall Tops and Copings.
   1. Carry 2-ply base (or parapet) flashings fully over top surface of parapets and concrete wall tops.
   2. Where base flashings terminate at a perimeter parapet or at the top of a tilt-up wall panel, carry the flashing over the top of the wall and anchor to the wall or panel with fasteners not less than 12 in. oc held the least distance from the exterior face of the wall or panel that will not spall the wall or panel, then fasten the coping over the flashing an seal both bottom edges.
   3. Where base flashings terminate, without a metal coping, at a perimeter parapet or at the top of a tilt-up wall panel, carry the flashing over the top of the wall and anchor to the wall or panel with fasteners not less than 12 in. oc. Hold fasteners back from the exterior face of the wall or panel the least distance that will not spall the wall or panel. Cover the edge of the base flashings with an additional torched cap ply to cover fasteners and the edge of the 2 plies, without carrying down the visible face of the wall or panel.
   4. Where base flashings meet at top from two sides of a wall, run one side under the other before terminating and fully adhere to make a 4-ply flashing at top surface before attaching sheet metal coping.

C. At Scuppers and Other Through-wall Penetrating Fabrications.
   1. At through-wall scuppers, apply the 2 plies of base flashing picture frame fashion to the entire perimeter – bottom, sides and top – and lap plies at interior corners to ensure full seal. Then install the sheet metal scupper fabrication, fastening at top and sides to avoid puncturing the flashing at bottom.

D. At Roof and Wall Sheet Metal and Steel Penetrations, including Ducts and Hoods
   1. Coordinate base flashing installation, mopping and sealant work with the installing of sheet metal items following the membrane producer's current published instructions, except as more stringently specified herein.
   2. Apply 2-plyf base flashing from 18 in. above roofing surface, down to the base of penetration or the cant, and 6 in. out onto roof. Add 2 ply base flashing cover over portion that runs out over roofing and extend at least 4 in. beyond.

E. At Hatches, Smoke Vents, Curbs, Portals, Equipment Bases
   1. Coordinate ply installation, mopping and sealant work with the installing of rooftop-mounted units following the membrane producer's current published instructions, except as more stringently specified herein.
   2. Check SRB cants that have been fastened to the sides of each unit after roof insulation is in place and dry, for suitability as substrate for modified bitumen base flashings. Provide base flashings, extended upward to the rim of each unit, terminating under each unit's counterflashing, and fasten all plies securely to the sides of each unit. Run the 2-ply base flashing down to base of hatch, smoke vent, curb, portal or equipment base – or its cants – and 6 in. out onto roof. Add 2 cover plies identical to base flashing over the portion of base flashing that runs out over the roofing and extend the cover plies at least 4 in. beyond the termination of the base flashing.

3.8 INSTALLING ROOF VENTS

A. Install 1 vent for each 1000 ft^2 of LWIC-insulated roof, holding the vents at least 6 ft from low points in the roof.

B. Remove all plies of the roofing membrane and the LWIC / styrene insulation by neatly coring full depth (to top of structural deck), to form a vapor collection chamber the same diameter as the cylindrical vent, directly beneath the vent...
   1. Remove granules and torch-melt the cap ply directly beneath the vent flange. Embed the flange, centering it precisely over the collection chamber..
   2. Cover the flange by torching in 1 interply 30 in. in diameter (or 30 x 30 in. square) and 1 cap ply 18 in. in diameter (or 18 x 18 in. square).
   3. Apply a heavy bead of sealant where cap ply of the flashing meets the vent cylinder.
   4. Follow THE CITY Roofing Manual Roof Vent Detail 23/RS.

3.9 INSTALLING WALKWAYS AND PADS

A. Unless more precisely shown on Drawings, lay out walkways to connect roof access points with items of roof-mounted equipment that need service or periodic inspection.
   1. Provide walkway access to 3 sides of each item of rooftop-mounted equipment, however do not place on the cricket side of any unit.

B. Install walkway traffic treads cut from cap ply rolls in lengths not exceeding 16 ft following the membrane producer's current published instructions, except as more stringently specified herein.
   1. Leave 2 in. ± 1/2 in. between tread units to aid full roof drainage and reduce ponding.
   2. Torch treads to roofing cap sheet. Alternatively, but only if approved by A/E OF RECORD and THE CITY, hot mop walkway treads in 25 lb/sq of SEBS-modified asphalt at a temperature (at point of application) of not less than 425 °F
   3. Fully seal edges of each walkway traffic tread, forming a watertight bevel, to minimize damage from rolling equipment traffic.

C. Install walkway pads or treads at ladder landings, all sides of rooftop equipment, and three sides of roof hatches and smoke vents. Install walkway pads wherever tools must be laid down to work on equipment or to climb over walls.

3.10 FIELD QUALITY CONTROL AND CORRECTION

A. The roofing membrane producer's technical representative (PTR) shall make a final inspection of the roofing system at end of Roof Assembly installation but before date of Substantial Completion. PTR shall issue a written report listing punch list items that are to be corrected by the roofing installer. Submit copies to GC, A/E OF RECORD and THE CITY. PTR shall monitor corrective work on all items and issue a report of satisfactory completion.

B. Correct deficiencies in or remove roofing system components that do not follow Construction Documents and producer's instructions. Repair or reinstall roofing work at time of Substantial Completion to a condition free of damage and deterioration, obedient to Special Warranty obligations.

3.11 PROTECTION AND CLEANING

A. Protect roofing system and surrounding areas from traffic, wear and damage during entire construction period.
   1. If any objects must be wheeled or dragged across roof, provide a 5/8 in. plywood traffic deck, set atop soft material such as 1/2 in. recover board

B. Do not let dirt or debris accumulate on roof. Clean adjacent surfaces using agents and procedures acceptable to GC and to installers of affected adjacent construction.

END OF SECTION

07600
FLASHING AND SHEET METAL

PART 1 GENERAL

1.01 SUMMARY

A. Related Sections:

1. 06100 - Carpentry.
2. 07900 - Joint Sealers.
3. Division 7 - Thermal and Moisture Protection.

1.02 REFERENCES AND CODES

A. Florida Building Code (FBC), including FBC - Roofing Application Standards (RAS), and FBC - Test Application Standards (TAS).

B. Uplift requirements based on the basic wind velocity pressures for the project according to American Society of Civil Engineers (ASCE) 7-98.

1. Comply with calculations, signed and sealed by a Florida registered professional engineer, establishing wind velocity pressure values for the specific project according to ASCE 7-98 using a wind speed of 146 mph, exposure category "C", and a wind load importance factor of 1.15.

C. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA): Architectural Sheet Metal Manual, latest edition.

D. American Society for Testing and Materials (ASTM):

1.	A167-96	Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
2.	A240/96a	Specification for Heat-resisting Chromium and Chromium-nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels.
3.	B32-96	Specification for Solder Metal.
4.	D4586-93	Specification for Asphalt Roof Cement, Asbestos-Free.

1.03 SUBMITTALS

A. Properly identified product data and descriptive literature before starting work.

B. Shop Drawings on flashing and sheet metal work.

1.04 QUALITY ASSURANCE

A. Regulatory Requirements: Flashing and sheet metal shall comply with requirements of SMACNA latest standards.

B. Coordinate application of flashings with application of roofing, protruding material, and roof accessories to provide a complete weathertight installation according to the

specified warranty requirements.

C. Pre-Roofing Conference: Attendance to the pre-roofing conference is required. Refer to the roofing sections.

1.05 WARRANTY

A. Furnish THE CITY a 20-year written warranty from manufacturer for repair and replacement.

B. Furnish THE CITY a 5-year written warranty covering applicator's quality of work for flashings with warranty of "Roofing System."

1. Warranty shall cover watertight integrity of flashings for 5 years, including repair and replacement of components or system deemed faulty or in disrepair by A/E OF RECORD OF RECORD during warranty period.
2. Such items deemed faulty or in disrepair shall be repaired at no cost to THE CITY.

C. Definition of faulty components or system in disrepair includes but is not limited to:

1. Defects in manufacture and installations.
2. Defects in materials.
3. Leaks of any kind.

PART 2 PRODUCTS

2.01 MATERIALS

A. Sheet Metal:

1. Type 302 or 304 stainless steel, 20 and 22 gage, complying with ASTM A167.
2. Flashing for Pipes, Conduits, and Round Equipment Supports: Type 304 stainless steel, 26 gage, 2B, complying with ASTM A240/A.
3. Solder: According to ASTM B32.
4. Fastening Devices: Fasteners shall be compatible with metal and roofing system. Use of powder activated fasteners is prohibited.

    a. For Attaching Sheet Metal to Wood with Concealed Fastenings: Hot dip galvanized ring shank roofing nails not less than 1-1/4" long.
    b. For Attaching Sheet Metal to Wood with Exposed Fastenings: No.10 x 1-1/4" pan head stainless steel sheet metal screws. Provide neoprene sealant washers and stainless-steel washers under screw heads.
    c. For Attaching Sheet Metal to Metal Walkway Covers: No.10 x 1/2" pan head stainless steel sheet metal screws. Provide neoprene sealant washers and stainless-steel washers under screw heads.
    d. For Attaching Sheet Metal to Masonry or Concrete: No.10 x 1-1/4" pan head Tap-Con zinc plated concrete tapping screws. Provide neoprene sealant washers and stainless-steel washers under screw heads.

5. Roofing Cement: Plastic roofing cement complying with the requirements of

ASTM D2822 or as appropriate and as recommended by roofing manufacturer.

6. SBS Flashing Cement: Roofing cement according to ASTM D4586.

B. Sanitary vents shall have vandalproof vent covers. Covers may be omitted at inaccessible or steep sloped roofs when accepted by THE CITY on a per condition basis

C. Vent Stack Flashing:

1. Stainless Steel Flashing for Vent Stacks, Extensions, and Caps by SBC Industries, North Miami, FL.

2. Vandalproof Vent Extension Caps and Flashing by Vent Extensions, Inc., Wellington, FL.

D. Splash Blocks: Approximately 2-foot x 1 foot - 6 inches x 1-1/2" thick reinforced concrete slabs with recess formed in top to deflect water away.

E. Roof Drain Flashing: 16 ounces 30 inches by 30 inches copper flashing.

2.02 FABRICATION

A. Fabricate flashing and sheet metal work according to accepted Shop Drawings.

B. Sanitary Vent Stack Flashings with Vandal Proof Caps:

1. Form tubular stainless steel flashing sleeve not less than 8 inches high with a diameter 1/2" larger than the vent stack:
2. Provide a 4-inch-wide flange soldered watertight.
3. Manufacturer's Option:

a. Provide a conical sealant cover, sloped outward and downward between 30 and 45 degrees from the horizontal plane with an inside diameter equal to the vent stack and an outside diameter 1 to 2 inches larger.

4. Provide a vandal proof vent stack cap. The annular space between the cap and vent or the flashing sleeve shall be not less than the cross area of the vent.
5. Manufacturer: SBC Industries or Vent Extensions, Inc.

C. Edge Drips:

1. Fabricate using sheet 22 gage stainless steel to detail indicated, in not over 10-foot sections.
2. Provide a continuous 20 gage stainless steel cleat with punched holes at 6 inches on center. If cleat extends 6 inches or more below top fastener, provide second row of punched holes at 12 inches on center.
3. Provide 4-inch roof flange, and extend bottom drip not less than 1 inch below bottom of wood or plywood roof sheathing, with kick to dispel water 3/4" from finish wall.
4. Comply with RAS 111 - Table 2.

D. Base Flashings at Metal Walkway Covers Abutting Concrete and Masonry:

1. Fabricate using sheet stainless steel to detail indicated, in not over 10-foot sections.
2. Provide 2-inch minimum upturned wall flange behind counterflashing.
3. Where flutes are parallel to abutting wall, provide horizontal roof flange extending 2 inches on nearest flat top on roof decking.
4. Where flutes abut wall, provide 2-inch roof flange.

E. Stucco Stop with Counterflashing (2-piece):

1. Fabricate in approximately 10-foot sections using sheet stainless steel to detail as indicated.
2. Provide receiver with 1-1/2" wall flange, 3/4" sloping stucco stop, 3/4" flange bend downward with 1/2" hem.
3. Shop punch wall flange at 12 inches on center for fastening.
4. Provide shop fabricated corner splices extending 4 inches each way.
5. Provide counterflashing with 1-1/2" 45-degree top flange with 1/4" kick back at top and a 4-inch bottom flange formed inward 3/4" towards wall with a hemmed 1/2" kick at bottom.
6. Provide 1-1/2" x 4" storm cleats.
7. Manufactured by SBC Industries or accepted equivalent.

F. Surface Mounted Flashing (1-piece):

1. Fabricate in approximately 10-foot sections using sheet stainless steel to detail as indicated.
2. Provide flashing with 1-1/2" wall flange with 1/4" kick at top to receive sealant, a 1/2" 135 degree sloping top flange and a 4-inch bottom flange formed inward 3/4" towards wall with a hemmed 1/2" kick at bottom.
3. Shop punch wall flange at 12 inches on center for fastening.
4. Provide shop fabricated corner splices extending 4 inches.
5. Manufactured by SBC industries or accepted equivalent.

G. Copings:

1. Fabricate in approximately 10-foot sections using sheet 22 gage stainless steel to detail as indicated.
2. Provide a continuous 20 gage stainless steel outer hold-down cleat with punched holes at 6 inches on center and face fasten at inward facing parapet components with removable fasteners as required for sheet metal.
3. Provide 8-inch-wide joint covers.
4. Manufactured by SBC Industries or accepted equivalent.
5. Comply with RAS 111 - Table 2.

H. Window Head Flashings:

1. Fabricate using sheet stainless steel to detail and dimension indicated.
2. Extend flashing 3 inches past window at each side.
3. Hem bottom drop edge.
4. Shop punch wall flange for fastenings.

I. Door Hoods:

1. Fabricate using sheet stainless steel with closed ends to detail dimensions indicated.
2. Lock seam top and side joints.
3. Form 1-1/2" minimum continuous wall flanges at sides and top.
4. Shop punch wall flanges at not over 6 inches on center for fastenings.
5. Form 1-1/2" minimum horizontal inward stiffener flanges with hemmed edges at top bottom of hood.
6. Lap bottom hood lips at corners, solder and secure with 2 stainless steel rivets each.

J. Pitch Pans: Not Used.

K. Flashings for Pipes, Conduits, and Round Equipment Supports Penetrating Roofing or Resting on Roofing:

1. Form tubular stainless steel base flashing sleeves not less than 8 inches high to fit pipe, conduit, and round equipment support and with 4-inch-wide roof flanges soldered watertight.
2. Form split tubular stainless-steel counterflashing to provide slip fit over base flashing, with 2-inch minimum loose edge lap, of 5-1/2" minimum height and with 4 inch lap over base flashings.
3. Provide a conical sealant cover, sloped outward and downward at 30 to 45 degrees from the horizontal plane with an inside diameter equal to the vent stack and an outside diameter 1 to 2 inches larger.
4. Manufacturer: SBC Industries or accepted equivalent.

L. Scuppers:

1. Fabricate using stainless steel with soldered seams to profiles and details shown.
2. Lock seam corners, solder watertight and hem outer exposed edges.
3. Provide 4-inch-wide minimum flanges formed to fit cants, decks and vertical wall surface.
4. Shop punch flanges for fastenings at 6 inches on center

    a. with a girth of up to 20", and 2" wide for girths exceeding 20".
    b. Attach to the face of the gutter, in addition to the building structure at the back of the gutter.

5. Provide spacer straps in gutters with a width of 5" or more, spaced at a maximum of 30" o.c., at locations staggered from the gutter brackets. Straps shall be stainless steel, a minimum of 1/16" thick (16 gauge) by 1" wide and fastened only the front and back of the gutter.
6. Provide conductor heads to collect water from the scuppers to discharge into the downspouts.

    a. Conductor heads shall be fabricated from stainless steel.
    b. The top of the conductor head shall be a minimum of 1" below and a

minimum of 2" wider than the scupper. Proportion as recommended in SMACNA Architectural Sheet Metal Manual.

7. Use ductile iron or Schedule 80 PVC plastic pipe instead of stainless steel downspouts within 9 feet of finish grade.

    a. The size of a downspout shall be constant throughout its length.
    b. At joints, the top portion shall fit into the lower.
    c. Provide stainless steel or other corrosion-resistant metal hangers.

M. Curb to Duct Flashing and Counter Flashing:

1. Fabricate from stainless steel to fit duct curbs and ducts projecting from curbs.
2. Provide 4-inch vertical flange to cover top edge of bituminous base flashings. Form flange bottom towards curb, with 1/4" bottom edge bent 1/4" out and hemmed.
3. At top of curbs bend metal 90 degrees and extend horizontally over to duct, then bend upward and extend vertically not less than 3 inches from top edge of flashing out 3/8" to receive sealant.
4. Provide for field soldered lap joints at corners and 1-inch lap joints at horizontal miter splices.

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 accepted Shop Drawings.

1. Lap, rivet, lock, or seal joints as field conditions require.
2. Provide necessary reinforcement, miscellaneous fittings, and accessories.

B. Apply flashing and sheet metal work including miscellaneous fittings and accessories to even, smooth, sound, thoroughly clean and dry surfaces that are free from defects that might affect application. Prime metal flanges that receive bitumen according to SFBC and manufacturer's requirements.

C. Perform soldering work slowly, with properly heated coppers to thoroughly heat seam material and sweat solder through full width of seam that shall show not less than 1 inch of evenly flowed solder.

1. Start soldering immediately after application of flux.
2. Solder flat locked seam.

D. Isolate dissimilar metals with accepted isolation paint or other accepted materials.

1. Do not place in contact with or in positions where drainage across such paint or

other materials will occur.

E. Make flashing and sheet metal work water and weathertight, with lines, arises and angles sharp and true and plane surfaces free from waves and buckles.

F. Provide sufficient fasteners and related hardware to insure a complete and weathertight system.

G. Flashing fasteners not covered by roofing membrane shall be removable.

H. Vent Stacks:

1. Slip stainless steel flashing over vent stack and set roof flanges in full bed of roofing cement.
2. Wrap backer rod of appropriate size around vent stack and insert it 3/8" below top of flashing.
3. Seal watertight at top edge with a one-part urethane sealant and tool to positive runoff.
4. Install conical sealant cover directly above sealant.
5. Install vandal-proof vent stack caps at all vent stacks unless otherwise indicated on drawings.

I. Edge Drips:

1. Install a continuous 20 gage stainless steel cleat.
2. Set 22 gage stainless steel edge drip roof flanges in full bed of roofing cement over completed roofing.
3. Lap splices 4 inches minimum and seal top horizontal surface laps with cold bitumen.
4. Stagger nails at 4-inch flange to roof deck at 4 inches on center
5. Cover roof flanges with 2 ply felt stripping set in full bed of roofing cement.
6. Locate drip bottom not less than 3/4" away from finished vertical surfaces

J. Base Flashings at Aluminum Walkway Covers Abutting Concrete and Masonry:

1. Set flashing tight against wall and with roof flange set on aluminum deck in bed of sealant.
2. Secure roof flanges to metal deck with No.10 x 1/2" stainless steel sheet metal screws at 6 inches on center maximum. Provide sealant washers and stainless-steel washers under screw heads.

K. Stucco Stop with Counterflashing (2- piece):

1. Set receiver on masonry and concrete walls where indicated.
2. Lap spices 4 inches minimum and seal laps with sealant.
3. Secure to wall with No.10 x 1-1/4" minimum Tap-Con screws 12 inches on center maximum.
4. Check for membrane/bitumen seal on top of felt flashing before counterflashing installation.
5. Attach storm cleats at 30 inches on center and with one cleat at each joint.
6. Insert counterflashing into receiver, and secure tightly with storm cleats.

L. Surface Mounted Flashing (1-piece):

1. Set on masonry and concrete walls over base flashing where indicated.
2. Lap splices 4 inches minimum and seal laps with sealant.
3. Secure to wall with No.10 x 1-1/4" Tap-Con pan head screws at 12 inches on center maximum. Provide neoprene sealant washers and stainless-steel washers.
4. Where corrugated metal wall occurs, place premolded neoprene filler strip on wall immediately above top of metal base flashing.

    a. Set filler strip in sealant and seal abutting edges of filler strip with sealant.
    b. Place counterflashing over filler strip set in sealant and secure flashing to metal wall through filler strip with No.10 x appropriate length stainless steel sheet metal screws at 6 inches on center maximum and centered on wall flutes.
    c. Provide sealant washers and stainless-steel washers under screw heads.

5. Check for membrane/bitumen seal on top of felt flashing before flashing installation.

M. Copings:

1. Secure outer hold-down cleat to wood block at 6 inches on center with ring shank roofing nails.
2. Install coping over cleat. Allow 1/8" space between each coping section.
3. Secure inside face of coping with removable grommet type fasteners.
4. Provide 1"/1' slope at coping to inner parapet wall.
5. Install joint covers in full bed of sealant.

N. Window Head Flashings:

1. Set wall flange in full bed of sealant over windows.
2. Secure to prefinished wall panels with No.10 x 3/4" pan head stainless steel sheet metal screws at 10 inches on center
3. Provide sealant washers and stainless-steel washers under screw heads.

O. Door Hoods:

1. Set hoods level over doors where required with wall flanges bedded in full bed of sealant.
2. Secure hood wall flanges to prefinished wall panels with No.10 x 3/4" stainless steel sheet metal screws at 6 inches on center
3. Provide sealant washers and stainless-steel washers under screw heads.

P. Provide pitch pans as approved by A/E OF RECORD OF RECORD.
1. Set pitch pan roof flange in a full bed of plastic roofing cement.
2. Cover pan flanges with 2 layers of roofing felt stripping set in solid coats of hot bitumen or roofing cement.
3. Fill pitch pan 1 inch deep with mixture of plastic roofing cement and Portland

cement and top out with hot asphalt bitumen or roofing cement.

a. Allow hot asphalt bitumen or roofing cement to fill to top edge of hem.
b. Do not nip top edge of hem to allow for drainage of water.
c. Use cold bitumen to cone from penetration to edge of pan to avoid standing water

Q. Provide sheet metal base and counterflashing at pipes, conduits and round equipment supports.

1. Mate shop fabricated half sections around pipe or conduit and solder vertical and horizontal seams watertight.
2. Set flashing roof flanges in full bed of roofing cement.
3. Cover flashing flanges with 2 layers of roofing felt stripping set in solid coats of hot bitumen or roofing cement.
4. Wrap pipe, conduit and round equipment support with 1 or more layers of 3/8" by 1-inch wide neoprene foam tape, with tight fitting butt joints.
5. Install counterflashing over base flashing and solder vertical seam.
6. Seal watertight at top edge with a one-part urethane sealant and tool for positive runoff.
7. After preliminary inspection, install conical sealant cover with sealant.

R. Installation of Curb to Duct Flashing and Counterflashing:

1. Install flashings after ducts through curbs are in place and after bituminous base flashings are completed.
2. Place flashings in place on curbs and solder corners and corner miter laps watertight.
3. Secure counterflashings to vertical edge of curb nailers with No.10 stainless steel sheet metal screws through sealant washers at not over 12 inches on center
4. Secure vertical upturned duct flashing to duct with No.10 stainless steel sheet metal screws through sealants washers at not over 6 inches on center
5. Seal joint between flashings and ducts with sealant as specified in Section 07920.

S. Installation of Scuppers:

1. Set scuppers in full bed of roofing cement over completed base flashing and roof membrane.
2. Secure to masonry walls and concrete decks with stainless sheet metal fasteners and anchors at 6 inches on center
3. Secure to wood nailers with stainless steel sheet metal screws at 6 inches on center.
4. Seal exterior wall at scupper perimeter.

T. Installation of Roof Drains:

1. Prime roof drain flanges before applying roof felts.
2. Set copper in full bed of cold bitumen over intermediate plies or cap sheet.
3. Strip copper cover with 2 layers of roofing felts in solid coats of hot bitumen.

END OF SECTION

07721
RA SUPPORTS FOR ROOFTOP EQUIPMENT

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

A. Coordinate Roof Assembly supports for rooftop equipment work with work before and after so that every item of roof-mounted equipment and associated piping and conduit is supplied with wind-resistant support. See especially:
   1. The lead section (roof membrane) for the entire Roof Assembly 07500
   2. Other Roof Assembly components such as insulation, roofing, steel blocking, sheet metal, hatches and smoke vents Div 07
   3. Exhaust fans 15821
   4. Air handling units 15855

1.2 DEFINITIONS, REFERENCES, AND OVERALL STANDARDS

1.3 QUALITY ASSURANCE

A. Single Source:
   1. For rooftop equipment fabricated without curbs: Provide rooftop equipment curbs from a single producer, as needed for each item.
   2. For rooftop equipment with integrally fabricated curbs: Each equipment producer of such items of equipment shall follow these specifications in fabricating curbs.

B. Wind Uplift, Toppling and Fastening Calculations. After the Contractor has submitted the specified list of and data for items of approved rooftop equipment, the A/E OF RECORD will provide wind resistance calculations for each unit of equipment-fastened-to-its-support.
   1. In addition to the name and data on the weights and basic dimensions of each item of rooftop equipment (as provided by Contractor), the A/E OF RECORD's calculations, following ASCE 7, will show the calculated uplift and toppling resistance of each item of equipment-fastened-to-its-support, including overturning forces on base flange attachments and overturning forces on restraint brackets, suitable for use in the Contractor's detailed design and fabrication of each support.

C. Installer's Qualifications. 5 years of successful experience in the installation of roof top equipment supports.

D. Pre-Installation Meeting. At least 6 weeks before installation of Roof Assembly, the Contractor shall conduct a meeting at the worksite with installers of each part of the Roof Assembly, A/E OF RECORD, AHJs, and THE CITY representatives.

1.4 SUBMITTALS

A. Special Warranties. Before making any other submittals, and at least 10 weeks before pre-installation meeting, submit and obtain approval of draft of (or form for) each specified Special Warranty.

B. General Product Data for the A/E OF RECORD's Calculations.

1. List of and Data for Approved Rooftop Equipment. Compile and submit to the A/E OF RECORD a list of approved rooftop equipment together with data stating the weight, dimensions, and elevation-above-grade of each item of rooftop equipment. Data shall be suitable for the A/E OF RECORD's calculating of the static and dynamic load that each support must bear, the uplift and toppling resistance of each item of equipment-fastened-to-its-support, and the base flange attachment and restraint bracket resistances.
2. Include in the list:
    a. Integral roof curbs that are permitted to be supplied with some rooftop equipment items, with data on each item of equipment so supported.
    b. Steel framed roof supports, with data on each item of equipment so supported.
3. Include basic data for each item in the list.
    a. Example, for a roof curb: Inside dimensions, wall thickness and R-value, height from structural roof to top of curb, weight and approximate size of each item of the roof-mounted equipment it supports, the method of tying-down to structure as needed to augment the tie-down value of curb, and the method of fastening both curb-to-deck and equipment-to-curb.
    b. Example, for a condensate line support: Material of support and pan, height, number of pipes it will support, method of fastening the pipe(s) to support.
4. Fastenings. Detail fastenings and hold-downs at each support and list the type and number of both support-to-deck and equipment-to-support fastenings. List the number of needed bolts and holes, their size and spacing.
5. Certification. Obtain approval of this submittal before ordering any rooftop equipment that has either an integral or loose curb.

C. Shop Drawings and Specific Product Data. Submit:
1. Drawings and data for items of rooftop equipment with their type of support and the overall wind uplift and toppling resistance of equipment-when-fastened-to-support as designed by the Contractor following calculations made by the A/E OF RECORD following ASCE 7.
    a. Attach calculations by Contractor's engineer as specified.
    b. Include calculations for equipment with integral roof curbs and steel framed equipment supports.
2. Details showing curb interface between structural deck and roofing. Show crickets and expansion joints and how they will be flashed.
    a. Show the fasteners in curbs needed to fasten to roof structure, and how steel cants and receivers for flashing are accommodated.
3. Note that curbs that are an integral part of rooftop equipment and that meet the requirements of this section should be supplied with that equipment. Make the dimensions and construction of those integral curbs a part of this submittal for all curbs on the roof. Obtain approval of this submittal before ordering any rooftop equipment that will have an integral curb.

D. Producers' Installation Instructions. Include detailed provisions for fastening curbs directly to each type of roof deck to resist wind forces.

1.5 SPECIAL WARRANTIES

A. By Membrane Producer. Provide a 20 year Special Warranty from the roof membrane producer covering correction of defects in the supports for rooftop equipment component of the Roof Assembly.

B. By Producer(s) of Support for Rooftop Equipment. Provide a 5-year Special Warranty in which the producer(s) of the rooftop equipment supports agree to correct defective supports.
   1. See 07500 for full list of requirements that shall be included in this Special Warranty (that will accompany the Roof Assembly Special Warranty).
   2. At the time of project closeout, submit this signed Special Warranty to the roof membrane producer, signed by each producer of rooftop equipment support, for transmittal to Contractor, A/E OF RECORD and THE CITY.

PART 2 PRODUCTS

2.1 ROOF EQUIPMENT CURBS (LOOSE)

A. Function and Design. Flashable, 4-sided, structural supports for rooftop-mounted mechanical equipment, bearing on the structural roof deck, with an open top and bottom to permit the passage of pipes, conduit and ducts through an opening in the roof deck, and to which rooftop equipment can be fastened
   1. Equipment bases: The term “curbs” includes open or compartmented equipment bases that are reinforced to handle heavier, vibrating loads.
   2. Provide loose curbs, as specified in this section, along with each item of equipment that does not have an integral curb.
   3. Integral curbs. See article that follows.

B. Description. All-steel, galvanized, all-welded construction, insulated, each unit custom fabricated to support the weight of equipment and wind uplift and toppling forces.
   1. Height of curbs. Fabricate to a total height that will place the bottom of the supported equipment at least 12 in. above the level of the roof membrane and its underlying insulation, including crickets.
   2. Cants: Do not fabricate integral cants as part of any loose curb. Steel cants for installation at the roof membrane level will be supplied and installed under 07600.
   3. Preparation for fastening: Provide fastener holes and reinforcement during fabrication after approval of shop drawings that show fastener sizes, locations and reinforcement adequate to resist design uplift loads and wind-toppling loads, calculated by a structural engineer registered in the State of Florida employed by the Contractor or the Contractor’s curb producer.
   4. Design at base: Provide flat, non-canted roof flanges 6 in. wide (not 4 in.) that have fastening holes and reinforcement capable of withstanding High Velocity Hurricane Zone (HVHZ) wind pressures acting on each item of equipment and its curb..
   5. Height increase for overhanging equipment: Increase freeboard distance of the curb above the roof membrane at least 1 in. for every 4 in. of equipment overhang to permit proper servicing and maintenance of equipment.
   6. Curb construction: Double steel walls, reinforced to support equipment weight, 2 in. (nominal) thick, filled with 2 in. of extruded foamed styrene or isocyanurate insulation producing an R-value of at least 10.0 (styrene) or 12.0 (isocyanurate). Make curb walls watertight.
   7. Wall thickness: For equipment weighing 1000 lb or more, provide 14 ga steel walls outside and inside, at top of curb, and at roof flange. For equipment weighing less than 1000 lb, thickness of curb skins may be reduced to 16 or18 ga as long as they are sufficient to support weight of equipment and toppling forces under 146 mph wind pressures from any direction.

a. Weld in steel reinforcements within the curb wall cavity as will aid in supporting equipment weight and in withstanding HVHZ wind uplift and toppling pressures.

8. Design at top: Provide14 ga or heavier galvanized and prime coated steel surface to which roof-mounted equipment can be fastened to withstand HVHZ wind pressures.
   a. Provide a level bearing surface – not parallel to roof deck slope.
   b. Use no wood, only steel, for fastening equipment to curb.
9. Galvanized steel; ASTM A653-04a, CS Type B, G60
10. Finish: Rust-inhibiting prime coat + TGIC polyester powder coat.

C. Product Producer. This specification is based on the properties and performance of one Basis of Design (BOD) product. Provide either the specified BOD product or submit a design approval request for a specific product from a specified TAE producer.
   1. BOD product / producer: Heavy Duty Roof Curb, by Nystrom.
   2. Other producers: Babcock-Davis, Bilco, Nystrom, O'Keeffe's.

2.2 CURBS THAT ARE INTEGRAL WITH ROOFTOP EQUIPMENT

A. The design and supplying of curbs that are fabricated as part of rooftop equipment is not included in the work of this section. Only the procedure for obtaining the A/E OF RECORD's calculating of wind uplift and toppling figures for equipment with integral curbs is specified here.
   1. It is the responsibility of the Contractor to ensure that the fabrication of integral equipment curbs is performed following the requirements of ASCE 7.

B. Design and Performance. Wood-free, equal to the height requirement specified and the structural performance specified in the loose Rooftop Equipment Curbs article above.
   1. The R-value requirement for the integral curb may be reduced to R = 8.0 if the A/E OF RECORD determines that the R-values specified in the Rooftop equipment curbs article above cannot be attained by the rooftop-mounted equipment producer.

C. Description. Integral curbs: Curbs and equipment bases that are fabricated as part of the item of equipment, without cants, for fastening to roof structure.
   1. Provide integral curbs, as described in this section, as an integral part of items of rooftop equipment in Div 15 that need support and access for pipes and conduit.

2.3 STEEL FRAMED EQUIPMENT SUPPORTS

A. The design and supplying of steel framed equipment supports is not included in the work of this section. Instead, only heights and clearances at the supports and the wind uplift and toppling resistance requirements for the equipment and its support are specified here.
   1. It is the responsibility of the Contractor to ensure that the fabrication of steel framed equipment supports (05590) is performed following the height, clearance, equipment weight, and wind uplift and toppling resistance requirements of this section.

B. Description. Open-sided structural steel frames of beams and flashable legs that support large units of equipment 18 in. clear (and higher) above the roof membrane and providing ample clearance below for service by related piping, ducts, conduit, and wiring.

2.4 ROOF PORTALS

A. Description. Curbs with a lid and clamped elastomeric opening that permit watertight passage of pipes and conduit to equipment on the roof. Flashed sheet metal hoods with seals for emerging pipe and conduit (07620) are preferred by THE CITY for this use.
   1. Where portals are approved by THE CITY for use in place of flashed sheet metal hoods, they shall be provided by the provider of the equipment that is served by the portals.

B. Product / Producer: Same as for loose roof curbs.

2.5 PIPING SUPPORTS

A. Description. Stainless steel supports, rectangular in plan, set on and fastened to roof structure (not the roof membrane), for one or more pipes or conduit, with no top-to-bottom opening, built much like a curb, the closed top surface of which supports a 2-leg adjustable channel rack (with clamps), securing pipes against wind pressures while permitting some thermal movement.
   1. Provide racks, as described in this section, in the types, sizes and quantity needed to support piping or conduit at least 16 in. above the roof membrane.

B. Product / Producer: Same as for loose roof curbs.

2.6 CONDENSATE SUPPORTS

A. Description. Concrete masonry units (CMU) without voids, atop roof membrane; for clamping up to 3 condensate pipes under 1-1/2 in: Set supports on SBS bases.
   1. Provide condensate supports, as described in this section, in the types, sizes and quantity needed to support pipes at least 2 in. above the roof membrane.
   2. SBS base. Sheet of walkway tread material, projecting at least 8 in. on each side of the CMU. Adhere support to base and adhere base to the roof membrane using a heavy coat of SBS modified bitumen.
   3. Clamps. Fasten stainless steel clamps to CMU with shielded s/s screws that will secure condensate pipes against wind pressures yet permit thermal movement.
   4. Condensate pipe supports are the only curbs or supports that are permitted to be set atop the roof membrane instead of being supported by the roof structure.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Check and prepare structural roof deck surfaces to receive rooftop equipment supports.
   1. Concrete condition: Dry, smooth, and free of shrinkage cracks, laitance, bond-breaking substances, loose material, pits, honeycomb, ridges and roughness.
   2. Metal condition: Clean and smooth. Coat dissimilar metals with bituminous paint.

B. Delivery, Storage and Weather. Deliver and store products in sealed protective packaging. Install products dry, in dry weather.

C. Do not start the installation of this work until conditions detrimental to its proper completion have been corrected.

3.2 INSTALLATION OF SUPPORTS FOR ROOFTOP EQUIPMENT.

A. Install supports following approved shop drawings and producers current published instructions, except as more stringently specified herein.
   1. Install supports to even, smooth, sound, thoroughly clean and dry surfaces of the building structure that are free from defects that might affect performance. Fasten to building structure, isolating dissimilar metals with isolation sheets or heavy isolation coatings. Exception: Condensate line supports may be placed over roof membrane.

B. Curb Flashing, and Counterflashing:
   1. Install sheet metal counterflashings after curbs, portals and their SRB cants are in place and after bituminous base flashings are complete.
   2. Set counterflashings in place. Solder corners and corner miter laps watertight.
   3. Fasten counterflashings to vertical edge of curbs with #10 stainless steel sheet metal screws through sealant washers at not over 12 in. oc
   4. Seal joints with sealant.

END OF SECTION

07840
FIRESTOPPING AND SMOKE SEALING

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

A. Coordinate firestopping, firesafing and smoke sealing with work before and after, especially fire-rated floor and wall construction and all the pipes, ducts, raceways, cable trays, and conductors that penetrate floors/ceilings and walls/partitions.
   1. GC shall make firestopping, firesafing and smoke sealing an agenda item at construction progress meetings to alert each subGC installing floors, ceilings, walls, partitions, piping, ducts, dampers, raceways, cable trays, busses and conductors to the need to stop passage of fire and smoke.
   2. GC shall make the proper routing and grouping of pipes, raceways and conductors by their installing subGCs an agenda item at construction progress meetings. Among other agreements made at these meetings, a cable tray routing plan shall result from this, and shall be promulgated by the GC.
   3. GC shall take particular care see that penetrations in gypsum THE CITY are not be sealed with joint cement, and that those in masonry (within 1 in. of the penetration) are not sealed with mortar.

1.2 DEFINITIONS

A. Firestopping: A tested, UL-listed, through-penetration fire-stopping and smoke sealing assembly as described in Florida Building Code 712, but that prevents the passage of smoke and air in addition to flame, hot gases, and water from a hose stream.
   1. The term “firestopping” will be used throughout this section to specify firestopping, smoke sealing and firesafing.
   2. Firestopping is used at pipes, ducts, raceways, conductors, cable trays, their supports, and other items that penetrate fire-rated walls and floors within the facility.
   3. The types of firestopping specified here are used (or, with the approval of the A/E, adapted for use) at all types of wall and floor material and construction in the Work.
   4. Non-destructive test: For purposes of field inspection and contract compliance the perceptible passage of air (at a pressure 0.01 in. WG) through the annular space between a penetrating item and the surrounding construction shall be deemed evidence that the annular space permits the passage of smoke, as well as flame, hot gases, and water from a firehose stream.

B. Firesafing: The treating of joints in floors and walls as described in FBC 713 Fire-Resistant Joint Systems. Firesafing is included in the firestopping work specified here.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM). Test Methods for:
   1. E119-00 Fire Tests of Building Construction and Materials.
   2. E814-02 Fire Tests of Through-Penetration Fire Stops.
   3. E1966-01 Fire Resistive Joint systems.

B. Underwriters Laboratories, Inc. (UL). Fire Resistance Directory, 2006:
   1. XHBN Joint Systems. (firestopping and firesafing).

2. XHEZ Through-Penetration Firestop Systems.
3. XHHW Fill, Void or Cavity Materials (firestopping and firesafing).
4. XHJI Firestop Devices.

1.4 QUALITY ASSURANCE

A. Firestopping Producer Qualifications.
   1. Each firestopping producer shall have at least 5 years experience in producing UL-listed firestopping assemblies of the type and function specified in this section.

B. Firestopping Installer Qualifications.
   1. The installing firm and lead installing mechanic shall have least 5 years experience in at least half of the types of firestopping (including that are specified in this section.
   2. The installing firm shall be approved in writing by the proposed firestopping producer.

C. Single Source:
   1. One supplier and installer of firestopping (including firesafing) work shall perform all firestopping work in connection with structural, finish, kitchen, elevator, plumbing, fire suppression, HVAC, telecommunication and electrical installation in the Work.
   2. Except for a firestopping function that cannot be provided by the approved firestopping producer, use the products of one producer for all firestopping.

1.5 SUBMITTALS

A. Product Data. List and description of each assembly and component product, with UL numbers and statement of prior successful use by installer (installing firm).
   1. Because the GC's installer will be selecting one of several specified assemblies or components from UL-listed products specified in PART 2, THE CITY requires that the firestopping installer have successful experience with each firestop product submitted.
   2. Provide a statement from the installer of prior successful use, stating if each proposed product has performed well or poorly during the 1st year after substantial completion on its 2 most recent projects comparable to this one. Poor performance includes such defects as:
      a. Not maintaining shape, adhesion or cohesion in the local environment,
      b. Signs of decay, degradation or crumbling in the local environment,
      c. Shrinking away from the penetrating item or from the fire-rated wall / floor in which the penetration is located, to the point that smoke can pass through.

B. Shop Drawings.
   1. A copy of the GC's cable tray and grouped-raceways routing diagram agreed to by all subcontractors whose raceways and wiring have been grouped to minimize the number of penetrations in walls and floors.
   2. Detail of firestopping / smoke sealing of ducts on both sides of fire dampers so that the gaps between framing angles and ducts, when firestopped using products specified herein, will not allow expansive firestopping to compress or crush the duct, thus inhibiting damper blade operation.

C. Producer's Installation Instructions. Provide for each proposed assembly or component.

D. Report of specified field quality control visit and punchlist, followed by confirmation that punchlist corrections have been made.

PART 2 PRODUCTS

2.1 FIRESTOPPING AND FIRESAFING

A. Description. Assemblies and components shall not:
   1. Degrade in water or in moist Florida atmosphere within 20 years.
   2. Require hazardous waste disposal.
   3. Contain lead, PCBs, ethylene glycol, or solvents.
   4. Employ a sodium silicate expansion agent; use graphite expansion agent instead.

B. Standards.
   1. Through-penetration firestopping: ASTM E814; also, UL-listed under XHEZ or XHHW
   2. Firesafing ASTM E1966; also, UL-listed under XHJI, XHBN or XHHW.

C. UL-Listed Assembly Product Lines. As approved for all of the producer's assemblies that perform each firestopping function specified in 2.2 and 2.3 following.
   1. Hilti.
   2. PFPP / JM.
   3. STI (Specified Technologies Inc.).
   4. 3M Fire Protection Products.
   5. Tremco.
   6. W.R. Grace
   7. Lines equal in quality and performance, as approved after review by A/E and THE CITY.

D. UL-Listed Accessory Producers: From the following list, as tested with and approved for use in assemblies specified in 2.2 and 2.3 following:
   1. CIA (Construction Industry Associates)
   2. Delta Mineral Wool Safing (Rockwool)
   3. IIG MinWool / Casilite-JM
   4. Unique Firestop Products (re-enterable cabling sleeves)
   5. Lines equal in quality and performance, as approved after review by A/E and THE CITY.

2.2 SCHEDULE OF FIRESTOPPING ASSEMBLIES

A. Firestop and Smoke Barrier Calk.
   1. Hilti FS 601 Sealant, FS 604 Sealant, FS-ONE.
   2. PFPP / JM 4800 DW, 3600 EX, 4100 SL, 5100 SP.
   3. 3M CP 25 Fire Barrier Caulk, Firedam 150+.
   4. Tremco IA, Fyre Sil, or acrylic.
   5. WR Grace Flamesafe FS900+, FS1900, or FS 4000.
   6. CIA Fire Barrier, Intumescent

B. Firestop and Smoke Barrier Wrap/Strip.
   1. PFPP / JM WS1 Wrap Strip.
   2. STI Spec Seal Wrap/Strip.
   3. 3M FS-195 Wrap/Strip.
   4. Tremco: Intumescent Wrap Strip.
   5. WR Grace Flamesafe FSWS Wrapstrip

C. Trowelable Firestop and Smoke Barrier Mortar.

1. Hilti FS 635.
2. STI Spec Seal mortar.
3. Tremco Tremstop Fire Mortar
4. WR Grace Flamesafe Mortar

D. Fire Prevention Pillows.
1. Hilti: FS 657 Fire Block.
2. PFPP / JM Pillow
3. STI: Spec Seal.
4. Tremco: Tremstop.
5. WR Grace Flamesafe FS Bags or Pillows

E. Firestop and Smoke Barrier Spray.
1. PFPP / JM 5100SP
2. 3M Fire Dam Spray.
3. WR.Grace Flamesafe FS3000 Elastomeric Spray

F. Firestop and Smoke Barrier Sleeves.
1. STI EZ-Path.
2. WR.Grace Flamesafe FSIS Intumescent Sleeve.
3. Unique Firestop Sleeves

G. Prefabricated Firestop and Smoke Barrier Restricting Collars: Provide with galvanized steel or stainless steel hose clamps.
1. Hilti CP 642.
2. PFPP / JM: PPC Pipe Collar
3. STI Spec Seal plastic pipe collars.
4. 3M PPD.
5. Tremco Tremstop D Firestop Collars.
6. WR Grace Flamesafe FSD Devices
7. CIA Fire Can Collar

H. Cast-in-Place Firestop and Smoke Barrier Devices:
1. 3M: CID Cast-In Device
2. Tremco: Fyre Can CIP Device
3. CIA: Fire Can Device, Combo Firestop Device
4. Proset:: Cast-in-Place Firestop Devices

2.3 SCHEDULE OF FIRESAFING ASSEMBLIES

A. Firesafing Insulation:
1. USG Thermafiber Safing Insulation.
2. IIG MinWool.
3. Delta Safing Rockwool.

B. Fire Barrier Composite Sheet.
1. 3M: Composite sheet CS-195
2. Nelson: Composite Sheet

C. Fastenings and Supports for Firestops and Firesafing.

1. Hole plates: 26 ga or heavier galvanized steel, 18 ga or heavier if over fluted steel deck.
2. Z-clips: 1 in. x 30 ga galvanized sheet steel, to support packing material at floor gaps and penetrations.
3. Hat-shaped support hangers: 10 ga galvanized steel, to support damming and packing material at floor penetrations.
4. Hardware cloth: 2 x 2 in. x 19 ga galvanized wire.
5. Adhesive: Waterproof, VOC-free adhesive with flame spread rating of <25.

PART 3 EXECUTION

3.1 PREPARATION

A. Concrete, masonry, steel and gypsum THE CITY surfaces shall be smooth, clean, and free of loose debris, holes, and projections.

B. Obtain, follow and cooperate with the routing and grouping of pipes, raceways and conductors in this Work.

3.2 INSTALLING FIRESAFING AND FIRESTOPPING / SMOKE SEALING

A. Apply firestop (including firesafing) insulation, fire and smoke barrier calk, and fire and smoke barrier wrap strips/collars following producer's published installation details, directions, UL classified fire test data, and as shown or specified.

B. Follow agreements made by installing subGCs for floors, ceilings, walls, partitions, piping, ducts, dampers, raceway, cable trays, busses and conductors, as developed and coordinated by GC, to group pipes and conductors to minimize the number of penetrations in walls and floors.

3.3 FIRESAFING INSTALLATION

A. Gaps at Floor and Roof Edges Abutting Exterior Walls:
   1. Install specified firesafing insulation continuously, following producer's directions, at each floor level above the first floor and at the roof, between the back of the wall construction, beams and columns and in a depth.
   2. Install firesafing insulation across exterior faces of columns at each floor level above first floor, including roof, before the erection of the walls. Fasten firesafing in place across columns with specified adhesive and with impaling clips at each side of each column.
   3. Fasten firesafing insulation to exterior faces of slab edges and beams with impaling clips 24 in. oc and with specified adhesive.
   4. Provide firesafing insulation in thicknesses needed to securely compress it in place in each joint.
   5. Where gap is less than 2 in., bend clips slightly upward.
   6. Where gap is less than 1 in., apply adhesive to sides of joint and tightly pack firesafing into joint.
   7. Recess top surface of firesafing, following producer's directions, to the depth stated in UL-test in order to receive fire and smoke barrier calk that will provide the 1, 2 or 3 hr fire resistance required on Drawings.

8. Apply specified fire and smoke barrier calk, following UL system description, to a uniform depth over horizontal surfaces of firesafing at each floor level above the first floor. Smooth surface of calk at areas exposed to view.

B. Floor and Roof Expansion Joints:
   1. Provide firesafing metal clips as needed and as required by UL-tested system.
   2. Install specified firesafing insulation, following producer's directions, to the depth required by UL. Tightly pack in each suspended floor and roof expansion joint, being sure that grain of firesafing batt material is correctly oriented following firestop producer's instructions to provide the 1, 2 or 3 hr fire resistance required on Drawings.
   3. Apply fire and smoke barrier calk, following UL system description, to a uniform depth over horizontal surfaces of firesafing at each floor level above the first floor except at roof expansion joints. Smooth surface of calk at areas exposed to view.

C. Gaps at Tops of Non-Load Bearing Masonry Fire Walls
   1. Ensure the installation of solid CMU course to within 5/8 in. of structural soffit to provide needed gap for installing firesafing insulation.
   2. Pack space between top of CMU and underside of overhead structure or soffit with specified firesafing insulation.
   3. Recess insulation on each side of wall in order to receive and support the 1/2 to 1 in. depth of fire and smoke barrier calk/spray instructed by UL and producer to provide the 1, 2 or 3 hr fire resistance required on Drawings.
   4. Install the specified fire and smoke barrier calk or putty In that recess. Smooth the surface of the calk, making it flush with visible wall surfaces.

3.4 FIRESTOPPING INSTALLATION

A. Floor and Fire Wall Penetrations - such as metal pipe, raceways, conductors, and the perimeters of HVAC ducts:
   1. Where gaps between pipes, raceways, conductors, and ducts are 1/4 in. or less, seal gaps with specified fire and smoke barrier calk and other firestop products.
   2. Where gaps between pipes, raceways, conductors, and ducts are more than 1/4 in.:
      a. Pack the space between opening and pipe, raceway, conductor or duct with the specified firesafing insulation following UL and firestopping producer requirements. The depth of the insulation shall be as needed to provide the 1, 2 or 3 hr fire resistance required on Drawings.
      b. Install specified fire and smoke barrier calk at uniform depth, usually 1/2 to 1 in., over the supporting firesafing insulation. Smooth the surface of the calk to make it flush with visible wall surfaces.
      c. Option: In place of specified fire and smoke barrier calk, provide fire and smoke barrier firestopping wrap strips or collars, fastened in place and covered with the specified fire and smoke barrier calk following UL- and producer requirements.

B. Floor and Fire Wall Penetrations - such as plastic pipe, raceways, and cables.
   1. Where plastic pipes and plastic raceways penetrate floors and walls, provide prefabricated fire barrier collars with fire and smoke barrier calk on both sides of wall and at underside of floor. Collars and calk shall provide the UL- and producer-required depth of fire and smoke barrier calk or spray for the 1, 2 or 3 hr fire resistance required by Drawings.

a. Provide firestop collars fastened to each side of wall at fire wall penetrations and to underside of floor for floor penetrations following UL and producer requirements.
b. Seal firestop collars at wall and floor with a 1/4 in. bead of the specified fire and smoke barrier calk.
c. Where annular space between plastic pipes, plastic raceways, cables and floor openings is more than 1/4 in. and where the firestop collar does not cover this annular space, cover it with a specified hole-plate between the firestop collar and the underside of the floor.
d. Fasten hole-plates to floor following UL and firestop producer requirements.

2. Grout the entire annular space around pipes that penetrate concrete floors from top of floor to bottom, leaving elevated steel rim to restrain water. Insulated electrical and telecommunication cable penetrations through fire walls:
   a. Provide galvanized steel pipe sleeves equivalent to EMT, sized to allow annular space of not less than 3/4 in. around cable. Extend the pipe sleeve 3 in. beyond wall on each side. Tightly fit the pipe sleeves to the wall.
      1) In masonry walls, grout the sleeves in solid.
      2) At gypsum THE CITY, fill the openings solidly with firecalk, not wallboard joint cement.
   b. Fill the space around cable to within 1 in. of the end of the pipe sleeve using firesafing insulation.
   c. Provide firestop calk at both ends of the sleeve following UL and firestop producer requirements.
   d. Do not permit any conductor to penetrate a partition without a grouted sleeve and firestopping around the conductor.

C. Floor and Fire Wall Penetrations, such as bus ducts and cable trays.
   1. Where cable trays and bus ducts penetrate floors and fire walls, install firestops and firesafing following UL and producer requirements as needed for each condition to provide the 1, 2 or 3 hr fire resistance required on Drawings
   2. Where "packing material" is shown on the producer's details, only specified firesafing mineral wool shall be used – not fiberglass. The depth of the packing material shall follow UL and firestopping producer requirements.
   3. Where cable trays penetrate floors and fire walls, provide a “re-enterable” fire prevention pillow assembly placed inside the opening in a staggered brick style along with other firestopping materials required by UL and the firestopping producer.
   4. Provide firestopping / smoke sealing of ducts on both sides of fire dampers in such a way that the gaps between framing angles and ducts, when firestopped using the specified products, will not allow expansive firestopping to compress or crush the duct, thus inhibiting damper blade operation.

3.5 FIELD QUALITY CONTROL

A. Before covering joints and penetrations in walls and floors (as with ceiling panels, gypsum THE CITY ceilings, or flooring materials) the firestopping installer, GC, A/E and THE CITY representative shall tour the project to observe the work completed to date for completeness and conformity to Construction Documents and UL requirements.

B. So as not to delay the work of finishes and delays caused by repeated uncovering of the Work, the GC shall make a firestopping punchlist of incomplete, non-complying and defective items of firestopping work as a guide to prompt completion and correction.

C. Promptly complete and correct items of unfinished and defective firestopping work. Submit report of each item on punchlist as completed, corrected, or when.

3.6 PROTECTION

A. Protect finished firestopping from water and punctures.

END OF SECTION

07900
JOINT SEALERS

PART 1 GENERAL

1.1 SUMMARY

A. System Description: Joint sealers, fillers, and other related materials compatible with one another, with joint substrate, and other adjacent materials including finishes.

1.2 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.
3. Kitchen areas to prevent open holes and crevices that could admit vermin.

1.3 QUALITY ASSURANCE

A. Provide single source responsibility for each type of joint materials.

1.4 WARRANTY

A. Manufacturer shall provide warranties covering joint sealers for 10 years from date of Substantial Completion.

B. Contractor shall furnish the City of Miami a 2-year written warranty, from date of Substantial Completion, covering quality of construction from applicator.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Joint Sealers:

1. Bostick a Division of Arkema.
2. Pecora Corp.
3. Sika Chemical Corp.
4. Sonneborn Building Products.
5. Thoro Systems Products.
6. Tremco Manufacturing Co.
7. W.R. Meadows, Inc.

END OF SECTION

08110
STEEL DOORS AND FRAMES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Steel doors and frames including necessary accessories.

B. Section Does Not Include: Use of aluminum doors.

C. Related Sections:

1. 04221 - Concrete Unit Masonry.
2. 04530 - Masonry Patchwork.
3. 06100 - Carpentry.
4. 07900 - Joint Sealers.
5. 08710 - Door Hardware.
6. 09200 - Metal Studs, Lath, Suspension Ceiling, Plaster, and Stucco.
7. 09900 - Painting of Unpainted Surfaces.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM), latest edition:

1. A653 Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
2. A924 Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
3. C270 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.
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), latest edition:
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 Department of Education, Office of Educational Facilities - State Requirements for Educational Facilities - 1999 (SREF).

I. Florida Building Code (FBC).

J. Americans with Disabilities Act and Accessibility Guidelines (ADA).

K. American National Standards Institute (ANSI), latest edition:

1. A250.4 Test Procedure and acceptance criteria for physical endurance, steel doors and frames.
2. A224.1 Test Procedure and acceptance criteria for prime painted steel surfaces for steel doors and frames.
3. All7.1 Accessible and Usable Buildings and Facilities.

L. Warnock Hersey International (WHI), Division of Inchcape Testing Services.

1.3 SUBMITTALS

A. Exterior Door Certification: Miami-Dade County Notice of Acceptance (NOA) or State of Florida Product Approval. Provide calculations signed and sealed by a Florida registered Professional Engineer demonstrating compliance with FBC and ASCE 7 missile impact requirements.

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 by A/E.
2. Provide shop drawings for louver kits and light kits.

D. 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.

1.4 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. The City of Miami reserves the right to cut open, at no cost to THE CITY, a random door to verify construction and reinforcements for compliance with the City of Miami previously accepted manufacturer′s shop drawings. Non-Compliance will be grounds for removal and replacement of installed door at no expense to THE CITY.

1.5 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.

1.6 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.

1.7 DEFINITIONS

A. Areas subject to wet mopping include kitchens, dining rooms, toilets, locker/showers, custodial, and other similar spaces with hard or resilient flooring.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Steel Doors and Frames: Steel doors referenced below are “stock” models which shall be modified by appropriate manufacturer as may be necessary to meet all the requirements stated in this document.

1. Model MS Medallion by Ceco Door Products, Carol Stream, IL.
2. Model 747by Curries Company, Mason City, IA.
3. Model “H” Series by Flemming.
4. Model F-16 by Quality Engineered Products Co., Inc., Tampa, FL.
5. Model “B” Series by Steelcraft, Cincinnati, OH.
6. Model DE416by Republic Builders Products, Pembroke Park, FL.

2.2 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, SREF, 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 Preparation: Refer to the Drawings and the City of Miami Design Criteria Appendix.

2.3 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: Refer to the Drawings and the City of Miami Design Criteria Appendix.
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 THE CITY 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 the City of Miami accepted 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 Preparation: Refer to 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. Security Grilles:

1. Able to withstand a 200-pound force applied to any point from any direction and reject a 1/2" diameter sphere.
2. 16 gage, powder coat finish, A60 galvanized steel, with 50 percent minimum open area.
3. Manufacturers:

a. Crime Shield Barriers by Exeter, Wyoming, PA.
b. Security Barrier Screens by Phoenix, Lawrenceville, GA.
c. Securiperf Security Screens by Security Sales Company, Miami, FL.

M. Security Grilles - Missile Impact Resistant:

1. Certified missile impact resistant.
2. 14 gage, powder coat finish, A40 galvannealed steel, with 50 percent minimum open area.
3. Manufacturers:

a. Storm Shield Barriers by Exeter, Wyoming, PA.
b. SureGuard Hurricane Barriers by Phoenix, Lawrenceville, GA.

N. 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.

O. 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.

P. 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.

Q. Slip-on Spats: 20 ga., #4 satin finish.

R. 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.

S. 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.

2.4 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

3.1 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.

3.2 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.

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.

3.3 ADJUST AND CLEAN

1. 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.
2. Protection Removal: Immediately before final inspection, remove protective plastic wrappings from prefinished doors.
3. Fill all dents, holes, etc. with metal filler and sand smooth flush with adjacent surfaces-paint to match.
4. 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:
5. Door Contact with Silencers: Doors shall strike a minimum of two silencers without binding lock or latch bolts in the strike plate.
6. Head, Strike, and Hinge Jamb Margin: 1/8".
7. Meeting Edge Clearance, Pairs of Doors: ± 1/16".
8. Bolts and Screws: Leave tight and firmly seated.
9. Soundseal gasketing.
10. Vermin Protection:

    a. Drop Seal: Full contact with no gaps.
    b. Brush weatherstripping.

END OF SECTION

08331
OVERHEAD ROLLING DOORS

PART 1 GENERAL

1.01 SUMMARY

A. Related Sections:

1. 05500 - Metal Fabrications.
2. 07900 - Joint Sealers.
3. 09900 - Painting.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. A653/A-96 Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
2. A924/A-96a Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

B. Florida Department of Education, Office of Educational Facilities - State Requirements for Educational Facilities - 1999 (SREF).

C. Florida Building Code (FBC).

1.03 SUBMITTALS

A. Submit properly identified manufacturer's literature including specifications, installation details, and the following data before starting work.

1. Shop Drawings: Indicate size, construction details, gages, finish, installation details, anchorage, and hardware location.
2. Certification: Miami-Dade County product approval demonstrating compliance with FBC missile impact criteria.

a. 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) 7-98 using a wind speed of 146 mph, exposure category "C", and a wind load importance factor of 1.15.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Overhead Coiling Doors:

1. Model S21-PS by Atlas Door, Orlando, FL.
2. Series S-10 by Best Rolling Doors, Hialeah-Gardens, FL.
3. Model F-H-S by Kinnear Division of Wayne Dalton, Wayne Dalton, OH.
4. Series 610 by Overhead Door, Dallas, TX.
5. Model SSD-FF by Raynor, Dixon, IL.

2.02 FABRICATION

A. Galvanizing: Hot-dip zinc coated sheet steel according to ASTM A924, G90 or ASTM A653, 1.25 oz. zinc per sq.ft.

B. Operation:

1. Chain hoist operation, maximum 35 lb. pull on hand chain.
2. Manufacturer's Option:

a. Momentary switch with safety edge for automatic stop and change of direction.
b. Constant pressure switch.

C. Curtain: Flat slat, 20-gauge galvanized steel minimum.

D. Locking: Provide means for padlocking. Padlock is NIC.

2.03 FINISHES:

A. Factory primed with baked-on enamel or polyester top coat. Color selection by A/E.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install according to manufacturer's installation instructions and with accepted shop drawings.

B. Install accurately, without warpage, true to line, plumb and level.

END OF SECTION

08350
ACCORDION FOLDING DOORS

PART 1 GENERAL

1.01 SUMMARY

A. Related Sections:

1. 04220 - Concrete Unit Masonry.
2. 05500 - Metal Fabrications.
3. 06100 - Carpentry.
4. 09200 -Metal Studs, Lath, Suspension Ceiling, Plaster, and Stucco.
5. 09900 - Painting.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. E84-96a Test Method for surface Burning Characteristics of Building Materials.
2. E90-96 Test Method for Laboratory measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
3. E557-93 Practice for Architectural Application and Installation of Operable Partitions.

1.03 SUBMITTALS

A. Submit properly identified manufacturer's literature and technical data including catalog cuts, materials specifications, and other data as may be required before starting work.

B. Shop Drawings: Submit shop drawings for review, showing details of construction, methods of installation, head track installation, bracing details, materials, fastenings, finishes, and other required details.

C. Samples: Submit samples of track, hanger assemblies, and wood core with wood grain embossed vinyl film finish or laminated covers.

1.04 QUALITY ASSURANCE

A. Manufacturer: Provide each folding door and partition assembly as complete unit by 1 manufacturer including necessary hardware, fittings, accessories, and anchorages.

B. Special Requirements:

1. Sound Transmission Class (STC): Provide folding partition units capable of achieving STC ratings as specified when tested according to ANSI/ASTM E90.
2. Flame Spread Rating: Use only facing materials that have maximum 25 flame spread rating when tested to ANSI/ASTM E84.

1.05 WARRANTY

A. Pre-Installation Guarantee:

1. Repair or replace with identical door delivered to project site.
2. Replacement: Identical door shall be of the same type, model number, finishing, and installation requirements as originally supplied by manufacturer.
3. Store and handle doors during pre-installation to not void manufacturer's guarantee.

B. Post-Installation Guarantee: Remove and rehang doors, accessories or assemblies that become defective after installation.

C. Guarantee Period: 3 years against defects in material or installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Accordion Folding Doors (STC 40):

1. Model 213 by Kwik Wall, Springfield, IL.
2. Soundmaster 12 by Modernfold, New Castle, IN.
3. Series 4000 by Hufcor, Janesville, WI.
4. Fabricwal by Panelfold, Miami, FL.
5. Series 4000 by Moderco, Kansas City, KS.

2.02 FABRICATION

A. Steel, accordion-type partition system, suspended from track at head without floor track or guides.

1. Furnish partition system assembled complete with head and jamb mold to conceal track and provide jamb closure.

B. Track and Hangers:

1. Track: 1-inch x 1 inch, minimum 20 gage steel with corrosion resistant coating, or heavy-duty extruded aluminum.
2. Hanger Assemblies and Bearings: Nylon construction or ball bearing wheels.

a. Install hangers on alternate panels.

C. Laminated Covers:

1. Laminated impact resistant vinyl covers attached to galvanized pantographs.
2. Color and Pattern of Vinyl: As selected by A/E from manufacturer's standard selection.

D. Perimeter seals shall consist of 2 sets of 3-ply sweep strips provided at top and bottom

of the partition. Lead post shall seal into foam lined extruded aluminum molding on the jamb of the opening or on the meeting lead post of a pair of partitions. Back post shall be secured and sound sealed against a 16-gage steel jamb channel with foam sealing strip. Back post shall contain concealed jamb lock mechanism for securing to the jamb channel.

E. Hardware:

1. Plate metal parts with suitable corrosion-resistant coating.
2. Spring Hinges: 0.024" hard-drawn, high-carbon spring wire, galvanized before drawing, and shall be 5/32" in diameter.
3. Furnish doors complete with necessary installation hardware including double end posts.

F. Operation: Assembly shall be manual under 12'-0" in length and electric over 12'-1" in length.

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 folding door by manufacturer's authorized installer according to accepted shop drawings and adjust for smooth operation.

B. Drill and tap as necessary and securely anchor track and accessories in accurate location.

C. Install track in lengths as long as practicable, with flush, hairline joints.

D. Adjust units as necessary to assure smooth, quiet operation without warping or binding.

E. Check and readjust operating hardware so that latches engage accurately and positively without forcing and binding.

F. Standard Clearances: Install units not acoustically rated to meet following:

1. Floor: Maximum 1/4" to 5/8" above floor finish.
2. Vertical Joints: Flush, light-tight.

G. Install units so seals are in contact with entire perimeter when units are in closed position, forming light-tight barrier and according to ASTM E557.

END OF SECTION

08520
ALUMINUM WINDOWS

PART 1 GENERAL

1.01 SUMMARY

A. Related Sections:

1. 03300 - Cast-In-Place Concrete
2. 07200 - Joint Sealers.
3. 08800 - Glass and Glazing.

1.02 REFERENCES

A. AAMA/NWWDA 101-97 Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors.

B. American Society for Testing and Materials (ASTM):

1.	A123-89a	Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
2.	C509-94	Specification for Elastomeric Cellular Preformed Gasket and Sealing Material.
3.	D2000-96	Classification System for Rubber Products in Automotive Applications
4.	E283-91	Test Method for determining the Rate of Air Leakage Through Exterior Windows, Curtain walls, and Doors Under Specified Pressure Differences Across the Specimen.
5.	E330-96	Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors By Uniform Static Air Pressure Difference.
6.	E331-96	Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

C. Florida Building Code (FBC).

1.03 DEFINITIONS

A. Exposed: Any fasteners, anchors, clips, accessories, sealants, etc., visible on the exterior or interior side of a window when in the maximum open position.

1.04 SUBMITTALS

A. Product Data: Manufacturer's specifications and catalog cuts.

B. Shop Drawings:

1. Indicate elevations, locations, markings, quantities, materials, jamb conditions,

metal thicknesses, sizes, shapes, dimensions, and finishes.
2. Indicate locations for installing frames.
3. Indicate methods of assembling, connecting, anchoring, fastening, and bracing.
4. Indicate types, material, finishes, sizes, and locations of hardware.
5. Indicate operable and fixed panels of each window unit.
6. Identify each type of mullion and anchorage system.

C. Missile Impact Certification:

1. Miami-Dade County product approval demonstrating compliance with FBC missile impact criteria for window type, size, and configuration.
2. 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) 7-98 using a wind speed of 146 mph, exposure category "C", and a wind load importance factor of 1.15.

D. Calculations/Test Results/Details:

1. Pressure test results accepted nationally recognized independent laboratory for supplied window units.
2. Installation details, signed and sealed by a Florida registered professional engineer, with anchorage system noted and specified to comply with ASCE 7-98.

E. Samples:

1. Aluminum and color finish
2. Sealants: Manufacturer color chart.

1.05 SYSTEM DESCRIPTION

A. Performance Requirements: Fabricate units to comply with:

1. Design Wind Velocity Pressures: According to ASCE 7-98.
2. Requirements of testing and certification by AAMA/NWWDA 101 for commercial or higher rated windows complying with AAMA/NWWDA 101, Table 2.1 Gateway Performance listed values as determined by ASCE 7-98.

1.06 QUALITY ASSURANCE

A. Notify inspector within 24-hours after completion of windows to arrange for inspection.

B. Do not conceal anchors and connections until inspection is complete.

C. Exposed fasteners, when the window is in a closed or opened position, shall be tamperproof.

D. Means of egress shall comply with the requirements of SREF without compromising

the aesthetics of the windows.

1. Designated egress windows shall comply with handicap accessibility requirements, opening from the inside with one 5 pound movement, without tools. Screens or louvers of egress windows shall open with the same one movement opening of the egress window.

E. Coordination of Fabrication:

1. Check actual window openings in construction work by accurate field measurement before fabrication. Show recorded measurements on final shop drawings.
2. Coordinate fabrication schedule with construction progress as directed by Contractor to avoid delay of work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver packaged materials in manufacturer's original, unopened, labeled containers.

B. Store items to prevent damage to materials or structure and in approximate order of use to avoid excessive rehandling.

C. Repair damaged materials and replace materials that cannot be repaired to original condition. Replace warped materials.

D. Protect exposed surfaces of metal with removable covering to prevent damage to finish. Protect metal while adjacent painting and caulking are being performed.

1.08 WARRANTY

A. Submit written warranty, signed jointly by manufacturer, installer, and Contractor, agreeing to replace aluminum window units that fail in materials or installations within 3 years after substantial completion. The 3 parties jointly and separately are responsible for the installation for the warranty period.

B. Failure of materials or installation shall include, but not be limited to, excessive leakage or air infiltration, excessive deflections, faulty operation of sash, deterioration of finish or metal in excess or normal weathering, and defects in hardware and weatherstripping.

PART 2 PRODUCTS

A. Missile Impact Resistant Windows: Certified missile impact resistant glass.

1. YKK.
2. Superior.
3. Traco.

4. Accepted equivalent.

2.02 COMPONENTS

A. Aluminum Extrusions: 6063-T5, alloy, minimum 22,000 psi ultimate tensile strength and minimum 0.062" thickness at any location for main frame and sash members.

B. Window Fabrication:

1. Provide manufacturer's standard fabrication and accessories that comply with indicated standards and are reglazable without dismantling of sash framing.
2. Include complete assembly of components and anchorage of window units, and prepare sash for glazing except where preglazed at factory.
3. Sizes and Profiles:

   a. Fabricate to sizes and profiles indicated on final shop drawings.
   b. Details in drawings are based upon standard details by one or more manufacturers.
   c. Similar details by other manufacturers will be acceptable, provided they comply with size requirements, minimum/maximum profile requirements, and referenced performance standards and are approved by THE CITY.

4. Preglazed Fabrication:

   a. Preglaze window units at factory where possible and practical.
   b. Comply with requirements of Section 08800, in addition to requirements of ANSI/AAMA 101.

5. Provide subframes with anchors for window units as shown, of profile and dimensions indicated minimum 0.062" thickness extruded aluminum, with mitered or coped corners, welded and dressed smooth or with concealed mechanical joint fasteners. Finish to match window units. Seal joints on inside with sealant.

C. Fasteners:

1. Aluminum, nonmagnetic stainless steel, or other materials warranted by manufacturer to be non-corrosive and compatible with aluminum window members, trim, hardware, anchors, and other components of window units.

2. Reinforcement: Fasteners screw-anchored into aluminum less than 0.125" thick, shall have interior reinforced with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard non-corrosive pressed-in splined grommet nuts.
3. Exposed fasteners, when the window is in a closed or opened position, shall be tamperproof.
4. Do not use exposed fasteners except for application of hardware.
5. Exposed fasteners shall match finish of adjoining metal.

6. Provide tamperproof machine screws or rivets for exposed fasteners.

D. Anchors, Clips and Window Accessories: Depending on strength and corrosion-inhibiting requirements, fabricate units of aluminum, nonmagnetic stainless steel, or hot-dip zinc coated steel complying with ASTM A123. Exposed items shall match the window frame color.

E. Compression Glazing Strips and Weatherstripping: Molded neoprene gaskets complying with ASTM D2000 designation 2BC415 to 3VC620, or molded expanded neoprene gaskets complying with ASTM C509, Grade 4.

F. Sealant:

1. Seal frame joints, completely filling voids, flush with exposed surfaces. Provide type recommended by window manufacturer for joint size and movement, to remain permanently elastic, non-shrinking, and non-migrating.
2. Comply with Section 07900 for materials and installation of sealants.
3. Color shall be as selected by A/E.

G. Friction Shoes: Nylon or other non-abrasive, nonmetallic, non-staining, non-corrosive durable material.

H. Balance Mechanism: Spring loaded, with adjustable tension control.

I. Mullions:

1. Provide mullions and cover plates as shown, matching window units, and complete with anchors for support and installation.
2. Allow for erection tolerances and provide for movements of window units due to thermal expansion and building deflections.

J. Finish for Windows and Window Components:

1. Kynar 500 with 70 percent resin.
2. Anodized: NAAMM AA-C2241, Class I, minimum 0.7 mils, natural aluminum color (or color as selected by A/E).
3. Baked enamel.
4. Electrostatic Paint (ESP).
5. Color as selected by A/E.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install windows according to Section 08800, manufacturer's printed instructions, Miami-Dade County product approvals and accepted shop drawings under direct supervision of manufacturer's representative.

B. Bed windows with sealants, mastic, or glazing tapes to masonry lip, concrete/precast lip, or wood buck as applicable and secure according to Miami-Dade County product approvals.

C. Separate aluminum from masonry and ferrous metals by use of bituminous coating or gasketing to eliminate possibility of corrosion from electrolytic action.

D. Erect windows plumb, level, and true.

1. Do not distort windows by erection screws or fittings.
2. After window erection, apply an even spray coat of liquid wax to window surfaces for protection against stains and scratches.

E. Protect work from corrosion, prime coat concealed steel stiffeners, anchors, brackets, fasteners, and the like before installation and seal joints between window frames and building tightly and continuously.

F. Maintain wire or clips holding ventilators closed in place until windows are completely erected and hardware is attached.

3.02 ADJUSTING AND CLEANING

A. Adjust operating sash and hardware to provide tight fit at contact points and at weatherstripping, and to ensure smooth operation and weathertight closure.

B. Cleaning:

1. Clean surfaces promptly after installation of windows, 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.
4. Clean glass of preglazed units promptly after installation of windows.
5. Comply with Section 08800 for cleaning and maintenance.

C. Protection: Provide protection to prevent damage to window units.

END OF SECTION

08710
DOOR HARDWARE

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

A. Coordinate door hardware with work before and after. See especially,
   1. 08110 - Steel Doors and Frames
   2. 10160 - Solid Plastic Toilet Partitions. (compartment hardware)

B. Definitions:

   1. OIB: Oil-impregnated bearings.
   2. VWP: Verify with producer.
   3. CHSS: Case-hardened stainless-steel screw anchors, for seating in drilled hole in concrete or masonry.
   4. SMS: Sheet metal screws.
   5. SSMS: Stainless steel sheet metal screws.
   6. BHMA A156.18 finish codes specified herein / former Fed Spec designations:

      600 Steel, primed for painting / 600
      626 Satin chromium on brass or bronze / 626
      630 Satin stainless steel / 630
      689 Painted aluminum

1.2 OVERALL STANDARDS

A. American Society of Civil Engineers (ASCE), latest edition.

   1. ASCE 7, Minimum Design Loads for Buildings and Other Structures, has been followed in the A/E's calculation of required positive and negative wind load resistance requirements which are shown in the wind pressure diagrams that are a part of these Construction Documents.
   2. Select hardware at exterior doors to resist the wind load resistance forces and missile impact resistance requirements in the Construction Documents.

B. National Fire Protection Association (NFPA) standards, latest edition:

   1. NFPA 80 - Fire Doors and Windows.
   2. NFPA 252 - Positive Pressure Fire Tests of Door Assemblies

C. American National Standards Association / Builders Hardware Manufacturers Association:

   1. Series 158 ANSI/BMHA Door Hardware Standards.

1.3 DOOR HARDWARE SCHEDULE FORMAT

A. Use the following format (sequence of hardware items, topics, terminology, and abbreviated descriptions) in preparing each hardware set for the Hardware Schedule.

1. Sample format for a typical set is shown. Names of hardware items not used in this sample are inserted (in parentheses) to show their sequence in any schedule.
2. Define abbreviations that are rare, obscure, confusing or ambiguous.
3. Do not include the following groups of doors within a single Hardware Set:

    a. Labeled and unlabeled doors
    b. Exterior and interior doors
    c. Single doors and pairs of doors
    d. Doors with and without card readers or astragals

4. Example of format for a typical set in the Hardware Schedule:

Hardware Set 12

Key Set	Qty / Leaf(s)	Door Mark	Door Location		Hand	Label	Deg Opg
	1 Pair	5100A-1	Ext from Stair 1	5100A	RHRA/LHR		100
	1 Pair	5100B-1	Ext from Stair 2	5100B	RHRA/LHR		180
	1 Pair	5100C-1	Ext from Stair 3	5100C	RHRA/LHR		180

Door Leaf Size 3-6 x 8-0 x 1-3/4
Door Elevation detail no. ____ and frame detail no. ____ *(from Drawings)*
Flush galv. steel door x galv. steel frame

Totl Qty	Qty / Opg	Producer	Hdw Item	Item Series / Description	Finish	
24	8 ea	HHC	Hinges	BB1199 4.5" x 4.5" x NRP	600	
3	1 ea	PHJ	Mullion	FLHC822 x 96"	600	
3	1 ea	SCH	Cylinder	20-022 WTSR	626	
			(Cylinders for alum entrance door exit device locks)			
			(Lockset)			
			(Deadbolt lock)			
			(Auxiliary lock)			
3	1 ea	PHI	Exit device	FLHC2101 SNB x less trim	626	Inactive
3	1 ea	PHI	Exit device	FLHC2108 SNB x V4908A	626	Active
			(Electromagnetic holder / release)			
			(Electric strike)			
5	1 ea	SSC	Closer	D-4550 AVB EDA x SN	689	
2	1 ea	HHC	(Wall door stop)	230W	626	
			(Floor door stop – only where use of a wall stop is not possible)			
			(Wall door stop & hold)			
			(Head & foot bolts, surface)			
			(Door pull, push plate; kick plate, door armor)			
3	1 ea	HHC	Threshold	520SV 84" x 5" x 1/4"	Alum	
			(Door bottom)			
3	1 ea	HHC	Weatherstrips	891SV 42" x 96" x vinyl	Alum	
			(Astragal)			
			(Viewport / peephole)			
			(Overhead rain drip)			
6	2 ea		Silencers			

1.4 SUBMITTALS

A. Certification for Door Hardware at Exterior Door Assemblies: Submit a list of Miami-Dade County product approvals for each exterior door / door frame / door hardware assembly in the Construction Documents, showing compliance with impact and cyclical pressure resistance requirements.

B. Hardware Schedule, Index and Cuts:

1. Prepare a draft Hardware Schedule for this Work following the requirements of the Construction Documents and in the format specified herein.
   a. Identify producer of each item along with its name, feature and finish symbols, and catalog number.
   b. Submit 2 sets of catalog cuts or other product data / shop drawing information for each hardware item to be supplied. Highlight cuts to indicate items for this Work.
   c. Include all information specified in Hardware Set format example shown above.
   d. Indicate doors that have card readers or other access control features.
   e. Do not submit schedules in horizontal format (computer “landscape format”).

2. Prepare a separate index, listing all doors in the Work sorted by mark and with appropriate hardware set number next to each door number, with building numbers.
3. Submit the draft Schedule and index to A/E. Revise the draft Hardware Schedule as directed by the A/E and City of Miami to obtain approval.
4. Four weeks before ordering hardware, submit 2 copies of revised, approved Hardware Schedule, with index, covering all items required for entire Work to the A/E.

C. Templates: Provide suitable templates, with the approved Hardware Schedule, to each door fabricator, hardware supplier and installing trade as needed to ensure accurate setting, reinforcing, and fitting of door hardware.

1.5 BITTING AND KEYWAY SELECTION PROCEDURE

1. Before ordering the cylinders and locksets, the Contractor’s door hardware producer shall, directly through the City of Miami Project Manager, request a Keying Schedule and Bitting List from the Central Lock Dept.
2. Keyway selection. The special keyway for the lock cylinders to be used on this Work shall be as selected by Central Lock Dept.

   a. Restricted keyways will be required by the City of Miami.
   b. The special keyway may be from a producer different from the lockset producer.

3. Maintain keying / bitting security as specified in SECURITY below.
4. Other keying requirements are specified in PART 3 of this section.

1.6 SECURITY

A. Confidential Information: Keying requirements for this Work shall be handled solely by Central Lock Dept. and the Contractor’s lockset cylinder producer.

1. Provide permanent cylinders, CMK-keyed, with all locks that are supplied to the Work.
2. Do not pack permanent keys, or keying information with the locksets.
3. Keying information and keys shall never be in the hands of the Contractor or any of his forces except the lockset cylinder producer.

B. Delivery of Keys: Deliver lockset keys, keying information, Keying Schedules and Bitting Lists, directly from the City of Miami approved lockset cylinder producer to the City of Miami Project Manager, through no other hands or entities in the Contractor's organization.

1. Deliver padlock keys and key cabinet keys the same way.

C. Breach of Security: If these security requirements are violated, the City of Miami will require full rekeying. The cost of rekeying the entire Work shall be borne entirely by the Contractor.

1.7 SPECIAL WARRANTY

A. Door Hardware:

1. Scope: Adjust, repair, or replace defective hinges, cylinders, locksets, deadbolt and auxiliary locks, exit devices, electromagnetic holder / releases, electric strikes, overhead stop & holds, and door bottoms to smooth, quiet, dependable operating condition during the Special Warranty period. If operating door hardware items cannot be kept in smooth, quiet, dependable operating condition after 3 adjustments or repairs, replace with new items matching the defective items.
2. Defects:

    a. Door hardware items that get out of adjustment under normal operating conditions (not abuse or vandalism);
    b. Door hardware items that repeatedly (3 or more times) get out of adjustment under normal operating conditions.
    c. Door hardware items that require repair rather than mere adjustment.
    d. Door hardware items that, after attempts to adjust or repair, still do not operate smoothly, quietly or dependably and for which replacement is the only remedy.
    e. If operating door hardware items cannot be kept in smooth, quiet, dependable operating condition after 3 adjustments or repairs, replace with new items matching the defective items.
    f. Door pulls, door stops, thresholds and weatherstrips that break or come loose are considered defective and shall be reinstalled.
    g. Other non-operating door hardware such as stops, plates and viewers are not part of this special warranty.

3. Duration of special warranty: From time of installing door hardware until 2 years after date of Substantial Completion of the Work.
4. Response time: Within 5 days after Contractor has been notified of 5 or more hardware items that need adjustment, repair or replacement, except defective work that threatens safety or life.
5. Adjust, repair or replace within 48 hours any defective hardware item that threatens safety or life.
6. Limit of door hardware producers' and installers' responsibility: No dollar limit; no deductible amount.

PART 2 PRODUCTS

2.1 HINGES

A. Description: Full mortise ball-bearing butt hinges.

1. Exterior doors and exterior gates: Oil-impregnated stainless-steel hinges with stainless steel bearings and non-removable pins:
2. Interior doors: Steel hinges with ball bearings and stainless-steel pins.

B. Examples of format for specifying required hinge qualities for Hardware Schedule:

1. For exterior doors: Hager BB1199 x ss x OIB x 4-1/2 x 4-1/2 x 630 x NRP
2. For exterior gates: Hager BB1199 x ss x OIB x 4-1/2 x 4-1/2 x 630 x NRP
3. For all other doors: Hager BB1168 x ss pin x 4-1/2 x 4-1/2 x 600

C. Standard. ANSI/BHMA A156.1, or A156.7 for template hinges.

D. Product / Producer:

1. exterior doors: BB1199, by Hager.
2. Interior doors: BB1168, by Hager.
3. Equal products by Ives.
4. Equal products by McKinney.
5. Equal reviewed and approved by the A/E and Central Lock Dept.

2.2 MULLION

A. Description: UL Listed. Removable hollow steel hardware mullion, 2 x 3 in. x 11 ga, grout-filled, with head cap- and sill-fittings, and bolts for easy removal and replacement.

1. Finish to match zinc-and-paint factory coats on each steel door frame.

B. Location:

1. Provide at exterior pairs of doors.

C. Product / Producer:

1. All openings, except at Flammable Storage Rooms: FL822, by Precision.
2. At Flammable Storage Rooms: Key Operated Removable Mullion, Model FLKR822 by Precision.
3. Equal reviewed and approved by the A/E and Central Lock Dept.

2.3 CYLINDERS

A. Description: Provide 6-pin, single-ring type, high security lock cylinders with restricted keyway as selected by Central Lock Dept.

1. Maintain lockset and keying security as specified in PART 1 SECURITY.

B. Standard. ANSI/BHMA 156.30, Level A.

2.4 LOCKSETS

A. Description: Provide locksets with strikes, CMK-keyed. Label locksets with door tag number and key symbol from door hardware lockset supplier.

1. Quality: Heavy duty.
2. Handles: Lever.
3. Knurling: Provide knurled outside lever handles for hazardous areas as well as for mechanical, electrical, and custodial storerooms.
4. Fastening: Thru-bolts at steel, aluminum and wood doors, regardless of any producer's recommendations.

B. Examples of format for specifying lockset functions (by location or extent) for Hardware Schedule:

Function	Location , Extent, or Use
Storeroom	Mechanical rooms, electrical rooms, and custodial storerooms
Communicating and A/E)	Communicating (restricted use as determined by the City of Miami
Institutional	Key both sides for doors that are always locked (use only when approved by the City of Miami)

C. Examples of format for specifying required lockset qualities for Hardware Schedule:

Schlage D Series, Rhodes: Heavy-duty, lever handle locksets,
"Vandlgard" design x 626 x thru-bolts.
Marks 195 Survivor Series: Heavy-duty, lever handle locksets,
"American" design x 626 x thru-bolts.
Best Varsity 9K-ATB, Alternate: Thrubolt Pattern, heavy-duty lever handle,
"Lost Motion" design x 626
Yale 5400 LN Series, Augusta (AU), heavy-duty handle locksets x 626 x thru-bolts.

D. Standard. ANSI/BHMA 156.2, Grade 1.

E. Product / Producer: Specify one of these producers as directed by Central Lock Dept. No substitution.

1. D Series, Rhodes Vandlgard by Schlage.
2. 195, Survivor Series American by MarksUSA.
3. Varsity 9K-ATB, Alternate Lost Motion by Best Access.
4. AU5400LN, Free Wheeling Lever by Yale.

2.5 DEADBOLT LOCKS

A. Description:

1. Thumbturn deadbolt locks: Provide only on secure side of door-within-a-door leafs, with no access (cylinder or thumbturn) on public side.

B. Product / Producer:

1. B663P Classroom Deadbolt, by Schlage.
2. B680 Thumb Deadbolt, by Schlage.

3. Central Lock Dept.- approved equal.

2.6 EXIT DEVICES

A. Description: Rim type, without vertical rod, with 3/4 in. deadlocking latchbolt and strike.

1. Mount producer's cylinders in the door and not through the body of the exit device.
2. At non-labeled doors: For pairs of doors provide outside door pull on RHR door only; provide exit-only device on LHR door.
3. At labeled doors: Interior labeled doors requiring exit devices, provide outside lever trim on RHR door; provide an exit-only device on LHR door.

B. Examples of format for specifying required exit device qualities for Hardware Schedule.:

1. Exterior openings:

a. Entry Doors:
Precision 2103-CD x 626 x SNB x less trim x cylinder x door pull x SNB.
b. Exit Only Doors:
Precision 2101 x less dogging x 626 x SNB x less trim x less cylinder.

2. Interior, exterior, and courtyard labeled openings:

a. Entry Doors:
Precision FL2108 x V4908A x cylinder.
b. Exit Only Doors:
Precision FL2101 x 626 x less trim x less cylinder.

3. Specially labeled exterior entry doors:

a. Pairs of doors at flammable storage rooms used for storage of lawn equipment:
Precision FL2103 x 626 x less trim x SNB x door pull x cylinder x
key operated removable mullion x head & foot bolts, surface mounted
b. Single leaf doors at flammable storage rooms for chemicals used in instruction.
Precision FL2103 x 626 x less trim x SNB x door pull x cylinder

C. Location: Provide as shown on Drawings.

D. Standard: ANSI/BHMA 156.3, Grade 1.

E. Product / Producer: One of the following:

1. 2100 Series, by Precision.
2. HC-19-8800 Series, by Sargent.
3. 99 Series, by Von Duprin.
4. Equal reviewed and approved by the A/E and Central Lock Dept.

2.7 CLOSERS

A. Description: Full rack and pinion door closer with steel spring and hydraulic fluid, with controls to regulate closing, latching, speeds and back-checking.

B. Examples of format for specifying required door closer qualities for Hardware Schedule:

LCN 4111-N AVB x EDA x TB, parallel arm only, or
Stanley D-4550 x AVB x EDA x SN x 689.
LCN 4111-N Spring Cush AVB x AL x EDA x 689 x TB, or
Stanley D-4550 Spring Cushion x AVB x EDA x SN x 689
LCN 4116-N AVB x AL x EDA x 689 x TB (oversize doors only; VWP)
Stanley D-4551 x AVB x EDA x SN x 689 (oversize doors only, VWP)

C. Locations:

1. Provide at all doors.
2. Provide closers for both leafs at pairs of doors.
3. Provide spring cushion closers for doors that cannot be fitted with wall or floor stops.

D. Standard: ANSI/BHMA 156.4.

E. Product / Producer.

1. 4111-N and 4116-N, by LCN.
2. D-4550 and D-4551, by Stanley.
3. Equal reviewed and approved by the A/E and Central Lock Dept.

2.8 WALL DOOR STOPS

A. Description: Cast brass stops with resilient bumpers, suitable for installing by screws and adhesive at lockset height on concrete or masonry walls, as well as at gypsum wallboard and plaster walls that have studs and backing/reinforcement sufficient to withstand a door being flung open.

1. Provide concave design for doors that have office-function locksets or that have lockset push-buttons on wall side of door.
2. Provide convex design for other doors.

B. Examples of format for specifying required wall door stop qualities for Hardware Schedule.

Concave wall door stop Hager 234W x 626 x CHSS
Convex wall door stop Hager 230W x 626 x CHSS

C. Selection and Location:

1. Provide wall mounted door stops at all doors unless otherwise specified after ascertaining that there is sturdy structural backing to withstand force of door impact.
2. If suitable structural backing is not present, protect walls with floor mounted doorstops that do not create trip hazard or difficulty in maintaining clean and in-place.
3. If neither wall mounting or floor mounting meets these selection and location criteria, provide closers of the specified spring-cushion design

D. Product / Producer:

1. Concave design: 234W, by Hager.
2. Convex design: 230W, by Hager.

3. Equals to each of the above as reviewed and approved by the A/E and Central Lock Dept.

2.9 FLOOR DOOR STOPS

A. Description: Dome type, with rubber pad but no hook for holding, 3-screw fastening.

1. Do not use floor screws provided by producer. Instead, fasten to floor slab using 3 case-hardened stainless-steel screws of the largest practicable size.

B. Example of format for specifying required floor door stop qualities for Hardware Schedule.:

Hager 259F x CHSS x 626.

C. Standard: ANSI/BHMA 156.16.

D. Location: Use only if wall mounted stops cannot be used because sturdy structural backing is not present or feasible in wall.

E. Product/Producer:

1. 259F, by Hager.
2. Equal reviewed and approved by the A/E and Central Lock Dept.

2.10 HEAD & FOOT BOLTS

A. Description: Provide a set of:

1. Surface-mounted sliding head & foot bolts at inactive leaf of exterior door pairs;
2. Flush sliding head & foot bolts at inactive leaf of interior door pairs.

B. Locations: Mount flush head & foot bolts on LHR leaf at labeled door pairs, where there is an exit or locking device on opposite leaf:

1. Exterior: Provide at pairs of doors.
2. Interior: Provide at pairs of doors at such locations as telephone closets, mechanical rooms, electrical rooms, and at interior storage rooms.

a. Do not use at student occupied areas.
b. Provide head & foot bolts with UL label at fire-rated openings.

C. Examples of format for required head & foot bolt qualities for Hardware Schedule.

Head & foot bolts (exterior)	Hager 275D & 282D at LHR leaf
Head & foot bolts (interior, labeled)	Hager 275D x UL & 282D x UL at LHR leaf

D. Standard: NFPA 80, 2.8 – 2.5.

E. Producer:

1. 275D or 276D (surface mounted), by Hager.
2. 282D (UL) (flush mounted), by Hager
3. Equal product by Baldwin, Ives, Quality, or Rockwood.

4. Equal reviewed and approved by the A/E and Central Lock Dept.

2.11 DOOR PULLS

A. Description: Cast aluminum, satin anodized finish, with thrubolts.

B. Standard: ANSI/BHMA 156.6.

C. Producer / Product:

1. H4G, by Hager.
2. Central Lock Dept. approved equal.

2.12 PUSH PLATES AND KICK PLATES

A. Description: Screw mounted, with beveled edges.

1. Material: Hard black plastic with beveled edges. Do not use metal or clear plastic.
2. Push plate size: 16 x 16 x 1/8 in.

a. Exception: Doors with vision lites, for which provide 4 x 16 x 1/8.

3. Kick plate size: 16 in. x 2 in. less-than-width-of-door x 1/8 in. thick.

a. Exception: Less than 16 in. high if needed to clear an opening in door leaf.

B. Location:

1. Push plates: Provide on the kick side at:

a. Non-labeled doors that have exit devices or Institutional function locksets.
b. Toilet room doors that have no locksets.

2. Do not use push-plates on:

a. Labeled doors.
b. Doors that have lever handle cylindrical locksets.

3. Kick plates: Provide at all doors without armor, unless otherwise shown.
4. At double-acting door leafs: Provide push plate and kick plate on each side

C. Standard: ANSI/BHMA 156.8.

D. Product / Producer:

1. 60S PK, by Hager (push plates)
2. 214S BL, by Hager (kick plates)
3. Equal reviewed and approved by the A/E and Central Lock Dept.

2.13 DOOR ARMOR

A. Description: Screw-mounted stainless steel in No. 4 finish, with eased edges and corners that will not catch or cut clothing or flesh. Armor, where used, takes the place of kick plate

1. Armor size: 48 in. x door width less 2 in. x 16 ga.
2. Labeled door armor: Provide at labeled doors.

B. Example of format for specifying required door armor qualities for Hardware Schedule:

Door armor: 48 in. x 2 in. less-than-width-of-door x 16 ga x No. 4 finish x SSMS

C. Location: At both sides of doors in food service area.

D. Standard: ANSI/BHMA 156.8.

E. Product / Producer:

1. As reviewed and approved by the A/E and Central Lock Dept.

2.14 THRESHOLDS

A. Description: Aluminum body, grooved top, of 1/2 / 1/4 in. high bumper design or 1/4 in. high saddle design, 5 in. wide unless door & frame configuration favors a narrower or wider dimension.

1. With bumper design only, provide 1-piece neoprene or EPDM gland seal.
2. Provide thresholds in one piece across entire jamb-to-jamb width of each opening.

B. Examples of format for specifying required threshold qualities for Hardware Schedule.:

Bumper type threshold: Hager 520SA 5 in. wide x CHSS x alum
Saddle type threshold: Hager 413SA 5 in. wide x CHSS x alum

C. Location:

1. Provide bumper design at exterior doors. Exception: Do not provide at kitchen receiving door.
2. Provide saddle design (for use with a door bottom) for each interior area that requires sound control as defined in RELATED REQUIREMENTS / Definitions in this section. Exception: Provide bumper design at each mechanical room and each electrical room with transformers, either of which is accessed from an interior corridor
3. Check and coordinate with the following spaces where marble thresholds are usually shown to make sure that a proper threshold is provided: Single-use toilet rooms, vestibules to toilet rooms, sink or mop-receptor equipped custodial closets.

D. Standard. ANSI/BHMA 156.21.

E. Product / Producer:

1. 520SA (bumper type), by Hager.
2. 413SA (saddle type), by Hager.
3. Equal products by National Guard, Pemko, Reese, or Zero Intl.
4. Equal reviewed and approved by the A/E and Central Lock Dept.

2.15 DOOR BOTTOMS

A. Description: Aluminum door bottoms, surface mounted, in 2 types:

1. Fixed (not retracting) neoprene or EPDM (not silicone) sweep strip.
2. Automatic-operating, with sponge neoprene or EPDM drop seals (with drop from 1/16 in. up to 3/4 in. as needed for seal to rest snugly against full length of threshold).
3. Door bottoms on fire rated doors: UL-rated pressure-resistant fire gaskets; NFPA 252.

B. Examples of format for specifying required door bottom qualities for Hardware Schedule.

Fixed sweep strip door bottom	Hager 750S x SSMS x alum
Automatic drop seal door bottom, fire rated	Hager 747S x SSMS x UL x alum

C. Location: Provide door bottom types as follows:

1. Fixed sweep strips, at kitchen receiving door and at interior perimeter doors to food service areas (no thresholds)
2. Automatic drop seals at doors (for use with saddle thresholds) for interior areas requiring sound control (except most mechanical rooms, see 3. following) as defined in RELATED REQUIREMENTS / Definitions in this section.
3. Automatic drop seals at doors (for use with saddle thresholds) to mechanical rooms that are within sound control areas. Do not provide door bottoms of any kind at other mechanical rooms

D. Product / Producer:

1. 750S (fixed sweep strip), by Hager.
2. 747S (automatic with drop seals), by Hager.
3. Equal products by the producers specified for Thresholds.
4. Equal reviewed and approved by the A/E and Central Lock Dept.

2.16 WEATHERSTRIPS

A. Description: Neoprene, EPDM or silicone weatherstrips, compressible bulb design, in aluminum holders 5/16 in. thick or less, to seal against either weather (exterior) or sound transmission (interior).

1. Weatherstrips on fire rated doors: UL-rated pressure-resistant fire gaskets, NFPA 252.

B. Examples of format for specifying required weatherstrip qualities for Hardware Schedule.

Weatherstrips:	Hager 891SAS x alum
Weatherstrips, fire rated:	Hager 891SAS x UL x alum

C. Locations: Provide rigid, bulb type weatherstrips:

1. At heads and jambs of exterior doors
2. At heads and jambs of interior doors for areas requiring sound control as defined in RELATED REQUIREMENTS / Definitions above.:

D. Standards:

1. NFPA 252.
2. ANSI/BHMA 156.22.

E. Product / Producer:

1. 891SAS, by Hager.
2. Equal products by the producers specified for Thresholds.
3. Equal reviewed and approved by the A/E and Central Lock Dept.

2.17 ACCESSORIES

A. Overhead Rain Drip: Aluminum, 2-1/2 in. wide, screw applied, for use exposed over concrete or masonry, or embedded in cement plaster. 810S x alum, by Hager

B. Silencers: Neoprene or EPDM: 307D, by Hager.

C. Fasteners: Provide the following fasteners, the head and color of which shall approximate the color of each surface to which hardware is fastened.

1. Case-hardened stainless-steel screw anchors (CHSS) with baked-on rust-inhibitive coating, for seating in drilled hole in concrete or masonry, such as GrabCon by Grabber, Tapcon by ITW Buildex, Tapper by Powers, or other product and producer approved by Central Lock Dept.
2. For visible fasteners at steel or wood doors: Recessed oval head (OH) Phillips corrosion-resistant screws, sheet metal or wood screw type as appropriate.
3. For concealed fasteners at steel doors: Machine screws.
4. For wall stops: CHSS screw(s), plus Liquid Nail or other super-adhesive approved by Central Lock Dept.
5. For push & kick plates, door armor at steel doors: Oval head (OH) Phillips recessed Type A stainless steel sheet metal screws (SMS).
6. For thresholds: Cadmium plated expansion screws, such as Hager FHSL 25-1/4 x 1/4-20 x 2, or equal approved by Central Lock Dept. Set in non-corroding, non-lead drilled shields. CHSS may be used if approved by Central Lock Dept.
7. For brush weatherstrips: Fasteners for various substrates as recommended by weatherstrip producer.
8. For rain drips: CHSS.

2.18 KEYING OF DOOR HARDWARE

A. Scope and Security:

1. Provide Great Grand Master Keys (GGMK), Grand Master Keys (GMK), Master Keys, Section Master Keys (SMK) and Change Keys (CK) following the keying schedule provided by City
2. Provide individual lock cylinder keying following City-supplied keying schedule.
3. Key and register lock cylinders at the factory for all Master Key (MK) and Construction Master Key (CMK) systems for identification and to maintain security.

B. Construction Master Keying:

1. Cylinders shall be Construction Master Keyed (CMK).

2. List the quantity of CMK keys to be supplied for Work on the Hardware Schedule.
3. Keep all locks in the Work on the CMK system until lockset installation is accepted by the City of Miami. After acceptance and notification by the City of Miami Project Manager, Central Lock Dept. will knock out the CMK system and replace with permanent keying.

C. Master Keys, Change Keys, and CMK Plug Extractors:

1. Provide each cylinder lock with 5 cut change keys (CK).
2. Provide 10 CMK Plug Extractors.
3. Provide 5 Master Keys (MK) for each MK group.
4. Provide temporary (CMK) keys and plug extractors in enveloped sets and identify with keyset numbers and factory file or folio number.
5. Coordinate delivery and pickup of the following items with City:

    a. Cut keys, blank keys, and CMK Plug Extractors used in construction.786
    b. Each CMK used on the Work (whole keys or pieces of keys) in the Contractor's possession at the time of project acceptance.
    c. Accounting of any lost or destroyed CMKs.
    d. Obtain a receipt for items listed above from City. upon delivery.

D. Key Stamping:

1. Stamp cut keys with the words DO NOT DUPLICATE and the City of Miami post number on opposite sides.
2. Verify with Central Lock Dept. the specific post numbers on the keying schedule.
3. Do not stamp bitting numbers or any factory nomenclature on the keys.

E. Key Bows: Provide large, unembossed bows of standard design.

F. Cylinder Location Verification:

1. Central Lock Dept. will determine if key cylinders are properly located within the Work by referring to the approved Hardware and Keying Schedules.
2. As CMK cylinders are knocked-out, cylinders found incorrectly or improperly keyed, in wrong location, or otherwise malfunctioning shall be corrected by Contractor at no cost to the City of Miami.

PART 3 EXECUTION

3.1 INSPECTION

A. Before starting installation of the work of this section, the installer of this work shall – accompanied by Contractor – inspect areas where the work will be performed. Ensure that earlier construction is complete. Confirm that poor workmanship and unsatisfactory conditions have been corrected in ways acceptable to the installer of this work.

3.2 PREPARATION

A. Do not start installing the work of this section until earlier construction and conditions detrimental to the timely and proper installation of this work have been completed and

corrected, by the Contractor and other entities that have performed earlier work, in ways that are acceptable to the installer of this work of this section.

3.3 DELIVERY, STORAGE, AND ENVIRONMENTAL CONDITIONS

A. Package and label door hardware items and sets following the Hardware Schedule, complete with necessary screws, special tools, instructions, and installation templates. Do not package keys (other than CMK) with the individual hardware sets.

B. Store hardware in a dry, secure area with work surface for assembling hardware and sets.

C. Do not proceed with the work of this section until conditions detrimental to the proper installation and protection of door hardware have been corrected and all damp construction operations in spaces are dry.

D. Do not install silencers or any other items of finish hardware, including weatherstrips, until and all field coats of paint have been applied to doors.

3.4 LOCATION OF HARDWARE ON DOORS

A. Locate each item as follows:

1. Lever Lockset: Lever handle 38 in. from door bottom.
2. Exit Device: Centerline 40 in. from door bottom.
3. Door stops: Match actual point of impact of door lever or other impacting projection.
4. Pushplate bottom: 1 in. above pushpad operator; 1 in. above top of exit device.
5. Pushplate near a vision panel: 1 in. above top of exit device mechanism and between vision panel and edge of door.
6. Kickplate: 1 in. from bottom edge of door, or 1/2 in. from top of surface-mounted automatic door bottom.
7. Viewport / peephole: Centerline 60 in. above door bottom.
8. Rain drip. Bottom edge of drip 1/4 to 3/4 in. above door's masonry opening. Where door frame is flush with exterior, place bottom edge of drip 1/2 to 3/4 in. above top of door

3.5 DOOR HARDWARE INSTALLATION

A. All Items: Install door hardware items following producer's recommendations.

B. Cylinders: Install temporary CMK cylinders with locksets.

C. Closers:

1. Install with closer producer's thrubolts and adjust for proper operation.
2. Location: Locate closer on door as if door were to swing 180°, regardless of the actual swing of the door. When using Spring-Cush, mount for maximum opening swing. Verify 90°, 100°, or 110° template mounting for each leaf.
3. Closer Foot: Install with 5 screws for wood jambs or 5 stove bolts for metal jambs. Provide a matching spacer (if required by the width of the stop) for the fifth fastener.
4. Use bolt, not screw, fasteners at metal door frames.

D. Electromagnetic Holder / Releases: Wire to fire detection devices and to the fire alarm system so as to release in case of fire.

E. Wall-mounted Door Stops: Ensure that these stops are mounted on walls that have adequate reinforcement in back of any finish material less than 1 in. thick (such as gypsum wallboard or plaster). Mount with liquid nail glue.

F. Stop and Hold Devices:

1. Wall-mounted: Install at top outside corner of door, with thrubolts. Install wall portion to withstand 100 lb. shear pressure under actual field conditions.

G. Thresholds:

1. Set exterior thresholds in a full bed of sealant.
2. If threshold is saddle type, coordinate so that automatic door bottom drops onto level portion of saddle.

H. Push Plates: Install between each vision panel and edge of door, on push side, 1 in. above exit device, on push side of door.

I. Door Pulls on other side of doors with Exit Devices: Locate the top screw hole of the door pull plate on vertical centerline of the exit device's lock mechanism case and 2 in. above the horizontal centerline of the exit device so as not to interfere with exit device fasteners.

J. Accessories:

1. Viewports: Install at kitchen receiving door and custodial receiving area doors.
2. Rain drips: Install full width + 6 in. to each side above exterior doors, unless they are already protected by a roof (or eyebrow) overhang at least 1 ft deep that is located within 2 ft above each door.
3. Silencers: Install 3 silencers in interior single leaf steel door frames, and 2 in interior double leaf steel door frames.

    a. At steel door frames that receive weatherstrips, do not install silencers. Fill each silencer hole in frame with silicone and make surface flush with frame, ready for field painting.

4. Sliding glass door locks: Deliver to casework producers, keyed as specified herein.

3.6 ADJUSTMENT AND CLEANING

A. Adjust and lubricate door hardware to smooth, quiet operating condition.

B. Adjust each closer, when it is fully installed and the facility's air conditioning test & balance is nearly complete. Adjust closers to speed and force needed to ensure smooth operation, with attention to ADA closing speed requirements, and, at exterior doors, smooth operation under strong wind.

C. Adjust or repair operating door hardware items such as hinges, cylinders, locksets, deadbolts and auxiliary locks, exit devices, electromagnetic holder / releases, electric strikes, overhead stop & holds, and door bottoms to smooth, quiet, dependable operating condition during the Special Warranty period. If operating door hardware items cannot be kept in smooth, quiet, dependable operating condition after 2 adjustments or repairs, replace with new items matching the defective items.

D. Clean each item and repair or replace defective items or components.

END OF SECTION

08800
GLASS AND GLAZING

PART 1 GENERAL

1.01 SUMMARY

A. Related Sections:

1. 08110 - Steel Doors and Frames.
2. 08520 - Aluminum Windows.

1.02 REFERENCES

A. Florida Building Code (FBC).

B. Flat Glass Marketing Association (FGMA): Glazing Manual, 1986 Edition.

C. CPSC Standard 16CFR 1201 Category II.

D. American Society for Testing and Materials (ASTM):

1. C1036-91 Specification for Flat Glass.
2. C1048-92 Specification for Heat-Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass.
3. E119-95a Test Methods for Fire Tests of Building Construction and Materials.
4. E152-81a Methods of Fire Tests of Door Assemblies.
5. E163-84 Methods of Fire Tests of Window Assemblies.

E. ANSI Z97.1 - Safety Performance and Methods of Test for Safety Glazing Materials Used in Buildings.

1.03 SUBMITTALS

A. Product Data: Manufacturer's specifications, recommendations for setting blocks, spacers and edge clearance, and installation instructions.

B. Color Charts: For preformed glazing materials and glazing sealant.

C. Certification:

1. Certification of tempered and laminated glass complying with Consumer Product Safety Commission 16CFR 1201-CII.
2. Certification of Miami-Dade County product approval demonstrating compliance with FBC missile impact criteria.
   a. 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)

7-98 using a wind speed of 146 mph, exposure category "C", and a wind load importance factor of 1.15.

1.04 QUALITY ASSURANCE

A. Labels:

1. Label each unit of glass with manufacturer's sticker showing quality, grade, thickness, and type of glass.
2. Labels shall remain in place until approval by the A/E.

B. Trademarks: Each panel of tempered glass shall bear the manufacturer's trademark.

C. Glass of each type shall be supplied by the same manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Missile Impact Resistant Glazing:

1. Saf-Glas by Security Impact Glass.
2. PPG
3. Viracon
4. Accepted Equivalent.

5. Accepted equivalent.

B. Fire Rated Safety Glazing:

1. Superlite by O'Keefe, San Francisco, CA.
2. Firelight Series, Pyrostop, and Pyro Swiss by Technical Glass Products, Kirkland, WA.

C. Glazing Sealant: Dow Corning 999-A Silicone Building and Glazing Sealant or General Electric Contractors 1000 Sealant.

D. Backer Rod: Dow Corning Ethafoam SB polyethelene cord or butyl rubber foam cord.

E. Edge Protection Tape for Laminated Glass: "Scotch Brand Cellopane Tape", manufactured by 3M Company.

F. Moisture-Resistant Paint for Frameless Mirror Glass: Palmer Products Corp., Mirro-Bac Paint.

G. Bond Sealer Coat for Mirrors: Palmer Products Corp., Mirro-Mastic Bond.

H. Mirror Adhesive: Palmer Products Corp., Mirro-Mastic.

I. Security Film: Madico (Protekt), Profilon (P100, P200), or 3M (SH4 CLAR).

2.02 MATERIALS

A. Tempered Glass: Comply with ASTM C1036 and further processed according to ASTM C1048, Kind FT, which has been fully tempered by the manufacturer's standard horizontal process. Minimum thickness of 1/4".

B. Missile Impact Resistant Glazing:

1. 0.070" polycarbonate between two 1/4" annealed glass sheets.

C. Fire Rated Glazing:

1. Wire Glass: ASTM C1036, Type II, Class 1, Form 1, Quality q8, Mesh M2, bearing UL label.
2. Safety Glazing: ASTM E152, ASTM E163, ASTM E119, NFPA 80, NFPA 251, NFPA 252, NFPA 257, CPSC 16 CFR Part 1201, bearing UL label.

D. Laminated Glass: Two sheets of equal thickness clear heat strengthened glass according to ASTM C1036, Type I, Class 1, Quality q3 permanently laminated with a 0.060 inch thick sheet of clear polyvinyl butyral.

E. Wall Mirrors:

1. 1/4" laminated glass with electrolytic copper plated back, ANSI Z97.1 - Category II backing, and guaranteed for 1 year.
2. Mirrors shall provide distortion-free reflected images and be optically matched for distortion-free reflected images from panel to adjacent panel.

F. Glazing Materials:

1. Glazing Sealant: Curing type gunable elastomeric sealant complying with TT-S-001543A, Type II Class A. Color as selected by A/E.

   a. Glazing sealants for use with insulating glass units shall be approved by the fabricator of the insulating glass units.

2. Unshimmed Glazing Tape: Butyl-polyisobutylene with 20 to 30 "Shore A" hardness, self-sticking; TBD color.
3. Pre-Shimmed Glazing Tape: Butyl-polyisobutylene with built-in synthetic rubber spacer; 20 to 30 "Shore A" hardness, self-sticking; TBD color.
4. Setting Blocks: Solid neoprene, 80 to 90 Shore A durometer hardness; sizes as required.
5. Edge Blocks: Solid neoprene, 60-70 Shore A durometer hardness; sizes as required.
6. Shims: Solid neoprene, 40 to 60 Shore A durometer hardness; sizes as required.
7. Glazing Gaskets: Compression gaskets, closed cell, neoprene, EPDM or silicone rubber composition designed to provide a water-resistant seal between glass and frame.
8. Primers and Cleaning Agents: Type recommended by the sealant, glass, and glazing accessories manufacturer.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify glazing frames are acceptable for the correct installation of glass and glazing accessories.

3.02 INSTALLATION

A. Glass Cutting: Make cuts clean, only moderately convoluted, with flare or bevel not exceeding 1/8 of glass thickness.

1. Unacceptable defects:

a. Impact chips, spalls, or nipped edges.
b. Flake chips or shark teeth deeper than 1/4 of glass thickness.
c. Serration hackle deeper than 1/8 of glass thickness.

B. Comply with recommendations of FGMA Glazing Manual, glass manufacturer, manufacturer of sealant, and other glazing accessories.

C. Do not attempt to cut, seam, nip, or abrade glass tempered or heat strengthened.

D. Remove and replace glass broken, chipped, cracked, abraded, or damaged during construction.

E. Install wall mirrors and fasten with non-corrosive, theftproof, concealed hangers and plywood backing according to standard practices. Fasten with mirror adhesive according to manufacturer's instructions.

F. Manufacturer's label showing strength, grade, thickness, type, and quality of glass shall remain on each piece of glass until it has been set and inspected.

G. Guarantee work to be waterproof.

3.03 CLEANING

A. After glass has been inspected and approved, remove labels and wash and polish glass on both faces before THE CITY's approval of the project.

1. Comply with glass manufacturer's recommendations for cleaning materials and methods.

END OF SECTION

09120
PLASTERED CEILING SUSPENSION SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 09200 - Metal Studs, Lath, Suspension Ceiling, Plaster, and Stucco.

1.2 SUBMITTALS

A. Submit properly identified product data, including materials specifications for each product specified, installation recommendations, and other data as may be required to show compliance with specifications.

B. Samples: Submit 12-inch-long samples of channels, lath, hangers, tie wires, and miscellaneous accessories for review.

1.3 QUALITY ASSURANCE

A. Comply with the applicable requirements of governing codes and authorities and applicable portions of the following:

1. ANSI A42.3 -Lathing and Furring for Portland Cement and Portland Cement-Lime Plastering, Exterior (Stucco) and Interior.
2. Metal Lath and Steel Framing Association Specifications, latest edition.

PART 2 PRODUCTS

2.1 COMPONENTS

A. Suspended Ceilings:

1. Hanger Devices for Concrete: No.SA-1625 self drilling sleeve type concrete expansion anchors with wire eyes, manufactured by Phillips Drill Co., according to Fed. Spec. FF-S-325 (3-1965), Group III, Figure 15(D).
2. Hangers: Galvanized, annealed, pre-straightened steel wire, No.8 gage, where supporting up to 12.5 square feet of ceiling, and No.6 gage where supporting up to 16 square feet of ceiling.
3. Channel Tie Wire: 16 gage galvanized steel wire.
4. Main Runners: Cold-rolled steel channels with black asphaltum paint coating, 1-1/2" x 0.475 lbs. per foot or 2 inches x .59 lbs. per foot as required.
5. Cross Furring: Cold-rolled steel channels with black asphaltum paint coating, 3/4" x 0.3 lbs. per foot.

B. Expanded Metal Lath: Diamond mesh cut from steel according to Federal Specifications QQ-L-101C (latest edition), weighing 3.4 lbs. per square yard.

1. Use galvanized on exterior and black asphaltum paint coating on interior only.

C. Hardware Cloth: Galvanized 4 mesh, 23 gage.

D. Accessories:

1. Casing Beads: No.10 as manufactured by Plastic Components, Inc., with ground depth matching the specified stucco or Portland cement plaster thickness.
2. W-Type Control Joints: No.20 M Joint as manufactured by Plastic Components, Inc., ground depth to match specified Portland cement plaster thickness.

PART 3 EXECUTION

3.1 INSTALLATION

A. Suspended Ceiling:

1. Hangers:

a. Do not exceed maximum allowable ceiling area to be supported by each hanger.
b. Alter spacing of hangers or provide double hangers splayed to avoid overhead obstructions.
c. Provide extra hangers within 6 inches of ends of main runners to support light fixtures and as required to support other items resting in or on the ceiling.

2. Main Runners: Suspend true and level, saddle tie to hanger wires, and locate within 6 inches of parallel walls to provide support for cross furring.
3. Cross Furring: Locate perpendicular to main runners spaced maximum 2 inches from parallel walls and saddle tie to main runners.

B. Metal Lath Application: Tie lath with long dimension of sheet across supports and secure at intervals not exceeding 6 inches, with a tie placed where sides of sheets lap at supports and at side laps between supports.

1. Use tie wires not less than 16 gage galvanized annealed wire.
2. Lap diamond mesh lath 1/2" at sides and 1 inch at ends.

C. Powder and pneumatic actuated (shot-type) fasteners shall not be used to provide support for construction elements located overhead.

D. Accessory Installation: Install casing beads at perimeter of suspended furring and lath systems.

E. Finished Installation: Leave suspended furring and lath system true and level ready to receive subsequent finish.

END OF SECTION

09200
METAL STUDS, METAL LATH, SUSPENSION CEILINGS, PLASTER, AND STUCCO

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Non-load bearing steel studs.
2. Metal furring and lath.
3. Ceiling suspension system.
4. Portland cement plaster and stucco.

B. Related Sections:

1. 04221 - Concrete Unit Masonry.
2. 05400 - Light Gage Metal Framing.
3. 06100 - Carpentry.
4. 09900 - Painting of Unpainted Surfaces.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM), latest edition:

1. A641/A641M Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
2. A653/A653M Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
3. A924/A924M Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
4. C150/C150M Specification for Portland Cement.
5. C645 Specification for Nonstructural Steel Framing Members.
6. C754 Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
7. C841 Specification for Installation of Interior Lathing and Furring.
8. C897 Specification for Aggregate for Job-Mixed Portland Cement-Based Plasters.
9. C926 Specification for Application of Portland Cement-Based Plaster.
10. C932 Specification for Surface-Applied Bonding Compounds for Exterior Plastering.
11. C1007 Specification for the Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories.
12. E119 Test Methods for Fire Tests of Building Construction and Materials.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's product data for cementitious materials, lath, metal support components, and accessories.

B. Material Certificates:

1. Submit producer's certificate for each kind of plaster aggregate indicated materials comply with requirements.
2. Provide detailed shop drawings for metal support systems indicating load calculations, sizing of members, connections and anchorages for review by A/E. Shop drawings

and calculations shall be signed and sealed by a Florida registered Professional Engineer and shall show compliance with FBC and ASCE 7.

1.4 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.
b. Provide plaster for fire-resistance rated systems having same aggregate as specified for similar non-rated work, unless specified aggregate has not been tested by accepted fire testing laboratories.
c. Portland cement plaster/stucco shall not be used in areas requiring fire-rated construction. Use only accepted listed UL rated materials.

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 plaster 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 acceptance of panel's visual quality before start of work.
5. Retain panel during construction as standard for judging completed work.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Metal Supports:

1. Dale/Incor.
2. Dietrich.
3. Gold Bond Building Products Division.
4. Unimast Inc. (USG Co.)

B. Expanded Metal Lath:

1. Dale/Incor.
2. Gold Bond Building Products Div.
3. South Lath Inc.
4. Unimast Inc. (USG Co.)

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.

E. One Coat Veneer Plaster Over Cement Board: 3/32" Imperial Finish over 5/8" Durock cement board by US Gypsum Co. over metal framing at 16 inches o.c. maximum or accepted equivalent. UL U407 for 1 hour rating.

2.2 MATERIALS

A. Metal Supports - Suspended and Furred Ceilings or Soffits:

1. Portland Cement Plaster/Stucco Installation: ASTM C926.
2. Wire for Hangers and Ties: ASTM A641, 16 gage monel.
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:

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:

    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:

    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: 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:

    a. Flat: 2.5 lbs. per sq.yd.
    b. Self-Furring: 2.5 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:

a. Weather Protected Exterior Horizontal Surfaces (Soffits, Ceilings, and Other Decorative Elements): Pyro K-Lath, Gun Lath, or other A/E accepted equivalent.
b. Back of Ceramic Tile (Interior Usage Only): Aqua Lath or other A/E accepted equivalent.
c. Fire Resistance and Waterproofing (Interior Usage Only): Pyro K-Lath or other A/E accepted equivalent.
d. Interior Walls (High Traffic Areas Only): Pyro K-Lath, Gun Lath, or other A/E accepted equivalent.

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.

2.3 MIXES

A. Portland Cement Plaster/Stucco Mixes and Compositions - Base Coats:

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:

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

3.1 INSTALLATION

A. Lath and Furring:

1. Interior Lath and Furring Installation Standard: Install lath and furring materials indicated for gypsum plaster to comply with ASTM C841.
2. Portland Cement Plaster/Stucco Lath and Furring Installation Standard: Install lath and furring materials indicated for Portland cement plaster to comply with ASTM C926.
3. 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.

4. 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. 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.

C. 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.

D. 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.

E. Plaster Application:

1. Two-coat plaster over gypsum lath or paper-backed welded wire fabric.
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.

F. 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.

3.2 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

09250
GYPSUM WALLBOARD

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 09200 - Metal Studs, Lath, Suspension Ceiling, Plaster, and Stucco.
2. 09310 - Ceramic Tile.

1.2 REFERENCES

A. American Society for Testing and Standards (ASTM), latest edition:

1. C11 Terminology Relating to Gypsum and Related Building Materials and Systems.
2. C36 Specification for Gypsum Wallboard.

1.3 SUBMITTALS

A. Before starting work, provide product data and samples as directed by A/E.

1.4 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.

1.5 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 corner beads and trim.

1.6 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

2.1 MANUFACTURERS

A. Gypsum Wallboard:

1. Gold Bond.
2. National Gypsum.
3. Georgia Pacific.
4. United States Gypsum Company (USG).

B. Accessories shall be by gypsum wallboard manufacturer.

2.2 MATERIALS

A. Gypsum Wallboard:

1. Fire Rated Gypsum Board: USG SA 927, 1/2" or 5/8" thick x 48 inches wide x longest stock length, Type "C" or Type "X", with tapered edges or other A/E accepted equivalent.
2. Gypsum Board: ASTM C36, tapered edge, 5/8" thick x 48 inches wide x longest stock length.
3. High Impact Abuse Resistant Gypsum Board: USG Fiberock - VHI Abuse- Resistant, 5/8" thick or other A/E accepted equivalent.

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.
2. Joint Reinforcement, Fasteners, Adhesives, and Grout: According to manufacturer's recommendation.

PART 3 EXECUTION

3.1 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.

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.

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. Metal corner beads are not allowed. Use vinyl trim accessories only.
2. Treat trim 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.
3. Apply 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.
4. Install expansion joints as detailed.
5. Install control joints as detailed.

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.
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.
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. 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.

END OF SECTION

09310
CERAMIC 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. 10800 - Toilet Room Accessories.
6. 15421 - Drains, Floor Sinks, and Cleanouts.
7. 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.

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.

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.

2.02 MATERIALS

A. Slip-Resistant Ceramic Mosaic 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. As shown on the drawings.
2. Colors and patterns shall be judged equivalent, as determined by the A/E, to those preselected or above specified patterns and colors.
3. Any preselected 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'sS 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.

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 $\pm$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

09330
QUARRY TILE

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 03300 - Cast-In-Place Concrete.
2. 07900 - Joint Sealers.
3. 09310 - Ceramic Tile.
4. 15421 - Drains and Cleanouts.

1.2 REFERENCES

A. American National Standards Institute (ANSI), latest edition:

1. A108.1A. Standard Specification for Dry-Set Portland Cement Mortar.
2. A108.3. Standard Specifications for chemical Resistant, Water Cleanable Tile Setting and Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive
3. A137.1. Standard Specifications for Ceramic Tile

B. Tile Council of North America, Inc. (TCNA): Handbook For Ceramic Tile Installation, latest edition:

1.3 SUBMITTALS

A. Submit properly identified product data including material specifications, printed installation and mixing instructions and maintenance recommendations for quarry tile and accessories specified.

B. Submit samples of the following for review and selection by A/E.

1. Tile manufacturer's full color and pattern range for each type of tile required.
2. Grout manufacturer's full color range samples.
3. Each type of trim shape and special shape required, if requested.
4. Submit sample board showing full range of colors available for review by the A/E.

1.4 QUALITY ASSURANCE

A. Dynamic Coefficient of Friction Factors:

1. Quarry tile flooring systems shall provide a minimum Dynamic Coefficient of Friction (DCOF) factor as noted below:

a. 0.42 for leveled and accessible floors and corridors.
b. Provide a minimum slip coefficient factor of 0.8 for inclined floors and ramps.

2. Non-compliance of slip-resistant coefficient factor will be grounds for removal and disposal of installed flooring system, properly preparing the floor substrate, and installation of required slip-resistant flooring system at no expense to THE CITY.

B. Both the application and clean-up procedures for a unit of epoxy shall not exceed 45 minutes to 1 hour at room temperature.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver quarry tile in containers to the site with labels intact and seals unbroken.

1.6 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 CITY for a period of 5 years.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Quarry Tile:

1. American Olean.
2. Dal-Tile Corp.: Quarry Textures
3. Summitville Tiles, Inc.

B. Setting Materials:

1. Custom Building Products.
2. Laticrete International, Inc
3. Mapei Corporation

C. Epoxy Grout:

1. Custom Building Products.
2. Laticrete International, Inc.
3. Mapei Corporation

D. Joint Sealers:

1. Cam Kote.
2. Macco Silicone Grout Sealer.
3. Hillyard Onex-Seal.
4. Other as approved by tile manufacturer for intended use.

2.2 MATERIALS

A. Quarry Floor Tile: Non-slip, rustproof abrasive aggregate surface, 6" x 6" x 1/2" size, preparaffined to resist grout staining.

B. Quarry Base Tile: 5" x 5" x 1/2" inch size, pre-paraffined, with coved bottoms, "thin lip" rounded tops, rounded external corners, and matching quarry floor tile.

C. Mortar for Setting Bed:

1. Conventional cement mortar according to ANSI A118.1A.

D. Mortar Bond Coat and Grout:

1. High temperature, chemical resistant epoxy mortar bond coat and joint grout according to ANSI A118.3.

2. Complying with Tile Council of America specifications for 3-component, dark gray color mix, consisting of a liquid resin, a hardening agent, and an inert filler, that when completely set and hard shall be free from offensive odors.

3. Certified by manufacturer as suitable for intended use.

E. Color: As selected by A/E.

F. Marble Thresholds: 2 inch wide standard thickness, color as selected by A/E.

PART 3 EXECUTION

3.1 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.

3.2 INSTALLATION

A. Surface Preparation:

1. Insure slab is free of curing compounds or when used, mechanical scarifying is necessary.
2. Verify slopes are down to drains as shown on drawings.

a. Comply with TCNA F131 at slabs with slopes as shown on drawings.
b. Comply with TCNA F132 at slabs requiring a setting bed for slopes or leveling and TCNA:

1) F112: For a mortar bed over slab on grade where no bending stresses occur.
2) F111: For mortar bed over structural floors subject to bending and deflection.
3) F121: For a mortar bed over a waterproof membrane.

c. Setting Bed Thickness:

1) 1-1/4" maximum thickness of setting bed on the concrete substrate. Screed and compact to achieve uniform slope.

3. Set marble thresholds where indicated or at dissimilar floor finishes with the same material used for setting quarry floor tile.

4. Movement Joints at Setting Bed:

a. Provide control, isolation, expansion, and contraction joints according to movement joint designs and install according the TCNA Handbook for Ceramic Tile Installation.
b. Locate movement joints:

1) At 20 to 25 feet in each direction, for interior locations.
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.

5. Movement Joints at Epoxy Mortar and Grout:

a. Provide for expansion and control joints where specified.
b. Do not cover or bridge any expansion joints with epoxy.
c. Plan installation so tiles line up on one side of the control or expansion joints.
d. Protect tilework with metal strips along both edges of structural building expansion joints.
e. Insert sealant manufacturer’s specified compressible bead and sealant for expansion and control joints.

6. Mixing Epoxy Mortar:

a. Wear rubber gloves and avoid skin contact during mixing, application, and cleaning.
b. Mix epoxy components in units according to manufacturer s instructions for proper curing.

7. Epoxy Mortar Application:

a. Follow tile-setter's conventional procedures, laying quarry tile in epoxy mortar bond coat and in pattern indicated with straight lines and uniform joints 3/8" wide.
b. Use the recommended notched trowel according to manufacturer s instructions with sufficient depth to ensure proper epoxy mortar transfer, covering 100 percent of the tile back.
c. Using the flat or straight edge of the trowel, apply a thin, pressure-applied coat to the substrate. Follow immediately with additional material, then comb the surface using the notched side of the trowel to achieve an even setting bed.
d. The entire substrate should be covered, leaving no bare areas between the ridges.
e. Set tiles dry.
f. Do not spread more epoxy mortar than can be covered immediately with ceramic tiles.
g. Place tiles firmly into position with a slight twisting motion to ensure good contact with the epoxy mortar.
h. Follow immediately with proper and thorough beat-in to flatten the ridges or notches into a continuous bed, allowing at least 25 percent of the thickness of each tile to be embedded into the epoxy mortar to minimize air bubbles from reaching the surface and causing pinholes during grouting.
i. Make all alignments or adjustments immediately following beat-in.
j. Remove smudges from the tile face immediately with a clean sponge and water.
k. Do not disturb, grout or walk over tiles for at least 24 hours.

8. Epoxy Grout Application:

a. Tile surfaces shall be clean, dry, and free of any debris.
b. Joints shall be clean and free of excess setting material, standing water, dust, and foreign substances.
c. Maintain surface temperature between 60 degrees F and 90 degrees F.

d. Prepare and mix epoxy according to manufacturer s instructions.
e. Grout and clean in small areas.
f. Using a hard rubber float, force the grout into the joints in a continuous manner, leaving it flush with the tile edge.
g. Joints shall be well-compacted and free of voids and gaps.
h. Fill the joints with the maximum amount of grout possible, except expansion control joints.
i. Thoroughly remove excess epoxy from the face of the tile before it loses its plasticity or begins to set.
j. Clean tiles immediately after applying each unit of epoxy.
k. Do not disturb, grout or walk over tiles for at least 24 hours.

9. Protection:

a. Before allowing foot traffic over finished tile surfaces cover the work with a layer of heavy polyethylene film, building paper, or other accepted protective covering.
b. Lay board walkways on areas to be used as passage ways for workers.

10. Replacement: Remove and replace loose, cracked, broken, or otherwise damaged or defaced tile or marble.

END OF SECTION

09510
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SUMMARY

A. Related Sections:

1. 09200 - Metal Studs, Lath, Suspension Ceilings, Plaster, and Stucco.
2. 09310 - Ceramic Tile.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. A653-96 Standard Specification for Steel Sheet, Zinc-coated (Galvanized) or Zinc-iron Alloy-coated (Galvannealed) by the Hot-dip Process.
2. C635-95 Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings.
3. C636-96 Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
4. E1264-96 Classification for Acoustical Ceiling Products.

B. Ceiling and Interior Systems Contractors Association (CISCA) publication (current edition): Acoustical Ceilings - Use and Practice.

C. Underwriters Laboratories (UL) fire rating listings and classifications.

1.03 SUBMITTALS

A. Submit properly identified product data, including properties of lay-in panels, fire tests, details of suspension grid system, and installation instructions for review before starting work.

B. Shop Drawings: As may be required by A/E. Coordinate grid erection drawings with lighting fixtures, air-conditioning outlets, access panels, sound system, and other openings and irregularities.

C. Samples: Submit identified samples of each of the following for review and selection:

1. Exposed grid suspension system with angle.
2. Acoustical lay-in panel, 12 inches square piece.

PART 2 PRODUCTS

2.01 MATERIALS

A. Acoustical Lay-in Panels, Mineral Fiber Type:

1. 24 inches x 24 inches.
2. Complying with ASTM E1264, Class A, Type 3, Form 2, square edged.
3. Nominal Thickness: 5/8".
4. Finish: Factory applied, washable white.
5. Manufacturers:

    a. Directional Panels:

        1) Armstrong: Minaboard #756 Fissured lay-in panels.
        2) Celotex: Hytone FH-157 Fissuretone II lay-in panels.
        3) USG Interiors: Auratone #560 Fissured lay-in panel.

    b. Non-directional Panels:

        1) Armstrong: Cortega #770 Fissured lay-in panels.
        2) Celotex: Baroque BET-157 Fissured lay-in panels.
        3) USG Interiors: Auratone Radar #2110 Fissured lay-in panel.

B. Acoustical Lay-in Panels, Fire Rated Mineral Fiber Type:

1. 24 inches x 24 inches.
2. Complying with ASTM E1264-90, Fire Rated, Class A, Type 3, Form 2, square edged.
3. Nominal Thickness: 5/8".
4. Finish: Factory applied, washable white.
5. Weight: 1 pound per square foot minimum.
6. Manufacturers:

    a. Directional:

        1) Armstrong: Minaboard #896 Fissured Fire Guard lay-in panels.
        2) Celotex: Hytone Fissuretone II PFH-157 Protectone lay-in panels.
        3) USG Interiors: #585 Fissured Fire Code lay-in panels.

    b. Non-directional:

        1) Armstrong: Cortega #824 Fissured Fire Guard lay-in panels.
        2) Celotex: Baroque #PBT 157 Fissured Protectone lay-in panels.
        3) USG Interiors: Radar #2115 Fissured Fire Code lay-in panels.

C. Hangers: 12 gage (0.109" diameter) annealed steel wire, galvanized.

D. Exposed Suspension Grids For Acoustical Lay-in Panels:

1. 2 feet x 2 feet grid pattern with steel caps for exposed grid tee and angle

members complying with ASTM C635, zinc-coated or hot-dipped galvanized complying with A653, factory painted steel parts with factory applied white baked enamel or polyester finish.

2. Manufacturers:

    a. Armstrong.
    b. Celotex.
    c. Chicago Metallic Corporation.
    d. USG Interiors, Inc. (Donn).

PART 3 EXECUTION

3.01 INSTALLATION

A. Powder activated fasteners are not allowed.

1. Coordinate and provide inserts, anchors, bolts, hangers, or other means to support ceilings suspended from structure.
2. If inserts have been omitted from the concrete structure, drill structure as needed to support equipment only with A/E's prior approval for drilling locations.

B. Install specified suspension system and acoustical lay-in panels according to ASTM C636 and CISCA Publication "Acoustical Ceilings - Use and Practice", and applicable manufacturer's printed instructions.

1. Complete partitions indicated to be extended to overhead construction with finishes applied before installation of ceilings abutting such partitions.
2. Provide one hanger minimum for each 16 square feet of ceiling.

    a. Locate hanger wire not more than 1 foot away from main runners resting on wall trim.

C. Acoustical Lay-in Panels:

1. Fit acoustical lay-in panels to grid accurately, without dented, broken, cracked, chipped, or soiled surfaces.
2. A cut panel shall be a size that will not expose an edge when the panel is slid to the opposite side.

D. Light Fixtures:

1. Fit acoustical lay-in panels accurately around surface mounted and stem mounted electrical fixture outlets.
2. Adequately support tees supporting light fixtures by hanger wires so grid is level after light fixture installation.

    a. Provide a hanger wire within 3 inches of each recessed lay-in light fixture corner.

E. Alignment:

1. Align suspension members for true level surfaces and straight lines. Run joints and exposed grid members parallel to the room axis in both directions.
2. Install exposed suspension grids per installers accepted grid layout drawings, properly coordinated with air conditioning and electrical trades.

F. Border Balance:

1. Balance border areas to avoid acoustical units less than 1/2 unit wide.

G. Textured or Patterned Acoustical Panels: Install in pattern in one direction including grain of panels with alternating grain, unless otherwise directed in writing by A/E.

3.02 ADJUSTING AND CLEANING

A. Replace dirty or discolored acoustical panel surfaces following erection and leave free from defects.

B. Remove damaged or improperly installed acoustical panels and replace.

END OF SECTION

09660
RESILIENT TILE FLOORING

PART 1 GENERAL

1.01 SUMMARY

A. Related Sections:

1. 03300 - Cast-In-Place Concrete.
2. 09665 - Sheet Vinyl Floor System.
3. 08710 - Finish Hardware.
4. 15421 - Drains and Cleanouts.
5. 16132 - Floor Boxes.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):

1.	E84-96a	Test Method for Surface Burning Characteristics of Building Materials.
2.	E648-97	Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
3.	E662-95	Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
4.	F710-92	Standard Practice for Preparing Concrete Floors and Other Monolithic Floors to Receive Resilient Flooring.
5.	F1066-95a	Standard Specification for Vinyl Composition Floor Tile, except Section 5 - Materials and Manufacture.

1.03 SUBMITTALS

A. Submit properly identified product data, including installation instructions before starting work.

B. Samples: Submit manufacturer's standard size samples of each type, color, and finish of resilient flooring and required accessories including full range of flooring color and pattern variations available from proposed manufacturer.

C. Manufacture's Safety Data Sheet (MSDS) for adhesive.

D. Quality Control Submittals: Provide manufacturer's printed document indicating compliance to slip-resistant coefficient requirements.

E. Maintenance Instructions: Submit manufacturer's written instructions for recommended maintenance practices for installed resilient flooring to include:

1. Schedule: Frequency and type of maintenance defined.
2. Equipment: Equipment and tools specified by generic language or

manufacturer's name.

3. Materials: Chemicals required to maintain flooring by brand name, quantities, and proper solutions.

1.04 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Resilient flooring systems shall comply with the minimum slip-resistant coefficients of:

a. 0.5 - For leveled floors.
b. 0.6 - For accessible routes.
c. 0.8 - For inclined floors such as, but not limited to, ramps.

2. Non-compliance of slip-resistant coefficient factor will be grounds for removal and disposal of installed flooring system, properly preparing the floor substrate and installation of required slip-resistant flooring system at no expense to THE CITY.

B. Taber Abrasionmeter Testing:

1. The weight loss of each tile shall average no more than 0.60 grams when ten tiles are abraded with aluminum oxide grit and a S-39 leather wheel for 2000 cycles according to ASTM F510-81.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in manufacturer's unopened original dry packaging, with tags and labels intact.

B. Provide equipment and personnel to handle materials to prevent damage from dropping, careless storage, and handling.

C. Store material in weather protected space with temperature between 65 and 90 degrees F.

1.06 SITE CONDITIONS

A. Maintain room and material temperature between 65 degrees F. and 90 degrees F. for at least 48 hours before, during, and 48 hours after installation. Maintain a minimum 65 degrees F. thereafter. Painting shall be completed, air-conditioning operational, and exterior thresholds installed.

1.07 WARRANTY

A. Furnish manufacturer's standard warranty covering manufacturing defects for a period of 2 years.

B. Installer shall warrant in writing 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 CITY.

PART 2 PRODUCTS

2.01 MATERIALS

A. Vinyl Composition Tile (VCT):

1. Manufacturers:

a. Standard Excelon by Armstrong, Lancaster, PA.
b. Flex-thru by Flextile, Toronto, Ontario.
c. Essentials by Mannington, Salem, NJ.
d. Expressions by Tarkett, Parsippany, NJ.

2. 12 inches x 12 inches x 1/8", marbleized pattern, composed of resin binder, fillers, and pigments.

a. The marbleized pattern on the surface of the tile shall be dispersed uniformly throughout the thickness of the tile to the back of the tile without significant change.

3. Color and Pattern:

a. As shown on the drawings, or accepted equivalent, as selected by A/E from the manufacturer's standard color selection for the specified product.
b. Colors and patterns shall be judged accepted equivalent, as determined by the A/E, to those preselected or above specified patterns and colors by the manufacturers as specified.

4. Tile shall comply with:

a. American Society for Testing and Materials (ASTM):

1) E648Critical Radiant Flux (CRF) of not less than 0.45 watts per square centimeter.
2) E662Smoke density not more than 450.

B. Resilient Accessories:

1. At Walls:

a. 1/8" thick, 4 or 6 inches high rubber with cove profile.
b. As shown on the drawings, colors shall be selected by a/e.
c. Colors shall be judged equivalent, as determined by the A/E, to those preselected or above specified colors.
d. At all corners, provide inside/outside corners as applicable to the specific

corner. Extend 4 inches minimum beyond corner.

e. Premolded corners are not allowed.

2. Colors and patterns shall be judged equal equivalent, as determined by the A/E, to those preselected or above specified colors and patterns.
3. Manufacturers:

a. Armstrong.
b. Flexco.
c. Johnsonite.
d. Burke Mercer.
e. R.C.A. Rubber.
f. Roppe.

C. Accessories:

1. Metal transition (edge) thresholds, Pemko #173A, Pemko #174C, or accepted equivalent.
2. Tile Adhesive: Non-toxic, waterproof, stabilized type as recommended by resilient tile flooring manufacturer, complying with EPA requirements.

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 off the work have been corrected in an acceptable manner.

3.02 PREPARATION

A. Comply with ASTM F710, manufacturer□s recommendations, and as specified for surface preparation.

B. Concrete shall be smooth and level, with maximum surface variations not exceeding 1/8" in a 10 foot radius. Grind down ridges and other irregularities.

C. Fill cracks, holes, and depressions with cementitious based or white premixed latex underlayment as recommended by the flooring manufacturer. Latex and powder shall be from the same manufacturer and as recommended by the manufacturer.

D. Seal concrete slabs to receive interlocking rubber flooring.

E. Remove paint, oils, bond breakers, waxes, and sealers from surface. Inorganic solvents are not to be used.

F. Moisture Tests:

1. Determine whether the concrete slab is adequately dry for resilient flooring installation.
2. Test concrete slabs in new construction or existing slabs on grade for

manufacturer’s allowable moisture content by one of the following:

a. The protimeter electrical conductivity survey master moisture test instrument.
b. Calcium chloride test.

3.03 INSTALLATION

A. Lay resilient flooring with adhesive cement according to manufacturer's recommendations with (linear)(basketweave) tile layout.
B. Lay interlocking rubber flooring over sealed concrete floor without adhesives.
C. Layout:

1. Butt tightly to vertical surfaces, thresholds, nosings, and edges.
2. Scribe, as necessary, around obstructions to produce neat joints, laid tight, even, and straight.
3. Extend flooring into toe spaces, door reveals, into closets, and similar openings.
4. Install border tiles next to walls of not less than one half tile and of approximately equal size around the perimeter of the room.

D. Fill surface imperfections such as cracks, depressions, or rough areas with underlayment.

1. Provide ventilation in areas where adhesive is being used. When natural ventilation is inadequate, use safety-spark-proof fans and prohibit smoking.

E. Transition (Edge) Strips:

1. Install metal transition (edge) thresholds with concrete screws at 6 inches o.c. wherever exposed edges of resilient flooring materials occur, Pemko #173A, Pemko #174C, or accepted equivalent.
2. Where resilient flooring stops at doorways, set transition thresholds directly under the door in its closed position.

3.04 CLEANING AND PROTECTION

A. Remove excess adhesive and other soilings from floors and adjacent surfaces, using neutral type cleaners as recommended by resilient flooring manufacturer.

1. Do not use acids or other caustic solutions as cleaning agents.

B. Clean and apply 3 coats of approved liquid wax floor finish to VCT according to wax manufacturer□s printed instructions.

C. Before allowing traffic, protect installed flooring from damage by covering with clean, heavy duty building paper from time of cleaning until all work in the area is complete.

END OF SECTION

09665
SHEET VINYL FLOORING

PART 1 GENERAL

1.01 SUMMARY

A. Related Section:

1. 03300 - Cast-In-Place Concrete.
2. 09561 - Hardwood Strip Flooring System.

1.02 REFERENCES

A. American Society for Testing and Standards (ASTM):

1. F710-92 Standard Practice for Preparing Concrete Floors and Other Monolithic Floors to Receive Resilient Flooring.

1.03 SUBMITTALS

A. Manufacturer's catalog cuts, product data, and installation instructions.

B. Samples: Submit heat weld colors and 3-inch x 6 inch samples of material for review to the A/E for pattern and color selection.

C. Manufacture's Safety Data Sheet (MSDS) for adhesive.

D. Quality Control Submittals:

1. Submit manufacturer's statement of approval of floor system installer.
2. Submit manufacturer's printed document indicating compliance to slip-resistant coefficient requirements.

E. Seaming diagram for heat welds.

1.04 QUALITY ASSURANCE

A. Qualifications: Installers of the sheet vinyl flooring system shall be certified by the sheet vinyl flooring system manufacturer as an approved installer of their products.

B. Regulatory Requirements:

1. Resilient flooring systems shall comply with the minimum slip-resistant coefficient of:

a. 0.5 - for leveled floors.
b. 0.6 - for accessible routes.
c. 0.8 - for inclined floors.

2. Non-compliance of slip-resistant coefficient factor will be grounds for removal and disposal of installed flooring system, and the proper preparation of the floor substrate and installation of flooring system meeting required slip-resistant coefficient requirements at no expense to THE CITY.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store material in weather protected space with temperatures between 65 and 90 degrees F.

1.06 SITE CONDITIONS

A. Maintain room temperature between 65 and 90 degrees F. for at least 48 hours before, during, and 48 hours after installation. Maintain a minimum 55 degrees F. thereafter.

1.07 WARRANTY

A. Furnish manufacturer's standard warranty covering manufacturing defects for a period of 1 year.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Sheet Vinyl Flooring;

1. Armstrong, Inc.
2. Mannington, Inc.
3. Multitones, Marleyflor Plus, and HD Acoustics by Marley, Richmond, VA.
4. Tarkett.

B. Slip Resistant Sheet Vinyl Flooring:

1. Impressionist II, Designer 25, Stronghold 35, and Marine 20 by Altro, Nazareth, PA.
2. Assurance by Mannington.

C. Resilient Rubber Wall Base:

1. Armstrong.
2. Flexco.
3. Mercer.
4. Roppe.

2.02 MATERIALS

A. Sheet Vinyl:

1. Sheet Vinyl, General Commercial: Homogeneous PVC construction, minimum 0.080" thick, non-asbestos.
2. Sheet Vinyl, Acoustical: Homogeneous PVC wear layer with open cell foam interlayer and stabilizing backing construction, minimum 0.060" thick, non-asbestos.
3. Sheet Vinyl, Slip Resistant: Homogeneous PVC construction, minimum 0.080" thick, non-asbestos.
4. Color and Pattern:

    a. As shown on the drawings, or accepted equivalent, as selected by A/E from the manufacturer's standard color selection for the specified product.
    b. Colors and patterns shall be judged equivalent, as determined by the A/E, to those preselected or above specified colors and patterns by the manufacturers as specified.

B. Rubber Base:

1. 1/8" thick, 4 or 6 inches high rubber with cove profile.
2. As shown on the drawings, or accepted equivalent.
3. Colors shall be judged equivalent, as determined by the A/E, to those preselected or above specified colors.
4. At all corners, provide inside/outside corners as applicable to the specific corner. Extend 4 inches minimum beyond corner.
5. Premolded corners are not allowed.

C. Adhesive: Non-toxic as recommended by sheet vinyl flooring manufacturer, complying with EPA requirements.

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. Comply with ASTM F710, manufacturer’s recommendations, and as specified for surface preparation.

B. Area to receive sheet vinyl floor covering shall be weathertight, with room temperature not less than 65 degrees F., adequately lighted and the work of other trade shall be complete.

C. Concrete shall be smooth and level, with maximum surface variations not exceeding

1/8" in a 10-foot radius. Grind down ridges and other irregularities.

D. Fill cracks, holes, and depressions with cementitious based or white premixed latex underlayment as recommended by the flooring manufacturer. Latex and powder shall be from the same manufacturer and as recommended by the manufacturer.

E. Moisture Tests:

1. Determine whether the concrete slab is adequately dry for flooring installation.
2. Test concrete slabs in new construction or existing slabs on grade for manufacturer□s allowable moisture content by one of the following:

   a. The protimeter electrical conductivity survey master moisture test instrument.
   b. Calcium chloride test.

F. Substrates: Dry, smooth, level, and clean of dirt and other foreign matter.

1. Do not coat substrate surfaces with any type of membrane or curing compound.
2. Level high spots in substrate by grinding or sanding, fill low spots or areas only with latex type powder and liquid underlayments.

G. Plan sheet floor layout to minimize the number and total length of seams. Seams shall be placed in inconspicuous locations, out of the path of heavy foot traffic.

H. Install sheet vinyl floor covering according to the manufacturer's installation instructions using manufacturer's recommended adhesive. Seams shall be heat welded.

I. Lay dance sheet vinyl flooring without adhesives and tape joints using manufacturer's recommended tape.

3.03 CLEANING AND PROTECTION

A. Remove excess adhesive and other soilings from floors and adjacent surfaces using neutral type cleaners as recommended by sheet vinyl floor manufacturer.

1. Do not use acids or other caustic solutions as cleaning agents.
2. Sheet Vinyl: Clean according to manufacturer's instructions and apply 3 coats of approved liquid wax floor finish.
3. Dance Floor Sheet Vinyl Flooring: Clean according to manufacturer's instructions.

B. Before allowing traffic, protect installed flooring from damage by covering with clean, heavy duty building paper from time of cleaning until all work in the area is complete.

END OF SECTION

09730
EPOXY RESIN FLOORING WITH COVE BASE

PART 1 GENERAL

1.01 SUMMARY

A. Related Sections:

1. 03300 - Cast-in-Place Concrete.
2. 09900 - Painting.
3. 09905 - Epoxy Resin Wall Finish.

1.02 REFERENCES

A. American Society for Testing and Standards (ASTM):
1. F710-92 Standard Practice for Preparing Concrete Floors and other Monolithic Floors to Receive Resilient Flooring.

1.03 SUBMITTALS

A. Manufacturer's specifications, recommendations, and installation instructions for specified underlayment and topping materials. Include the following:

1. Manufacturer's published data, or letter of certification, or certified testing laboratory report, indicating each material complies with specified requirements and is intended for application shown.
2. Manufacturer's standard color chart.
3. Manufacturer's top coat skid-resistance chart ranging from fine to coarse.

B. Samples: Provide 4 inch by 4-inch minimum samples in the color and finish as selected by the A/E.

1. Provide a minimum of 3 samples per color and finish as selected by the A/E.
2. The epoxy resin composition flooring samples shall be applied to a rigid backing.

1.04 QUALITY ASSURANCE

A. Applicator: Submit evidence in writing that intended applicator is approved by the flooring materials manufacturer.

B. Compliance: Upon completion of work submit report signed by an authorized representative of applicator certifying compliance with the flooring manufacturer's recommended procedures and specifications.

C. Pre-Installation Conference:

1. Arrange a meeting not less than 30 days before starting work.
2. Attendance: General Contractor, A/E, THE CITY's representative, manufacturer's representative, and installer's representative.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Check delivered material to job-site for completeness and shipping damage before starting work.

B. Materials used shall be factory pre-weighed and prepackaged in single, easy to manage batches.

C. Store materials in a dry and enclosed area, protected from exposure to moisture. Maintain temperature of storage area between 68 and 90 degrees F.

1.06 PROJECT CONDITIONS

A. Allow for concrete substrate to properly cure concrete substrate for a minimum of 28 days.

1. If manufacturer requirements are stricter than the minimum required 28 days curing time, comply with manufacturer's requirements.

B. Work area shall be free of other trades during installation, and for a minimum period of 24 hours after installation.

C. Protect finished floor from damage by subsequent trades.

1.07 WARRANTY

A. Manufacturer shall furnish a single written warranty covering both material and labor for a period of 5 years from date of substantial completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Epoxy Resin Composition Flooring:
1. Dex-O-Tex: Decorflor and Cheminert KD.
2. Dur-A-Flex: Dur-A-Quartz.
3. Selby: Selbaclad, Selba Twede HD.
4. Master Builders: Morritex.
5. StonHard, Inc.: Stonshield HRI.

B. Slip Retardant Epoxy Resin Coating:
1. Dex-O-Tex: Posi-tred "O".
2. Accepted equivalent.

2.02 MATERIALS

A. Epoxy Resin Composition Flooring:

1. Basecoat:
   a. Thickness: 1/4".
   b. Color: Selected by the A/E from the basecoat manufacturer's stock color selection.

2. Top Coat:
   a. Colored, skid-resistant, orange peel texture, non-abrasive topping in quantity as recommended by the basecoat manufacturer for use with the specified basecoat.
   b. Color: Matching basecoat color.

3. Skid-Resistance: Selected by the A/E from the basecoat manufacturer's stock selection showing a smooth skid-resistance and with a coefficient of friction of at least 0.5.

4. Underlayment: As recommended by the basecoat manufacturer.

5. Joint Sealant Materials: As produced by manufacturer of epoxy resin composition flooring system for type of service and joint condition indicated.

B. Slip Retardant Epoxy Resin Coating:
1. Skid-resistant, metallic oxide aggregate course topping in quantity as recommended by the basecoat manufacturer for use with the specified basecoat.
2. Skid-Resistance: Dry and wet coefficient of friction of at least 0.8.

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. Existing Slopes to Floor Drains: Before starting work, verify existing slopes to floor drains function properly and do not leave standing water or "bird baths". If such conditions are found to exist, notify the A/E before proceeding with the work.

3.02 PREPARATION

A. Comply with ASTM F710, manufacturer’s recommendations, and as specified for surface preparation of new and existing substrates.

B. Remove fixed and movable equipment before application of impervious flooring material. Reinstall after application of impervious flooring materials is complete.

C. Moisture Tests:

1. Determine whether the concrete slab is adequately dry for flooring installation.
2. Test concrete slabs in new construction or existing slabs on grade for manufacturer’s allowable moisture content by one of the following:
    a. The protimeter electrical conductivity survey master moisture test instrument.
    b. Calcium chloride test.

D. Concrete shall be smooth and level, with maximum surface variations not exceeding 1/8" in a 10-foot radius. Grind down ridges and other irregularities.
1. Fill cracks, holes, and depressions with latex cement underlayment as recommended by the flooring manufacturer.

E. Cleaning Before Installation:
1. Clean substrate surfaces to be free of paint, wax, oil, grease or other materials that can affect bonding and smoothness of basecoat materials. Provide a clean, dry, and neutral substrate.
2. Shot-blast concrete surfaces as required to obtain optimum bond of flooring to concrete.
    a. Remove sufficient material to provide a sound surface free of laitance, glaze, efflorescence, and any bond-inhibiting curing compounds or form release agents.
    b. Remove grease, oil, and other penetrating contaminates.
    c. Repair damaged and deteriorated concrete to acceptable condition.
    d. Leave surfaces free of dust, dirt, laitance, and efflorescence.

3.03 INSTALLATION

A. Application:
1. Apply troweled epoxy resin composition flooring with integral 4-inch-high cove base by an applicator approved by the manufacturer of the flooring materials.
2. Apply without seams according to shop drawings and the flooring manufacturer's printed instructions.
3. New flooring thickness shall be uniform to maintain existing slope to floor drain, chip a minimum of 12 inches around floor drain to maintain new flooring thickness at the drain.

B. Patching or Repair: Patch or repair cracks and level uneven areas with specified underlayment materials according to underlayment manufacturer's recommendations.

3.04 ADJUSTING AND CLEANING

A. Use cleaning materials and procedures recommended by flooring manufacturer.

B. Contractor is responsible for protection and cleaning of surfaces after final coats.

3.05 PROTECTION

A. Protect installed floor from damage and wear during overall construction operation. Contractor shall comply with manufacturer's recommendations for protective materials.

END OF SECTION

09900
PAINTING OF UNPAINTED SURFACES

PART 1 GENERAL

1.01 SUMMARY:

A. Section Includes:

1. 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.
2. 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. 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.

B. 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 from THE CITY.
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” x 18” panels with texture simulating actual finish. Label and identify each by location.

1) Provide three samples of each color and material on 6” x 18” samples, on wood, of natural and stained wood finish. Label and identify each by location.
2) Provide three 6” x 18” samples of masonry for each type of finish and color, defining filler, prime, and finish coat. Label and identify each by location.

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 name, project number, name of the Contractor, name of the supplier, designated use, and type of paint in the container.

C. 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 CITY, from the authorized paint manufacturer representative, a signed and notarized letter stating that the surfaces painted have met all the conditions for paint adhesion.
4. Warranties require acceptance by the City of Miami Paint Quality Staff.

1.05 QUALITY ASSURANCE

A. Qualifications: Paint applicator shall be licensed in the State of Florida or in Miami-Dade County and use state or county-certified journeymen. Provide a legible copy of license and, when applicable, a journeyman's certification attesting to required qualifications.

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.
2. Products shall be listed by the Florida Plant Management Association.

C. 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 the City of Miami.

D. 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, paint manufacturer, and the City of Miami Paint Quality Staff.

E. Mockups:

1. Provide a mockup of each wall surface condition, allowing space for a minimum of 20 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.

5. The City of Miami Paint Quality Staff will test the mockup sample or selected painted surface according to ASTM D3359. If test fails, retesting shall be at the Contractor's expense.

F. 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.
4. Paint (red), using stencils, identifications and warnings, following text specified in other sections.
5. Paint (yellow), door-swing arcs and warning lines where required.

G. 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, attached signs, 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, of concrete or masonry surfaces such as walls or ceilings in concealed and areas of limited access, foundation spaces, furred areas, utility tunnels, pipe spaces, duct shafts, and elevator shafts.
3. Finished Metal Surfaces: Painting is not required at metal surfaces of anodized or enameled aluminum, stainless steel, chromium plate, bare copper, bare bronze, and metals of similar finish. Paint visible galvanized steel and mill-finish aluminum surfaces.
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 are not required to be painted.

H. 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.

I. Do not paint over code-required labels such as Underwriters Laboratories (UL) and Factory Mutual (FM), name, equipment identification, performance rating, or nomenclature plates, or at piping or circuit identifiers.

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 THE CITY including necessary removal or protection of other work, without limit, within 30 days after notification by the THE CITY, and to perform such work based on the provisions of this section, including extension of the guarantee to cover new work.

1.010 MAINTENANCE

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 MANUFACTURERS

A. Use approved manufacturers
1. Sherwin Williams.
2. Benjamin-Moore
3. A/E Approved equal.

2.02 MATERIALS

A. Use materials listed in the City of Miami Paints, available from City of Miami Materials Control.

1. Latex-based materials shall be used for painting of exterior and interior finishes.

B. Primers, Undercoats, Split and Finish Coats: Use materials from same manufacturer when such materials are applied on same surface.

C. 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.

D. Color Selection:

1. Select colors with City and A/E.
2. If color is not listed for a specific area or item, Contractor is not relieved of responsibility for providing colors subsequently selected.
3. Color selection made by A/E is to determine basic color required for surface.
4. Colors with same designation but produced from two or more sources shall match when viewed from distance of 24 inches or more.
5. Final application of colors shall match prepared samples approved by A/E.

E. 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 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 CITY 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 City Staff 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 City 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 CITY 's property.

C. Dispose oil-based products, their by-products, and waste contaminated by them, in a manner acceptable to THE CITY Safety and Environmental Hazards Management.

3.06 IDENTIFICATION OF SURFACES AND PAINTING SCHEDULE

A. Material designations (e.g. MP-26) refer to coatings listed in City of Miami Paints.
1. Submit requests for substitutions originating from the materials manufacturers at the Pre-Construction meeting specified in Part 1 of this section.
2. Such substitutions will be considered only to allow manufacturers to meet the terms of guarantees required, and will be subject to approval by the A/E.

3. Substitutions from other sources will be considered as provided in Instructions to Bidders and General Conditions.

B. 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.

C. 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.

D. INTERIOR SPACES PAINT SCHEDULE

1. Walls: Unless noted otherwise on plans)

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.

E. 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 (reference page F-1 of City of Miami Paints.
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

09905
EPOXY RESIN WALL FINISH

PART 1 GENERAL

1.01 SUMMARY

A. Section includes: Two-component epoxy resin wall finish work as indicated or specified in this section.

B. Related Sections:

1. 04520 - Concrete Unit Masonry.
2. 09730 - Epoxy Resin Flooring with Integral Cove Base.
3. 09900 - Painting.

1.02 SUBMITTALS

A. Manufacturer's published data and letter of certification or certified testing laboratory report, indicating each material complies with requirements of this specification and is intended generally for application shown.

B. Manufacturer's standard color chart.

1.03 QUALITY ASSURANCE

A. Applicator: Submit evidence that the intended applicator is approved by two-component epoxy resin wall finish material manufacturer.

B. Certification: Products shall be listed by the Florida Plant Management Association.

C. Compliance: Upon completion of work, submit report signed by an authorized representative of applicator certifying compliance with procedures and specifications.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Epoxy Resin Wall Finish:

1. Cross-Guard Wallcote "E" (solventless) by Crossfield Products Corporation.
2. Pittglaze (water base) acrylic epoxy by PPG Industries.

2.02 MATERIALS

A. Primer: As recommended by the coating manufacturer.

B. Coating Color: Selected by the A/E from the approved manufacturer's stock color selection.

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. Application: Apply reacted epoxy resin wall finish full height on walls as indicated for a jointless surface, finished to neat uniform edges according to accepted manufacturer's printed instructions.

B. Preparation:

1. Remove surface mounted equipment, accessories, and movable equipment before application of impervious wall material. Reinstall such removed surface mounted equipment, accessories, and movable equipment after application of impervious wall material is complete.

   a. “Surface mounted equipment and accessories” defined:

   b. In food service kitchens, sculleries (dishwashing), can wash, and related vestibule areas, "surface mounted equipment and accessories" shall be interpreted to mean soap and towel dispensers, mirrors, chalkboards or tackboards, shelving, cabinets, wood or metal tables, stoves, ovens or other types of cooking equipment, refrigerators, or any other types of apparatus, equipment, device or machine, fixed or portable, used within the space for preparation, storing or dispensing of food products of any kind that will prevent the proper and timely application of impervious wall materials specified.

   c. In toilet rooms and related vestibule areas, "surface mounted equipment and accessories" shall be interpreted to mean wall mounted paper towel holders, toilet paper holders, soap dispensers or other equipment, devices or apparatus, excluding lavatories, water closets, urinals, sinks and electric hand dryers, that will prevent the proper and timely application of impervious wall materials specified.

2. Prepare new or existing substrates according to the manufacturer's recommendations.
3. Clean substrate surfaces free of paint, wax, oil, grease, or other material that affect bonding and smoothness of the applied materials.
4. Patch or repair cracks or uneven areas with materials recommended by the two-component epoxy resin wall finish manufacturer.

C. Cleaning: Leave finished work clean and free of blemishes, dirt, finger prints, and other foreign matter.

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

END OF SECTION

10160
TOILET COMPARTMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Powder-Coated Steel:
1. Headrail braced partitions.
2. Ceiling hung partitions.
3. Floor mounted partitions.
4. Floor-to-ceiling pilaster partitions.
5. Wall mounted urinal screens.
6. Floor mounted urinal screens.
7. Flange mounted urinal screens.

B. Stainless Steel:
1. Headrail braced partitions.
2. Ceiling hung partitions.
3. Floor mounted partitions.
4. Floor-to-ceiling pilaster partitions.
5. Wall mounted urinal screens.
6. Floor mounted urinal screens.
7. Flange mounted urinal screens.

C. Solid Polymer (HDPE):
1. Headrail braced partitions.
2. Ceiling hung partitions.
3. Floor-to-ceiling pilaster partitions.
4. Wall mounted urinal screens.

1.2 RELATED SECTIONS

A. Section 05500 - Metal Fabrications: Steel supports for ceiling hung partitions.

B. Section 10500 - Lockers.

C. Section 10800 - Toilet and Bath Accessories.

1.3 REFERENCES

A. ASTM A 65 3/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

B. ASTM A 24 0/A 240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.

2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Shop Drawings: Show layout, door swings, clearance to fixtures, hardware, and methods of anchoring.

D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

F. Operations and Maintenance Data: At completion of the project, furnish to the Owner two (2) copies of an Owner's Operation and Maintenance Manual.

1.5 QUALITY ASSURANCE

A. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
1. Finish areas designated by Architect.
2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
3. Refinish mock-up area as required to produce acceptable work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Mark packaging with numbering or nomenclature used on shop drawings.

B. Store products in manufacturer's unopened packaging until ready for installation.

1.7 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits. The Manual shall consist of a hard cover three ring binder with the project name in the front. Include in the manual the following information: Maintenance instructions, Catalogue pages for each product, Name/Address and phone number of the Manufacturer and their Sales Agent, Copy of the final shop drawings.

1.8 WARRANTY

A. The Toilet Partition manufacturer shall guarantee all solid plastic toilet partitions by written certification, for a period of 25 years against breakage, delamination, and corrosion of solid plastic parts.

B. The toilet partition manufacturer shall guarantee all powder coated toilet partitions by written certification, for a period of 3 years against defects in material and workmanship. Warranty does not include installation errors, improper usage or vandalism.

C. The toilet partition manufacturer shall guarantee all stainless-steel toilet partitions by written certification, for a period of 5 years against defects in material and workmanship. Warranty does not include installation errors, improper usage or

vandalism.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Hadrian Inc., which is located at: 7420 Clover Ave.; Mentor, OH 44060; Tel: 440-942-9118; Fax: 440-942-9618; Email: request info (mail@hadrian-inc.com); Web: www.hadrian-inc.com

B. Substitutions: approved A/E equal

C. Requests for substitutions will be considered in accordance with provisions of Section 01600; include the following with request for substitution:
   1. Product Data and finish sample submittals as described under Submittals.
   2. Full-size sample of partition, which will be returned to manufacturer.

2.2 METAL COMPARTMENTS AND SCREENS

A. Toilet Compartments: Headrail braced.
   1. Compartment Depth and Width: As indicated on drawings.
   2. Door Width: 23 inches (610 mm), minimum; at wheelchair accessible compartments, 36 inches (915 mm), minimum.
   3. Door and Panel Type:
      a. Style: Standard (58 inches / 1473 mm high doors and panels).
      b. Style: Elite (64 inches / 1626 mm high doors and panels).
      c. Style: Elite Plus (72 inches / 1829 mm high doors and 76 inches / 1930 mm high panels).
   4. Doors and Panels:
      a. Top at 69.5 inches (1765 mm) above finished floor.
      b. Top of door at 77.5 inches (1968mm) and top of panels at 81.5 inches (2070mm).
      c. Bottom at 12 inches (305 mm) above finished floor.
      d. Bottom at 6 inches (152 mm) above finished floor.
   5. Pilaster Width: As required to fit space; minimum 3 inches (76 mm).
   6. Pilaster Height: 81.5 inches (2070 mm).

B. Toilet Compartments: Ceiling hung.
   1. Ceiling Height: As indicated on drawings.
   2. Ceiling Height: 96 inches (2440 mm).
   3. Compartment Depth and Width: As indicated on drawings.
   4. Door Width: 23 inches (610 mm), minimum; at wheelchair accessible compartments, 36 inches (915 mm), minimum.
   5. Doors and Panels:
      a. Top at 69.5 inches (1765 mm) above finished floor.
      b. Bottom at 12 inches (305 mm) above finished floor.
      c. Bottom at 6 inches (152 mm) above finished floor.
   6. Door and Panel Type:
      a. Style: Standard (58 inches / 1473 mm high doors and panels).
      b. Style: Elite (64 inches / 1626 mm high doors and panels).
   7. Pilaster Width: As required to fit space; minimum 3 inches (76 mm).
   8. Bottom of Pilasters: At 12 inches (305 mm) above finished floor.

9. Bottom of Pilasters: At 6 inches (152mm) above finished floor.

C. Toilet Compartments: Floor mounted.
   1. Compartment Depth and Width: As indicated on drawings.
   2. Door Width: 23 inches (610 mm), minimum; at wheelchair accessible compartments, 36 inches (915 mm), minimum.
   3. Doors and Panels:
      a. Top at 69.5 inches (1765 mm) above finished floor.
      b. Bottom at 12 inches (305 mm) above finished floor.
      c. Bottom at 6 inches (152 mm) above finished floor.
   4. Door and Panel Type:
      a. Style: Standard (58 inches / 1473 mm high doors and panels).
      b. Style: Elite (64 inches / 1626 mm high doors and panels).
   5. Pilaster Width: As required to fit space; minimum 3 inches (76 mm).
   6. Pilaster Height: 69 inches (1753 mm).

D. Toilet Compartments: Floor to ceiling pilasters.
   1. Floor to Ceiling Height: As indicated on drawings.
   2. Floor to Ceiling Height: 96 inches (2440 mm).
   3. Compartment Depth and Width: As indicated on drawings.
   4. Door Width: 23 inches (610 mm), minimum; at wheelchair accessible compartments, 36 inches (915 mm), minimum.
   5. Doors and Panels:
      a. Top of door and panel 69.5 inches (1765 mm) above finished floor.
      b. Top of door at 77.5 inches (1968mm) and top of panel at 81.5 inches (2070mm).
      c. Bottom at 12 inches (305 mm) above finished floor.
      d. Bottom at 6 inches (152 mm) above finished floor.
   6. Door and Panel Type:
      a. Style: Standard (58 inches / 1473 mm high doors and panels).
      b. Style: Elite (64 inches / 1626 mm high doors and panels).
      c. Style: Elite Plus (72 inches / 1829 mm high doors and 76 inches / 1930 mm high panels).
   7. Pilaster Width: As required to fit space; minimum 3 inches (76 mm).
   8. Pilaster Height: As required to fit space; maximum 120 inches (3048mm).

E. Urinal Screens: Wall mounted.
   1. Depth: 12 inches (305 mm).
   2. Depth: 18 inches (457 mm).
   3. Depth: 24 inches (610 mm).
   4. Height: 42 inches (1067 mm).
   5. Height: 48 inches (1219 mm).
   6. Mounting: Stirrup brackets.
   7. Mounting: Full length T-shaped bracket with 3 inches (75 mm) wide mounting surface and 4 inches (102 mm) deep flange anchored into panel core; finish to match panels; attached with concrete anchors; only available for 18 inches (457mm) and 24 inches (610mm) deep screens.

F. Urinal Screens: Floor mounted.
   1. Depth: 24 inches (610 mm).
   2. Depth: 34 inches (864 mm).
   3. Other dimensions same as toilet compartments.

G. Urinal Screens: Flange mounted.
   1. Depth: 18 inches (457 mm).
   2. Depth: 24 inches (610 mm).
   3. Height: Top at 54 inches (1372 mm) and bottom at 12 inches (305 mm) above finished floor.
   4. Mounting: Full length T-shaped bracket with 3 inches (75 mm) wide mounting surface and 4 inches (102 mm) deep flange anchored into panel core; finish to match panels; attached with concrete anchors; only available for 18 inches (457mm) and 24 inches (610mm) deep screens.

2.3 SOLID POLYMER PARTITIONS AND SCREENS

A. Toilet Compartments: Standard Headrail braced.
   1. Compartment Depth and Width: As indicated on drawings.
   2. Door Width: 22 inches (559 mm), minimum; at wheelchair accessible compartments, 36 inches (915 mm), minimum.
   3. Doors and Panels:
      a. Top at 69 inches (1753 mm) above finished floor.
      b. Bottom at 14 inches (356 mm) above finished floor.
   4. Door and Panel Heights:
      a. Standard Style Doors and Panels: 55 inches (1397 mm) high with straight edges.
   5. Pilaster Width: As required to fit space; minimum 3 inches (76 mm).
   6. Pilaster Height: 82 inches (2083 mm).
   7. Color: One solid color to be selected from manufacturer's full line.

B. Toilet Compartments: Standard Ceiling Hung.
   1. Compartment Depth and Width: As indicated on drawings.
   2. Door Width: 22 inches (559 mm), minimum; at wheelchair accessible compartments, 36 inches (915 mm), minimum.
   3. Doors and Panels:
      a. Top at 69 inches (1753 mm) above finished floor.
      b. Bottom at 14 inches (356 mm) above finished floor.
   4. Door and Panel Heights:
      a. Standard Style Doors and Panels: 55 inches (1397 mm) high with straight edges.
   5. Pilaster Width: As required to fit space; minimum 3 inches (76 mm).
   6. Pilasters shall be securely and rigidly fastened to structural steel or pre-cast concrete supporting member in ceiling (note: wood support is not acceptable) by means of two heavy hanging studs permitting vertical adjustment between bottom of supporting member and finished ceiling line. Heavy hanging studs shall be attached to pilasters by means of a heavy duty, 3/8 inch (10 mm) thick mounting bracket. The ceiling fastening shall be concealed and protected by 3 inches (76 mm) high stainless-steel pilaster shoe. Ceiling hung partitions shall be additionally stabilized by means of a 3 inches (76 mm) stabilizer mounted 7 feet (2134 mm) from the finished floor continuous around the interior of the stall.
   7. Color: One solid color to be selected from manufacturer's full line.

C. Toilet Compartments: Standard Floor to Ceiling.

1. Compartment Depth and Width: As indicated on drawings.
2. Door Width: 22 inches (559 mm), minimum; at wheelchair accessible compartments, 36 inches (915 mm), minimum.
3. Doors and Panels:
    a. Top at 69 inches (1753 mm) above finished floor.
    b. Bottom at 14 inches (356 mm) above finished floor.
4. Door and Panel Heights:
    a. Standard Style Doors and Panels: 55 inches (1397 mm) high with straight edges.
5. Pilaster Width: As required to fit space; minimum 3 inches (76 mm).
6. Pilasters shall be securely and rigidly fastened to structural steel or pre-cast concrete supporting member in the ceiling (note: wood support is not acceptable) by means of two heavy hanging studs permitting vertical adjustment between bottom of supporting member and finished ceiling line. Heavy hanging studs to be attached to pilasters by means of a heavy duty, 3/8 inch (10 mm) thick mounting bracket. Pilasters shall be fastened to the floor on vertically adjustable floor brackets. Floor and ceiling connections shall be concealed and protected by 3 inches (76 mm) high stainless-steel pilaster shoe.
7. Color: One solid color to be selected from manufacturer's full line.

D. Standard Style:
1. Material: Panels, pilasters and doors of certified Class B HDPE solid plastic.
2. Material: Panels, pilasters and doors of 100% post-consumer recycled polyethylene (HDPE) solid plastic.
3. Doors: 1 inch (25 mm) thick by 55 inches (1397 mm) high straight cut with fine radius edges.
4. Panels: 1 inch (25 mm) thick by 55 inches (1397 mm) high straight cut with fine radius edges.
5. Pilasters: 1 inch (25 mm) thick by 82 inches (2083 mm) high straight cut with fine radius edges.
6. Headrail: 1-1/4 inches (32mm) by 1-3/4 inches (44mm) extruded anodized aluminum with anti-grip design. Wall thickness to be 1.5mm (0.060) and shall be securely attached to wall and pilasters with manufacturers fittings in such a way as to make a rigid installation. All joints in headrails shall be made at a pilaster.
7. Hardware and Fittings:
    a. Door Hinges: 1/8-inch (3 mm) thick extruded clear anodized, 8 inches (203 mm) rounded aluminum hinges, which wrap around both the door and pilaster. Hinges shall be fastened to door and pilaster with tamper-proof 6-lobe security head stainless steel thru-bolts and to the edge of door and pilaster with #10 by 1-inch (25 mm) screw. Top hinges shall have adjustable nylon cams. Strike-keeper and throw latch shall be of extruded clear anodized aluminum.
    b. Wall Connections: Three heavy-duty aluminum brackets.
    c. Wall Connections: Full height continuous plastic channels.
    d. Wall Connections: Full height continuous stainless-steel channels.
    e. Panel to Pilaster Connection: Full-height continuous aluminum channels.
    f. Panel to Pilaster Connection: Full-height continuous plastic channels.
    g. Panel to Pilaster Connection: Full-height continuous stainless-steel

channels.

h. Coat Hook & Bumper: Solid cast zinc hook and oversized black rubber bumper that functions as both a door stop and bag hook.
i. Fasteners are theft-proof 6-lobe security head stainless steel screws.
j. Floor Anchors: Pilasters shall be fastened to the floor with a 3 inches (76mm) high stainless-steel pilaster anchor shoe.
k. Floor Anchors: Pilasters shall be fastened to the floor with a 3 inches (76mm) high plastic anchor shoe.

E. Urinal Screens: Wall mounted.
1. Standard Type: Standard type shall have square edges.
a. Depth: 18 inches (457 mm).
b. Depth: 24 inches (610 mm).
2. Height: 42 inches (1067 mm).
3. Height: 48 inches (1219 mm).
4. Mounting: Stirrup brackets.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions in locations indicated on drawings.

B. Adjust hardware for proper operation of doors.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF 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. 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) 7-98.

1. Use wind velocity pressure values for the specific project according to ASCE 7-98 using a wind speed of 146 mph, exposure category "C", and a wind load importance factor of 1.15.

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.

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) Or approved equal.

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. 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

10284
ELECTRIC HAND DRYERS

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

A. Coordinate electric hand dryers with work before and after. See especially: wall structure and finish sections, and electric power sections.

B. Provide dryers from one producer for this project.

1.2 SUBMITTALS

A. Product Data: Include items such as noise level, motor and sensor data, wiring.

B. Shop Drawings: Show dimensions and method of fastening for maximum vandalism and pull-out resistance

C. Dryer Mockup: Mount and hook up 1 dryer in place at the project site for demonstration and approval before starting the rest of installation. The mockup dryer, if in good condition, may be installed in the work after A/E's approval.

1.3 WARRANTY

A. Replace electric hand dryers that show manufacturing defects, from the time of installation until 5 years after date of Substantial Completion.

PART 2 PRODUCTS

2.1 ELECTRIC HAND DRYERS

A. Description: ADA compliant projection beyond face of wall, blowing hot air in one direction, with outlet not easily accessed for abuse, electric motor activated by sensor only, and with automatic drying cutoff time and high-temperature cutoff.

B. Shape of dryer: Top surface sharply down-sloping or curving down, with no projections from which clothing, bookbags, or persons can hang or be hung.

1. Maximum projection from wall: ADA Compliant.
2. Wall-mount Type: Surface or recess-mounted.
3. Motor / fan / sensor case: Galvanized steel, 18 ga or heavier, with conduit knockouts on opposite sides, back or bottom, and 4 mounting brackets at face for fastening with No.12 toggle bolts or screws to steel framing or to masonry inserts.
4. Internal splash guards: Provide at sensor, switches, heater, and motor to minimize effects of any liquid intrusion.
5. External case: 18 ga stainless steel, brush or satin chrome finish on 18 ga steel, with edges beveled 40° to 50° or curved less than quarter-round, designed to resist prying-off and to not allow effective applying of force vertically or sideways.
6. Case fasteners: Heavy tamper-resistant (TR) screws. Deliver one TR screw bit to the City of Miami for each project.

7. Air outlet: Recessed, with sturdy grille or other guard to resist access to sensor, heating element, fan and motor. Outlet shall not be rotatable or adjustable by users.
8. Operation: By automatic infrared sensor only, inconspicuous and located out of view of users; no pushbuttons.
9. Maximum noise level in operation: 70 dB.
10. Sensor: Solid state electronic infrared, without relays or moving parts, turning off 2 sec maximum after hands are removed, or 40 sec after start, whichever is earliest.
11. Airflow: At least 150 ft3/min, at a velocity that effectively dries hands in a maximum of 20 seconds.
12. Motor: Lowest rpm (to reduce noise) that will produce specified airflow, permanent lubrication, with automatic-reset thermal protection, and circuit breaker; no fuses.
13. Motor power consumption: 10 to 18 A at 110/120 V AC.
14. Heater: Nickel/chromium wire to heat without wire glow, thermally protected to cut out at 90 °C / 130 °F., not accessible by users through the air outlet.

C. Standard: Product shall be listed by an OSHA approved Nationally Recognized Testing Laboratory (NRTL).

D. Product / Producer.

1. Xlerator XL, by Excel Dryer, Inc.
2. PDC-R10, by Pinnacle Dryer Corp.
3. Equal product in quality and performance as reviewed and approved by A/E and the City of Miami.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Coordinate and verify the mounting and opening heights, the size of openings, and the providing of 20 ga steel studs / furring and cats to receive heavy-duty screws or toggle bolts for mounting dryers.

1. If dryers are shown to be placed within 60 in. of plumbing fixtures, notify A/E so that proper protection for users can be accomplished.

B. Verify that field conditions and opening preparation, as well as electric service are acceptable and are ready to receive dryers.

3.2 INSTALLATION OF ELECTRIC HAND DRYERS

A. Install dryers following producer’s current published directions and recommendations, except as more stringently specified herein.

B. Fasten dryer motor cases and room cases so as to be pry-resistant and to withstand a withdrawal force of 200 lb at each fastener.

C. Demonstrate each dryer to be in good working order. Protect dryers until date of Substantial Completion. Leave clean and in good operating condition.

END OF THIS SECTION

10350
FLAGPOLES

PART 1 GENERAL

1.01 SUMMARY

A. Related Sections:

1. 02200 - Earthwork.
2. 03300 - Cast-In-Place Concrete.

1.02 SUBMITTALS

A. Shop Drawings: Flagpole and base, showing general layout, jointing and complete anchoring, supporting system, details, and sections as required.

B. Submit samples of finished metal for flagpole and accessories as requested.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Aluminum Flagpoles:

1. American Flagpoles, Abingdon, VA.
2. Concord Industries, Inc., Addison, TX.
3. Eder Flagpole Company, Inc., Oak Creek, WI.
4. Morgan Francis, Waterbury, CT.

2.02 MATERIALS AND COMPONENTS

A. General:

1. Flagpole and Base: Design and construct to withstand wind velocity pressures determined by American Society of Civil Engineers (ASCE) 7-98.

a. Use wind velocity pressure values for the specific project according to ASCE 7-98 using a wind speed of 146 mph, exposure category "C", and a wind load importance factor of 1.15.

2. Height: Exposed height of 30 feet plus required depth in ground for foundation.

3. Standard flash collar design.

4. Halyard:

a. Internal: Revolving truck, keyed flush access door.
b. External: Revolving truck, 9" cleat.

B. Aluminum Flagpoles:

1. 6063-T6, continuous taper, and seamless.
2. Finish: Satin brushed.
3. Color: Anodized or duranodic color selected by A/E.

4. Foundation:

a. Minimum 16 gage galvanized corrugated steel tube, or minimum 12 gage rolled steel tube, sized to suit the flagpole and installation.

b. Furnish complete with welded steel bottom base and support plate, lightning ground rod to groundwater, and steel centering wedges, all welded construction.

c. Provide loose aluminum wedges at top for plumbing pole after erection. Wood wedges are for temporary use only.

5. Galvanize steel parts after assembly, including foundation tube.

2.03 FITTINGS

A. Aluminum Ball: 6 inches, spun from 14-gauge aluminum, gold anodized, mount on 5/8" rod attached to truck. Screwed fittings are not allowed.

B. Non-Fouling Ballbearing Revolving Truck: Standard, with cast aluminum body, fitted with two, 2-inch diameter aluminum sheaves.

C. Internal Halyards: Swivel snaps.

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 flagpole as shown and according to accepted shop drawings and manufacturer's instructions.

B. Paint portions of flagpole below grade with heavy coat of bituminous paint.

C. Provide positive lightning ground.

1. Ground flagpole as indicated in Articles 250-83 and 250-84 of National Electrical Code.
2. Measure resistance from pole to the ground.

D. Excavation:

1. Excavate for foundation concrete to neat, clean lines in undisturbed soil.
2. Provide forms as directed by A/E due to unstable soil conditions.
3. Remove wood, loose soil, rubbish and other foreign matter from within excavation, and wet earth before placing concrete.

E. Concrete:

1. Provide and place 3,000 psi minimum concrete according to Section 03300 - Cast-In-Place Concrete.
2. Slope or dome top surface of concrete setting base to direct water away from pole.
3. Minimum diameter of concrete base shall be equal to length of pole at setting depth.

END OF SECTION

10400
IDENTIFYING DEVICES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Labor and materials required for installation of plaque, name and address numbers, directional signage, signage, buildings, traffic control, parking, emergency exits, fire system and warning information, elevators, toilet rooms, and capacity signs and obstruction warnings.

1.2 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 name and address numbers for approval.

C. Samples: Submit 3 samples of raised-image laminated signs to the A/E and the City office of Planning, Design and Sustainability for review and approval before fabrication.

PART 2 PRODUCTS

2.1 MATERIALS

A. Dedication Plaque:

1. Material: Cast Aluminum, single edge.
2. Size: 14 inches x 20 inches high.
3. Text: Modern block letters as indicated in the Contract documents. Text layout and design shall be in accordance with A/E Drawings. Dedication plaque shall contain the following information:
    a. The name of the facility.
    b. The awarded dated of the construction project.
    c. The names of City of Miami Board of Commissioners in office the day the construction contract was awarded. Names shall include appropriate titles and “honorifics”.
    d. The name of the Mayor in office the day the construction contract was awarded.
    e. The name of the City Manager in office the day the construction contract was awarded.
    f. The name of the Design Criteria Professional.
    g. The name of the Design Builder.
    h. Shop drawings for the dedication plaque shall be submitted to the City for final approval, prior to A/E’s approval of shop drawings.
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. Name and Numbers for Address, Cast Aluminum Letters:

1. Material: Cast aluminum, alloy 214.
2. Style: Helvetica Regular.
3. Finish: (lettering shall be of a contrasting color from the wall on which they are mounted). Finish shall be satin aluminum with either a clear lacquer spray coating or an AAMA 2605 PVDF coating, with color to be selected by the City Facilities Design and Standards.
4. Sizes:
    a. Name: 18" to 24" letters, minimum 3/4" thick.
    b. Address: 10" numbers, 1/4" thick.
5. Manufacturers:
    a. A.R.K. Ramos.
    b. Gemini Inc.
    c. Sheidow Bronze Corp.

C. Raised-Image Laminated Signs:

1. Locations:
    a. Provide room identification sign at each entry and exit point to all spaces indicated on the drawings.
    b. Provide a building number sign at each building entry and exit point, and on an exterior building wall facing the emergency access paths for emergency responders.
    c. Sings shall include room name, room number and Braille as scheduled on drawings.

2. Comply with Florida Building Code (FBC) for accessibility requirements.

3. Signs shall be 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, FL.
        3) ASE (Architectural Signs and Engraving) Inc., Orofino, ID.
        4) Best Sign Systems, Montrose, CO.
        5) Industrial Frames, Inc., Miami, FL.
        6) Mohawk Sign Systems, Schenectady, NY.

4. 1/32" Raised Images:
    a. Letters and numbers: Size, according to Drawings or as follows:

        1) For building number(s) signage, text shall be 2-inch high Helvetica Regular with the word “BUILDING” written on the upper part followed by 8-inch high number(s) identifying the building number designated on the drawings.
        2) For all other signs 1 inch high, Helvetica Regular.

b. Braille: Tactile Grade II. Adhered labels are not allowed.

c. Symbols: Use Braille, letters, numbers, and Group One symbols sized per requirements of standard spacing.

5. Sizes:

a. Accessible Signage, Room Identification, and Life Safety Signage: Minimum 8" wide x 6" high.
b. Building number sign: minimum 15 inches x 15 inches.
c. Symbol Signage: minimum 9 inches x 9 inches or as custom designed.
d. Directional Signage: minimum 9 inches x 9 inches or as custom designed.

6. Mountings:

a. Mount using tamperproof screws, shields, and double face tape or adhesives to hold signage in place.

7. Colors:

a. White raised text, symbols and Braille with background color as indicated on drawings.

1) Interior/exterior room names, room numbers and building numbers signage.

2) Specialty description as required or as indicated on drawings.

3) Accessible egress signage.

4) Directional accessibility signage for the disabled at the following locations as required or as indicated on drawings:

a) At inaccessible facility entrances and along the route indicating the route to accessible facility entrances.

5) Directional signage at the following locations as required or as indicated on drawings:

a) At corridors indicating direction to specific room numbers or subject areas.

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.

2) "FIRE ALARM PULL STATION INSIDE" at each main door of a room containing a pull station.

3) "EMERGENCY EGRESS - KEEP AREA CLEAR" at emergency egress openings and not readily identifiable secondary egress doors.

4) "EMERGENCY RESCUE - KEEP AREA CLEAR" at emergency rescue openings.

5) "STORAGE NOT PERMITTED" at mechanical, electrical, and kiln rooms.

6) Occupancy load signs for spaces with 50 or more occupants.

7) "NO SMOKING" as indicated on Drawings and specified in this section.

D. Evacuation Signage.

1. Provide metal frames with safety glazing, to receive an 8-1/2" x 11" floor plan provided by the A/E, showing the primary and emergency evacuation routes from each space with an occupant load of 6 or more, in accordance FBC.
2. The diagram shall clearly indicate, by contrasting color and number, each route of evacuation.
3. Evacuation signage shall be posted adjacent to the primary exit door, or as otherwise indicated on the Plans.

E. Traffic Signage.

1. Comply with Florida Department of Transportation requirements for signage as indicated on Drawings.
2. The use of aluminum components is not allowed.

PART 3 EXECUTION

3.1 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.

3.2 INSTALLATION

A. Erect plaque to wall with concealed mounting where directed by A/E.

B. Mount name and address cast aluminum letters where indicated by A/E via threaded pins in drilled holes with mastic cement, and 3/4" 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 or adhesives.

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

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).
2. Florida Department of Education, Office of Educational Facilities - State Requirements for Educational Facilities - 1999 (SREF).

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.

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) Woodworking shops.
2) Storage rooms where paper products are stored.
3) Class C fire areas.

b. Flammable Areas: (Sodium Bicarbonate) 40BC.

1) Kitchens.
2) Boiler rooms.
3) Science laboratories.
4) Automotive shops.
5) Air handling rooms.
6) Flammable storage areas.

c. Low Hazard Areas: 2A-10BC.

1) Hallways and remaining rooms.
2) Class A or B fire areas.

d. Electronic Lab Areas: (Carbon Dioxide) Type C, 10BC.

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 and Kitchens):

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

10675
SHELVING (UTILITY/STORAGE)

GENERAL

1.1 SECTION INCLUDES:

A. Related Section:

1. 06100 - Carpentry.

1.2 SUBMITTALS

A. Submit properly identified manufacturer's catalog cuts and installation instructions before starting work.

1. Shop Drawings:

a. Layout.
b. Details.
c. Dimensions.
d. Assembly and anchorage.

B. Samples: Submit samples for review as directed by A/E.

PART 2 PRODUCTS

2.1 SHELVING

A. Manufacturers:

1. Adapto Storage Products, Hialeah, FL.
2. Equipto, Tatamy, PA.
3. Hallowell-List, Apopka, FL.
4. Republic Storage Systems, Canton, OH.
5. Penco Products, Oaks, PA.
6. Wilson Metal Products, Monterey, IN.

B. Design and Construction: Clip-type adjustable metal shelving of modular unit construction of individual bolted rigid frame assemblies (no cross bracing), constructed so any section can be moved and each shelf can be independently adjusted without the use of tools, 18 gage.

C. Shelving Unit Sizes:

1. Type A: 84/87" high x 36" wide x 12" deep, with top and 6 adjustable shelves, closed base fronts.
2. Type B: 84/87" high x 36" wide x 18" deep, with top and 6 adjustable shelves, closed base fronts.
3. Type C: 84/87" high x 36" wide x 24" deep, with top and 6 adjustable shelves, closed base fronts.

D. Pallet Rack Sizes:

1. 84 " high x 96" wide x 48" deep with 2 shelves.

E. Wall and Floor Attachment Hardware: Include manufacturer□s recommended brackets and mounting screws for wall and floor attachment.

2.2 STORAGE SHELVING

A. Manufacturers:

1. Adapto.
2. Equal product in quality and performance as approved by the A/E.

B. Unit Components:

1. 12-inch x 36-inch, 18 gage steel shelf (3 per unit). Model S8-12-36, gray.
2. 12-inch sway brace (6 per unit). Model XB-12, gray.
3. 31-inch, 12 gage upright post (2 per unit). Model P12-31, gray.

C. Wall Hardware: Include manufacturer′s recommended fasteners and mounting screws for wall attachment.

PART 3 EXECUTION

3.1 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.

3.2 INSTALLATION

A. Set fixed shelving units accurately in place as indicated on drawings and fasten to adjacent walls with approved anchoring devices to blocking as recommended by the shelving manufacturer.

B. Touch-up marred surfaces, replace units damaged beyond cosmetic correction as directed by A/E.

C. Install intermediate shelves at equal spacing in each unit.

3.3 CLEANING

A. Leave shelving clean and free from dirt, smears, fingerprints, and other foreign matter.

END OF SECTION

10800
TOILET ROOM ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:
   1. 04220 – Concrete Unit Masonry
   2. 06100 – Carpentry
   3. 09310 – Ceramic Tile
   4. 10160 – Solid Plastic Toilet Partition

1.2 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.

1.3 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

2.1 MANUFACTURERS

A. Toilet Room Accessories:
   1. A&J Washroom Accessories.
   2. American Specialties.
   3. Baylor American Accessories.
   4. Bobrick.
   5. Gamco.
   6. McKinney/Parker.
   7. Meek Manufacturing Company, Fort Smith, AR.
   8. Moore Dispensers.

2.2 MANUFATURED 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 0030.
    c. Baylor American Accessories: VT-5.
    d. Bobrick: Model B-2888.
    e. Gamco: Model TTD-5.
    f. McKinney/Parker: Model 615

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 theft-proof concealed fasteners with snap flange cover.
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: UG Series.
    b. American Specialties: 3500 Series.
    c. Baylor American Accessories: Georgia Series.
    d. Bobrick: B-6806 Series.
    e. Gamco: 150 S Series.
    f. McKinney/Parker: 9705 Series.

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 245SS.
    c. Baylor American Accessories: Model TN-5.
    d. Bobrick: Model B-263.
    e. Gamco: Model TD-5.
    f. Moore Dispensers: Model 850.

D. Mirrors:
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.
    b. American Specialties: Model 0600-A.
    c. Baylor American Accessories: Series AR.
    d. Bobrick: Model B-290.
    e. Gamco: A Series.
    f. McKinney/Parker: Model 150 or 170.

E. Feminine Napkin/Tampon Disposal:
   1. Stainless Steel, single recessed or dual access, self-closing doors, with tumbler lock keyed like other bathroom accessories.
   2. Manufacturers:
      a. A&J Washroom Accessories: Models U581 (single) or U580 (dual).
      b. American Specialties: Models 0473 (single) or 0472 (dual).
      c. Baylor American Accessories: Model NM-40 (single) or NM-60 (dual).
      d. Bobrick: Models B-353 (single) or B-354 (dual).
      e. Gamco: ND-4. (single) or ND-6 (dual).

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 0342.
      c. Baylor American Accessories: Model SD-58AP.
      d. Bobrick: Model B-2112.
      e. Gamco: G-58AP.
      f. McKinney/Parker: Model 304H.

G. Shower and Entrance Doorway Curtains:
   1. Heavy white vinyl shower curtains complete with curtain rod for surface mounting with exposed fasteners, in widths and heights as indicated on drawings.
   2. Provide chrome plated roller type curtain looks.
   3. Provide matching tie-backs, one for each curtain, according to manufacturer's recommendations.
   4. Manufacturers:
      a. Acorn: 3895-001-000 with 1193-1 curtain hooks with rollers.
      b. Baylor American Accessories: Model OR-100SC with OR-100CHNR hooks with rollers.
      c. Gamco: Model 100SC with 100CHNR hooks with rollers.

H. Towel/Robe Hooks:
   1. Heavy-duty, chrome plated brass for surface mounting with exposed fasteners.

   2. Manufacturers:
      a. A&J Washroom Accessories: Model UB15.
      b. American Specialties: Model 0751A.
      c. Baylor American Accessories: Model NY-1.
      d. Bobrick: Model B-211.
      e. Gamco: Model RH-1S.
      f. McKinney/Parker: Model 1027B.

I. Folding Shower Seat:
   1. No.4 finish, stainless steel with vinyl covered padding over marine-grade plywood.
   2. Manufacturers:
      a. A&J Washroom Accessories: Model U933-1.
      b. American Specialties, Inc: Model 8250.
      c. Baylor American Accessories: Model SC-2.
      d. Bobrick: Model B-517/518.

PART 3 EXECUTION

3.1 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.

3.2 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

13742
TELECOMMUNICATIONS RACEWAY SYSTEM

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Complete raceway system to serve the telecommunications system. Installation shall include, but not be limited to, all necessary accessories, plywood backboards, conduits, cable trays, appropriate supports, pull boxes, outlet boxes and pull strings, etc.

B. Related Sections:

1. 07840 - Firestopping and Smoke Sealing.
2. 16100 - Basic Materials and Methods.
3. 16112 - Raceways and Conduits.
4. 16120 - Wire and Cable.
5. 16131 - Outlet, Pull, and Junction Boxes.
6. 16132 - Floor Boxes.
7. 16450 - Grounding.
8. 16511 - Lighting, Fixtures, and Lamps.

C. Products Supplied and Installed by Contractor.

1. Fiber optic cable for data distribution in underground conduit.
2. Telecommunications jacks and wiring.

1.2 SUBMITTALS

A. Submit for review, properly identified product data giving materials, finishes, accessories, and installation directions where required.

B. Furnish a set of "Record Drawings" to A/E indicating accurate plan layout, conduit runs, and the like as installed.

PART 2 PRODUCTS

2.1 MATERIALS

A. Telecommunications Raceway System:

1. Extend main raceway conduits from the main telecommunications room to the existing underground utilities system. System shall be complete from service provider pick up point at property line, via main raceway conduits and main telecommunications rooms and branch conduits, to final telecommunications data outlet locations.
2. Extend riser conduits from main telecommunications switch room (next to electrical room when possible) to each satellite wiring closet. Conduit runs between closets shall not exceed 300 feet.
3. Provide a minimum of 3 conduits between the main telecommunications room and each satellite wiring closet.
    a. One 2-inch conduit for the fiber optic cable.
    b. One 2-inch conduit for future use.
    c. Remaining conduits for copper cable sized for the total number of telecommunications outlets being served.

4. Size underground conduits as follows:

Conduit Size	Number of pairs
2" (minimum)	1-99
3"	100-300
4"	301-900

5. Refer to the telecommunications riser diagrams shown on the Approved Permit Drawings.
6. Branch conduits to final telecommunications outlet locations from main or satellite locations shall be 3/4" minimum and not exceed a length of 250 feet.
7. Where a cellular metal deck is provided (i.e., Walker duct), it shall be used as part of the telecommunications raceway system.
8. Furnish and install necessary interior conduit, sleeves, strip cabinets, pull boxes, outlet boxes, and other materials for a complete conduit system for telecommunications as shown on the Drawings.
9. Install the conduit in the same manner as specified for lighting work.
10. Provide pull strings in all empty conduits.
11. Where junction boxes are used to distribute the 3/4" conduit runs, the conduit(s) feeding the junction box shall be sized as specified.
12. Computer lab outlet boxes require one 4-pair cable. Any other outlet box served requires four 4-pair cables to be pulled from wiring closet. Size conduits as follows:

Conduit Size	No. of Cables if Pulled Together
3/4" (minimum)	4
1"	7
1-1/4"	12
1-1/2"	16
2"	22
2-1/2"	36
3"	50

13. Raceways shall contain no more than two 90-degree bends or equivalent. Provide additional junction or pull boxes to meet this requirement.

B. Backboards:

1. Main Telecommunications Room and Satellite Wiring Closets: Cover all walls, from floor to ceiling, with 3/4" plywood painted with gray fire-retardant paint.
2. Terminate telecommunications conduits at the top and bottom of the backboards.

C. Floor Sleeves:

1. Extend 6 inches above and below the slab construction at main telecommunications room and satellite wiring closets.
2. Provide 4-inch sleeves at above grade telecommunications closets unless noted otherwise.
3. Provide iron pull eyes at structural ceiling slabs in all telecommunications rooms for cable pulling.

D. Outlets:

1. Wall Telecommunications Outlet Boxes:
    a. 4-inch boxes.
    b. Faceplates and jacks will be furnished and installed by ITS.
2. Floor Telecommunications Outlet Boxes:
    a. Provide a separate 4-inch box for each telecommunications position.
    b. Telecommunications outlets installed in floors shall have a mounting frame for a duplex receptacle, a brass cover with brass screws, and 2 hinged lids to allow the use of either or both outlets. Walker 828R or accepted equivalent
    c. Do not connect more than 2 floor outlet boxes together. Provide one 1-1/4" conduit from the satellite wiring closet to feed a pair of floor outlets.

E. Service Entrance Conduit:

1. Underground: PVC schedule 40.
2. Aboveground: Rigid metallic.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install materials according to local and national codes.

B. Conduit from branch telecommunications outlets shall terminate at the top and bottom of the backboard unless indicated otherwise. Provide empty conduit with suitable pull strings. Allow 10 inches minimum slack at each end of pull string.

C. Provide pull boxes in telecommunications conduit runs spaced not greater than 100 feet apart and on of runs with more than two right angle bends.

1. Place telecommunications label on pull and junction boxes.
2. Minimum conduit size to each instrument will be 3/4 inch.
3. Minimum size outlet box shall be 4 inches square by 1-1/2 inches deep.
4. Conduit bushings for low voltage system wiring may be plastic.

D. Bury underground conduit a minimum of 24 inches below finish grade.

E. At each satellite telecommunication room, provide an insulated No. 6 AWG grounding wire terminated on a grounding bar listed by a Nationally Recognized Testing Laboratory (NRTL) approved by OSHA.

F. In the main telecommunications room, provide 2 NRTL listed, independently isolated grounding systems.

G. Ensure the empty raceway system installed for the telecommunications system, including spare conduits, are clearly marked, and are not used for any other purpose.

H. Mount wall telecommunications outlets in one outlet box at 18 inches above finish floor.

I. Conduit Installation:

1. Install 3/4" conduit from the final outlet box to an accessible junction/pull box or cable tray to the telephone and data closet backboard within a 250-foot wire run of the outlet.

2. Conduits from junction boxes to main and satellite closets shall be sized according to the information contained in this section.
3. Wiring from outlet-box to outlet-box (daisy-chaining) is not acceptable.
4. Provide wall space and proper access to the following as required:
    a. Protection assemblies for black cables as determined by ITS.
    b. Splice cases.
    c. Data hub and patch panels.
    d. Jack panels.
    e. Light-guide interface units.
    f. Telecommunication termination blocks.
    g. Floor space for telecommunication switches.

K. Contractor, Subcontractor, and ITS Coordination:

1. Schedule the inspection and turnover of the telecommunication conduit system. The turnover of the system shall be not later than 90 days before the scheduled completion date of the construction contract.
2. Coordination with THE CITY is required before other trades can use conduits or wiring closet space.
3. Allow the wiring contractor and equipment installers and contractors access to the building to perform their work. Access times and areas shall be determined by mutual agreement.
4. The Contractor, subcontractors, and THE CITY shall cooperate with each other. In the event that conflicts arise, THE CITY shall mediate to resolve the conflict.

END OF SECTION

13845
INTRUSION DETECTION SYSTEM

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: A complete, operable, tested intrusion detection system, bearing Underwriters Laboratories (UL) mercantile listing and including raceway system and cables. All programming shall be by the Contractor with assistance from THE CITY.

B. Related Sections:

1. 09900 - Painting.
2. 16112 - Raceways and Conduits.
3. 16131 - Outlet, Pull, and Junction Boxes.

1.02 SYSTEM DESCRIPTION

A. Significant System Components and Procedures:

1. Contacts for every exterior door including roof accesses.
2. Motion detectors.
3. Intrusion control panels.
4. Power supply.
5. Extended zone modules.
6. Keypads.
7. Raceway and junction box system.
8. Testing.
9. Record drawings.

1.03 SUBMITTALS

A. Submit properly identified manufacturer's literature and technical data before starting work.

B. Shop Drawings: Include manufacturer's catalog cuts, data sheets, and riser and wiring diagrams with standard symbols for each component used.

C. Quality Assurance Submittals: Submit the following with the required shop drawings and manufacturer's literature and data.

1. Load calculations for battery backup and system components.
2. Programming schedule sheet with zone descriptions.
3. Warranty:

a. Letter from authorized manufacturer's representative addressed to THE CITY, stating compliance to warranty requirements.
b. Submit 5 copies of warranty to be provided.

D. Closeout Submittals: Record drawings and warranties.

1.04 QUALITY ASSURANCE

A. Items and Components: UL listed meeting the latest editions of standards 603, 609, 634, 639, 1076, and 1610.

B. Install wiring according to National Electrical Code - 1999 (NEC).

C. Shunt switches are not allowed.

D. System shall be hardwired in its entirety.

E. In terminal cabinets, use screw-on terminal strips for power and signal cable splices.

1.05 WARRANTY

A. Provide full manufacturer's published standard warranty for parts and components.

B. Provide 1-year full maintenance (parts, wiring, and labor) provided by Contractor or manufacturer's authorized representative from date of substantial completion.

C. Provide warranty response information inside alarm system control panel.

D. Warranty shall allow THE CITY to repair vandalized areas without voiding the total system warranty

PART 2 PRODUCTS

2.01 EQUIPMENT

A. Door Contacts:

1. Side Hinged Doors: Recessed magnetic switch, Model 1078W as manufactured by Sentrol, Inc. or accepted equivalent, complete with necessary mounting accessories for installation in closed circuit alarm systems.

2. Roll-Up Overhead Doors: Magnetic switch, No.[2205A] [2505A] [2515A] by Sentrol or accepted equivalent, complete with necessary mounting accessories for installation in closed circuit alarm systems.

B. Cable: Belden No.8740 (2 conductor), No.8443 (3 conductor), No.9794 (4 conductor), or accepted equivalent.

1. Conductors for Monitoring Devices: Minimum 22 gage AWG stranded, unshielded cable with vinyl plastic insulation, color-coded.
2. UL listed, NEC type CM or CL3, UL standard 13 and 444.

3. Comply with UL 1581 flame test.
4. Power Conductor for Motion Detectors, EZMs, and Keypads: CL-2 or CL-3, jacketed, minimum 18 gage stranded wire.
5. Power Conductor for Battery: Minimum 18 gage stranded wire.
6. Underground cable shall be for wet locations according to NEC.

C. Motion Detectors: Dual technology (PIR/microwave) motion detector sensors.

1. Recessed Ceiling Mount:

a. Model 2T360 by Sentrol Inc., Tualatin, OR.
b. Model DS9360 by Simplex.

2. Wall Mount:

a. Models 2T40, 2T70, or 2T100 by Sentrol.
b. Models DS720, DS860, DS950, RDS97 by Simplex.

D. Intrusion Control Panels:

1. Manufacturers:

a. NAPCO MA 3000 (96 zones).
b. Simplex DS7400Xi.

2. Provide mandatory UL Mercantile listing with tamperproof provisions.
3. Indicate location on riser diagram.
4. Install panels with centerline at 5'-0" above finish floor.

E. Panel Batteries:

1. Provide two 7 amp batteries in parallel in the panel.

F. Remote Power Supplies:

1. Supervised for low battery failure and power supply failure.
2. Show locations on riser diagram.
3. These indications shall report through a dedicated zone of the intrusion detection system to THE CITY as a priority trouble.

G. Zone Expansion Modules/Expansion Zone Modules (EZM):

1. Remotely located in a distributed fashion to minimize raceway and wiring.
2. Powered from the intrusion control panel.
3. Power supply load shall not exceed 85 percent of the maximum load.
4. Mount EZM's in a hinged door junction box with a fire retardant painted plywood backboard inside the box, 10" x 10" x 4" minimum size.
5. Install EZM cabinets with centerline at 5'-0" above finish floor.
6. Install power supplies between 6"-0" to 8'-0" above finish floor.

7. List EZM's location numbers inside and outside the junction boxes and on riser diagram.
8. Do not use the keypad as a zone expander.

H. Miscellaneous: Refer to Section 16112 for products also required for installation under this section.

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 wiring, conduit, boxes, and the like required for a complete system according to manufacturer's instructions and approved submittals.

B. System equipment and wiring installation shall be by the properly licensed company, either the original equipment manufacturer or the factory distributer for the brand of equipment used. Furnish wiring diagrams and wire runs for the raceway system installed by the licensed electrical Contractor, under Division 16.

C. Provide door contacts and related devices at exterior doors, roof scuttles, and interior doors to high security spaces including, but not limited to, spaces containing student records, audiovisual equipment, instructional TV equipment, computer equipment, chemical storage, facility operation and management equipment, and other similar valuable goods. Rooms with interior corridor access and motion detectors do not require door contacts.

1. Hinged Door Contacts: A maximum of 4 associated door contacts may be grouped in a zone. Provide independent wiring to each switch from a junction box located next to the expansion zone module (E.M.) before converting to a zone.

    a. Side Hinged Doors:

        1) Install recessed switch components in spaces in both door and head jamb prepared by the door and frame manufacturer.
        2) Set magnet into top of door with accepted silicone sealant.

2. Motion Detectors:

    a. Provide motion detectors in each area with windows, fixed glass, or glass block to the exterior and any room with vision panels, regardless of the location or function.

b. Provide motion detectors at exterior accessed storage rooms.
c. Provide individual zones for each motion detector.
d. Motion detectors shall have their own power supply and not be fed from the security panel.
e. Locate ceiling mounted motion detectors at least 5 feet away from A/C supply registers and at least 10 feet from windows.

3. Wiring:

a. Install wiring in metallic conduit from door head switch through door lintel construction to adjacent junction box.
b. Connection between top of sheet metal sleeve in head jamb section and conduit in door lintel construction to adjacent junction box need not be solid but sheet metal sleeve and conduit shall be in alignment with each other.
c. Provide EOL resistor and indicate location on drawings
d. A maximum of 4 associated door switches may be grouped in a zone. Provide independent wiring to each switch from a junction box located next to the expansion zone module (E.M.) before converting to a zone.
e. Splices in main cabinets and sub panels shall be on terminal strips.

4. Bonding and Grounding: Provide as required by the latest edition of the NEC.
5. Conductor Identification: Identify each pair of conductors, each contact in each panel, and at loose wire terminations.
6. Cable Slack:

a. Terminate cables with enough slack, each duly tagged for future connections by THE CITY, on terminal strips in junction box in electrical room as shown on Drawings, extending 1-inch empty conduit from this box underground to pull box as shown Drawings (site plan).

D. At security cabinets, provide 3/4" plywood backboard with fire retardant paint.
E. Provide patch cord from intrusion detection circuit board to telephone outlet in the intrusion detection panel.

F. Connect fire alarm system to the 2 separate telephone outlets in the fire alarm panel.

3.03 FIELD QUALITY CONTROL

A. Before testing the intrusion detection system transmission from the project site to the central control station, coordinate with THE CITY and A/E to ensure a successful and trouble-free transmission signal.

B. Site Test:

1. Check and test installation for shorts, grounds, circuit continuity, and minimum 12 volts readings at all motion detectors.
2. Cables: Test free from opens, grounds, or crosses (shorts) between conductors.

3. Walk-test doors and motion detectors for proper function and operation. Ensure proper zoning of devices.
4. Test all functions on intrusion control panels for proper functions and operations.
5. Verify signals are properly received at THE CITY DCOM.
6. Check for proper standby battery backup in intrusion panels and remote power supplies.
7. Verify remote power supplies are UL 603 listed for burglary systems.
8. Inspect and test cabinet tampers on intrusion cabinets.
9. Verify raceway cover is properly painted blue.

END OF SECTION

15010
GENERAL PROVISIONS

PART 1 GENERAL

1.1 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.

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 CITY's decision to accept or reject requested substitution.

1.2 SUBMITTALS

A. Submit shop and detail drawings, factory certified prints, brochures, and materials lists for items specified according to Instructions to Bidders and General Conditions. In addition to submitting these documents to the A/E for review and approval, the Contractor shall provide a copy of the shop drawings to the Building Code Consultant for review purposes only.

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.

1.3 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 Mechanical and or 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 Chapter 10 of the Miami-Dade 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.

1.4 WARRANTY

A. Furnish copies to THE CITY 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 CITY.

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 CITY.

E. Inspections at End of Warranty:

1. At the end of the 1-year warranty period, THE CITY will decide if the warranty items cited during the course of the warranty period have been completed to the satisfaction of THE CITY.
2. Meet on-site with the City of Miami Warranty Section and A/E before the end of the 1-year warranty period and address unresolved warranty items to the satisfaction of THE CITY.

PART 2 PRODUCTS

2.1 MATERIALS

A. Provide new materials, free from defects, of domestic manufacture unless otherwise noted.

2.2 EQUIPMENT

A. Use equipment scheduled in the Construction Documents to determine space and service requirements.

PART 3 EXECUTION

3.1 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 Division 9, Finishes, of the City of Miami Master Specifications.

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.

3.2 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.

3.3 FIELD QUALITY CONTROL

A. Work will be inspected by A/E during construction.

B. Maintain a repair log of equipment before substantial completion.

C. 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. Ventilation:

a. Ductwork shall be installed complete with required dampers, deflectors, hangers, and insulation.
b. Control system components shall be installed and tested for function.
c. System testing and balancing shall be completed.

3.4 DEMONSTRATION

A. As a condition for substantial completion and after systems have been tested and checked as complete and operational, Upon THE CITY's request and at no cost to THE CITY, provide on-site training of the operation of systems to THE CITY'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 CITY.

END OF SECTION

15023
CODES AND STANDARDS

PART 1 GENERAL

1.1 REFERENCES

A. Comply with the following:

1. Florida Building Code (FBC).
2. Florida Building Code (FMC) - Mechanical.
3. Florida Building Code (FPC) - Plumbing
4. Florida Building Code (FPC) - Energy Conservation Code.
5. National Electrical Code - NEC (NFPA 70).
6. National Fire Protection Association - (NFPA). NFPA 101 and other NFPA codes as applicable.
7. American National Standards Institute (ANSI) A117.1.
8. American Society of Civil Engineers (ASCE) 7.
9. ASHRAE Standards as referenced by applicable Code(s).

1.2 QUALITY ASSURANCE

A. Where materials and equipment are available under the continuing inspection and listing service of on OSHA approved Nationally Recognized Testing Laboratories (NRTL) and National Electrical Manufacturer's Association (NEMA), furnish materials and equipment so listed.
B. Where codes conflict, the most stringent requirement applies

PART 2 NOT USED

PART 3 NOT USED

END OF SECTION

15044
GENERAL COMPLETION

PART 1 NOT USED

PART 2 NOT USED

PART 3 EXECUTION

3.1 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. Ventilation:

a. Ductwork: Installed complete, including required dampers, deflectors, hangers, and insulation.
b. Fan Units: Installed, cleaned, and leveled.
c. Control System Components: Installed and tested for function.
d. Safety Equipment: Installed and tested.
e. 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. Compressed Air System: Piping sloped, air outlets and moisture traps installed and working.
g. Safety Equipment: Installed and tested.
h. Valving: Open.

END OF SECTION

15047
IDENTIFICATION

PART 1 GENERAL

1.1 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. 15330 - Automatic Sprinkler Piping.
4. 15510 - Piping (HVAC)

1.2 SUBMITTALS

A. Submit properly identified product and technical data including printed installation instructions before starting work.

1.3 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

2.1 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. Valves: Provide all valves with a 1-1/2" diameter brass tag having 1/2" high black filled numbers and 1/4" high letters, as manufactured by Seton or accepted equivalent.

1. Service shall be identified by abbreviations such as: CHW (Chilled Water), CW (Condenser Water), HW (Hot Water), DW (Domestic Water), GAS, etc.
2. Valve tag fasteners shall consist of No.6 brass beaded chain. The use of color coded one piece nylon ties is acceptable instead of beaded chain fasteners.

3. Prepare schematic piping diagrams of systems controlled by valves with a schedule identifying all valves. Diagram and Valve Schedule shall be posted in the mechanical room where system depicted is located. All diagrams shall be printed on non-fading media and framed under a plastic laminate surface.

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

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

3.1 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.

3.2 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

15051
MECHANICAL SUPPORT DEVICES

PART 1 GENERAL

1.1 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.

1.2 REFERENCES

A. Comply with applicable standards of the following:

1. National Electrical Manufacturers Association (NEMA): MG 1 – Motors and Generators.

1.3 SUBMITTALS

A. Properly identified manufacturer's catalog cuts and technical data before starting the work.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Motors:

1. Gould.
2. Baldor.

B. Starters:

1. Allen-Bradley.
2. Accepted equivalent.

2.2 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: 40 degrees.

2. Motors 1/6 HP and Under: May be split phase type, unless otherwise noted.
3. Motors Smaller Than 1 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 1 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: Shall be premium high efficiency meeting the nominal efficiencies found in NEMA MG 1. Minimum power factor for motors between 1 and 5 HP shall be 0.70 and 0.80 for larger sizes.

B. Starters:

1. For Motors Smaller Than 1/2 HP: 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: 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, with toggle operator and 3 overload heaters.

    a. Provide NEMA 1 enclosures, unless otherwise noted.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install specified equipment according to manufacturer's recommendations and applicable codes and regulations.

END OF SECTION

15090
SUPPORTS, ANCHORS, AND SEALS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Pipe supports, anchors, seals and accessories indicated on the Drawings and specified in this section.

1.2 REFERENCES

A. Pipe Supports: ANSI B31.1, Power Piping.

1.3 SUBMITTALS

A. Submit properly identified manufacturer's literature before starting work.

PART 2 PRODUCTS

2.1 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 non=conducting PVC jacketing or insulating grommet between support and piping.

B. Hanger Rods: Provide steel hanger rods, threaded both ends, threaded one end, or continuous threaded.

C. Flashing: Stainless steel as per Division 7.

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

3.1 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.

3.2 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 CPVC and polypropylene 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.

END OF SECTION

15180
MECHANICAL SYSTEMS INSULATION

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 15510 - Piping (HVAC).
2. 15410 - Piping (Plumbing).
3. 15515 - Valves, Hangers, and Specialties.
4. 15540 - Pumping Equipment (HVAC).
5. 15890 - Ductwork.

1.2 REFERENCES

A. Current applicable edition of standards of: 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. E96-95Test 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.

1.3 SUBMITTALS

A. Submit properly identified manufacturer's catalog cuts, performance curves, and procedures before starting work.

1.4 DELIVERY AND STORAGE

A. Protect materials from the weather during storage and installation.

1.5 QUALITY ASSURANCE

A. Materials shall be labeled, listed, or have certified test reports submitted from testing laboratory accepted by A/E OF RECORD.

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.

E. All adhesives and sealants used on the construction of mechanical insulation shall comply with the South Coast Air Quality Management District (SCAQMD) Rule #1168; VOC limits shall comply with the limits indicated in Table 1 of LEED Version 2.2, Indoor Environmental Quality Section, Credit EQ-4.1.

F. All coatings and mastics for mechanical insulation used on the building's interior shall comply with the VOC limits set forth by Green Seal GS-11 and comply with the South Coast Air Quality Management District (SCAQMD) Rule #1113; VOC limits shall comply with the limits indicated in Table 1 of LEED Version 2.2, Indoor Environmental Quality Section, Credit EQ-4.1.

G. Fiberglass Adhesives and Vapor Barrier Coatings shall meet California Department of Public Health (CDPH) Standard Method Ver. 1.1, 2010 Small Scale Environmental Chamber Test for VOCs.

1.6 FIRE HAZARD RATING

A. Fire hazard rated materials shall be UL labeled and shall be submitted indicating product's 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 pre-molded 1-piece fittings and valve covers

F. Flame resistance treatments subject to deterioration due to effects of moisture or high humidity are not acceptable.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Insulation:

1. Armaflex.
2. Armstrong.
3. Certain-Teed.
4. Foamglas.
5. Manville.
6. Owens-Corning.
7. Pittsburgh Corning.

B. Insulating Cement Mastics, adhesives and coatings as manufactured and recommended by:

1. Keene Powerhouse.
2. Fibrex FBX fast set.

2.2 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. Tape: As recommended by the insulation manufacturer or 3M adhesive EC-1329.

C. Insulating Cement: All-purpose mineral wool cement.

D. Glass Cloth Jacket: Factory sized white, standard weight, with 1-1/2" minimum longitudinal pressure sealing lap and seal strips for butt joints.

E. Vapor Barrier Jacket:

1. Flame resistant glass fiber adhered to outside of a 1 mil aluminum foil sheet with longitudinal pressure sealing lap and seal strips for butt joints.
2. End cement perm rating shall not exceed 0.05.

F. Weatherproof Metal Jacket (Exterior Above Ground Only):

1. Damage and corrosion resistant, longitudinal seam closure, joint construction capable of locking insulation and jacket securely in place.
2. Seal and weatherproof butt joints with factory supplied 2 inch wide "snap-straps" lined with plastic sealing compound secured with outer holding band.
3. Jacket Material: 0.016 aluminum.

G. 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.

H. 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.

I. Cellular Glass Insulation:

1. Comply with ASTM C552
2. Maximum Thermal Conductivity: 0.33 K factor at 75 degrees F.
3. Water Vapor Permeability: 0.00 perm-in.

J. Flexible Fiberglass Ductwrap Blanket Insulation:

1. 2.2/2.3 inches thick, 3/4 pounds per cubic foot 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 pounds per cubic foot 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 Barrier Mastic:

        1) Foster 30-65.
        2) Childers CP-34.
        3) Vimasco 749.

    c. Lagging Adhesive:

1) Foster 81-42W or 30-36.
2) Childers CP-50 AMV1.
3) Vimasco 713.

d. Weather Barrier Breather Mastic:

1) Foster 45-00 or 46-50.
2) Childers CP-10 or CP-11.
3) Vimasco WC-5.

e. Insulation Bonding Adhesive (to metal):

1) Foster 85-60.
2) Childers CP-127.
3) Duro Dyne SSG.

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. Insulation Joint Sealants: Foster 95-50, Childers CP-76, Pittsburgh Corning PC444 or accepted equivalent.
h. Metal Jacketing Sealant: Foster 95-44, Childers CP-76, Pittsburgh Corning 727 or accepted equivalent.
i. Staples: Type 304 or 316 stainless steel outward clinching type.
j. Wire: 16 gage, copper weld wire.
k. Bands: 3/4 by 0.015" thick galvanized steel.
l. Glass or Polyester Reinforcing Mesh :

1) 10 strands by 10 strands per square inch or 9 strands by 9 strands per square inch.
2) Childers Chil Glas #10.
3) Foster Mast a Fab.
4) Pittsburgh Corning PC 79.

m. Insulation Jackets:

1) Jackets inside building shall comply with fire hazard classifications as specified. Insulation jackets shall not support mold growth.
2) Vapor Barrier Jackets:

a) For Cold Pipelines (-30 degrees F. to 60 degrees F.): Perm rating shall bot exceed 0.05, ASTM E96 Procedure A. Puncture resistance shall not be less than 50 beach units.
b) For Air-conditioning Ducts: Perm rating not more than 0.05, ASTM E96, Procedure A. Puncture resistance shall not be less than 25 beach units.

2.3 SYSTEMS INSULATION BY SERVICE TYPE

A. Chilled Water Supply and Return Piping Insulation:

1. 1" diameter and smaller - copper, aboveground:

a. Foamed Plastic Pipe Insulation: 1 inch thick.
b. Provide vapor barrier mastic on all seams, elbows and fittings.

2. 1-1/2" to 4" diameter - aboveground:

a. Cellular Glass Insulation.
b. Thicknesses as follows:

1) 2 inches thick for interior ceilings.
2) 2-1/2 inches thick for areas such as exterior or perimeter corridors and walkways, whether exposed of concealed, or in ceilings or breezeways.
3) Provide insulation joint sealant on all longitudinal and butt joints.
4) Provide vapor barrier mastic and reinforcing mesh on all elbows, fittings and valves. Omit this finish at exterior aboveground piping as specified in paragraph 3.2.C of this section.

3. 5" to 10" diameter - aboveground:

a. Cellular Glass Insulation.
b. Thicknesses as follows:

1) 2-1/2 inches thick for interior ceilings.
2) 3 inches thick for areas such as exterior or perimeter corridors and walkways, whether exposed of concealed, or in ceilings or breezeways.
3) Provide insulation joint sealant on all longitudinal and butt joints.
4) Provide vapor barrier mastic and reinforcing mesh on all elbows, fittings and valves. Omit this finish at exterior aboveground piping as specified in paragraph 3.2.C of this section.

4. Underground, all sizes.

a. Cellular Glass Insulation: 2-1/2 inches thick with factory applied jacket.

B. Hydronic and Domestic Hot Water Supply, Return and Recirculation Piping and Fittings Insulation:

1. 1 inch 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. Solar Collector Piping and fittings Insulation:

1. Same as specified for Hot Water Piping except with weatherproof jacket.

D. AHU Drainage Piping, Drinking Fountain, and Electric Water Cooler Drain Piping; refrigerant suction 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.

E. Engine Exhaust and Gas Boiler Flue Insulation:

1. 3 inches thick hydrous calcium silicate on pipe, fittings, and muffler.
2. 3 inches thick Temp Matt on flexible connections.
3. Fasteners: 14 gage galvanized iron wire on 9 inch centers.
4. Fittings: Fabricated from pipe insulation.
5. Finish: 1200 degree F. glass cloth.
6. Maximum thermal conductivity factor of 0.5 K at 500 degrees F. mean temperature and a density of 11 pounds per cubic foot.

F. 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.

G. Interior Concealed Ductwork Insulation:

1. Flexible fiberglass Ductwrap Blanket Insulation:

a. 2.2 inches thick, 3/4 pounds per cubic foot density, R=6.5..
b. 2.0 inches thick, 1-1/2 pounds per cubic foot density, R=6.3.

H. Interior or Exterior Exposed Ductwork Insulation:

1. Rigid Fiberglass Ductboard Insulation: 2 inches thick, 3 pounds per cubic foot density, with factory applied FSK jacket.

I. At contractor’s option, where specified and approved by the City of Miami on per project basis pre-insulated, underground exterior piping may be used.

1. Pre-insulated underground piping system shall consist of integral sealed units insulated with rigid polyurethane foam sealed with outer jacket and compression fitted rubber end seals:
2. Pipe: All sizes: Pipe shall be as specified in Section 15510.
3. Insulation: All sizes: Rigid 90 to 95 percent closed cell polyurethane with 1.9 to 3.0 lbs./cu.ft. density and a thermal conductivity (K) of 0.13 to 0.17 BTU/sq.ft./°F./inch at 73 degrees F, 2 1/2" minimum thickness.

4. Jacket: All sizes: Type I, Grade 1 PVC or HDPE with a minimum wall thickness of 0.060 inches.
5. Fittings: Fittings shall be coated in the field (Ricwil "Rip Coat or equivalent).
6. Manufacturers:

    a. Energy Task Force, Apopka, FL.
    b. Insul-Tek, Mulberry, FL.
    c. Steel-Gard by Ricwil.
    d. Insul-8 by Rovanco Corp.
    e. Heat Tite by Thermal Pipe Systems Inc.
    f. Thermacor Process, Inc.

        1) Ferro-Therm (Welded)
        2) Ferro-Therm D.I. (Gasketed)
        3) Copper-Therm (Brazed).

    g. U.I.P. by Urecon, Melbourne, FL.

PART 3 EXECUTION

3.1 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. Insulation shall be kept clean and dry at all times.

I. Insulation on exposed piping penetrating floors in locations subject to water damage, such as kitchens and custodial spaces, shall be protected with aluminum jacketing as specified herein. Apply jacketing over the insulation for a minimum height of three feet above the finish floor.

J. Duct Materials:

1. Fiber glass duct lining is not allowed.
2. Duct materials exposed to the airflow shall be noncombustible metal.
3. Duct insulation for thermal 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's 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. Flanges, Fittings, and Valves on Insulated Piping:

1. Provide pre-molded glass fiber fittings wired or taped on and adhered with canvas jacket and mold resistant lagging adhesive.
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 with vapor barrier mastic.

M. Vapor Barriers:

1. Intact and continuous.
2. Apply over staples.

N. 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.

O. All ductwork shall be insulated, except as noted below:

1. Exhaust air ductwork.
2. Where indicated on plans: supply air ductwork, exposed in air-conditioned spaces. (Note: Ceiling plenums, and mechanical equipment rooms are not to be considered air-conditioned spaces.)

P. Ceiling supply air registers located on perimeter rooms and corridors shall be field insulated with flexible fiberglass duct wrap insulation as specified. Insulation shall cover the upper body and installation flanges.

Q. All appurtenances subject to condensation shall be protected as necessary and covered with vapor seal mastic.

3.2 APPLICATIONS

A. Molded Fiberglass Pipe Insulation Installation (Hot Water Piping):

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 vapor barrier mastic for chilled water service insulation for all areas.

C. Cellular Glass Insulation Installation (Chilled Water Supply/Return):

1. Interior aboveground.

    a. Each length of insulation shall be secured with two wires. Insulation shall be applied with all joints fitted to eliminate voids. Voids shall be eliminated by refitting or replacing insulation. Do not fill voids with joint sealer.
    b. Seal longitudinal and butt joints with insulation joint sealant.
    c. On any straight run over 40 feet, install an expansion joint consisting of a 2-inch-wide section of foamed plastic. Finish over this section with reinforcing mesh and vapor barrier mastic.
    d. Finish concealed piping with factory installed white all purpose jacket, all joints and seams sealed with fire rated adhesive. Finish elbows and fittings with vapor barrier mastic reinforced with white open weave membrane with maximum mesh opening of 10 x 10 per inch.
    e. For exposed piping in machine rooms and similar spaces, finish with vapor barrier mastic reinforced with white open weave membrane with maximum mesh opening of 10 x 10 per inch. Then apply second coat of vapor barrier mastic and brush lightly with a wet brush to a smooth finish.

2. Exterior Aboveground:

    a. Same as interior aboveground, except finish specified above for elbows and fittings shall be omitted.
    b. Finish straight runs with 0.016" aluminum jacket secured with 1/2" aluminum bands and seals, aluminum screws, or pop rivets on 9 inches on center. Elbows, valves, and fittings shall be finished with preformed aluminum fitting covers. Seam shall be placed at bottom. Caulk all joints to prevent water intrusion with 1/8 inch bead of metal jacketing sealant to prevent water intrusion.

3. Exterior Underground:

    a. Same as interior aboveground.
    b. Finish with factory applied jacket, self-sealing, nonmetallic consisting of special bituminous resin, reinforced with an aluminized Mylar film and a release paper. Finish jacket shall be not less than 70 mils thick and weigh not less than 39 lbs. per 100 sq.ft.
    c. Provide a minimum of 6 inches of clean sand all around underground insulated piping. Provide one foot above the 6 inches of sand cover with rock free backfill.

D. 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.

E. 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.
6. Insulation shall be continuous through walls and floors except at fire dampers and at combination smoke/fire dampers.

F. Equipment:

1. Chilled Water Pump Casings:

    a. Insulate with not less than 2 inches of cellular glass block insulation finished with a 1/2" thick coat of insulating cement reinforced with 1-inch hexagonal mesh wire cloth, followed by a 1/2" thick coat of hard finish insulating cement.
    b. Apply casing insulation in 2 removable sections to ease pump maintenance.

G. 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

15240
VIBRATION ISOLATION

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 15450 - Plumbing Equipment.
2. 15510 - Piping (HVAC).
3. 15515 - Valves, Hangers, and Specialties.
4. 15540 - Pumping Equipment (HVAC).
5. 15670 – Air Cooled Condensing Units
8. 15855 - Air Handling Units.
10. 15890 - Ductwork.
11. 15900 - HVAC Control System.

1.2 SUBMITTALS

A. Vibration Isolators: Provide catalog cuts, diameters, isolation efficiencies, deflections, free height, operating height, solid height, and lowest equipment speed for each isolator.

B. Equipment Bases: Provide catalog cuts or drawings.

C. Concrete Inertia Bases: Drawings showing required concrete steel reinforcing, construction details, and dimensions.

1.3 QUALITY ASSURANCE

A. Vibration isolators and equipment bases shall be the products of 1 manufacturer who shall determine mounting sizes and provide field supervision and inspection to assure proper installation and performance.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Vibration Isolation:

1. Consolidated Kinetics Corp., Columbus, OH.
2. Korfund Dynamics Corp., Westbury, NY.
3. Mason Industries, Inc., Hollis, NY.
4. Vibration Mountings and Controls, Inc., Butler, NJ.

2.2 MATERIALS

A. Rubber-in-Sheer Type Isolators:

1. Molded mount shaped elements with bolt holes for bolting to equipment bases and mounted on bottom steel plates for bolting to foundations.
2. Double rubber-in-shear elements shall be mounted in series.
3. Metal surfaces shall be neoprene covered and have friction pads both top and bottom.

B. Spring Isolators:

1. Free-standing type, laterally stable without any housing, complete with rubber sounddeadening pads between active spring and its support, leveling adjustment bolts, and adequate facilities for bolting to both equipment and supporting structure.
2. Spring diameter not less than allowable compressed height of spring.
3. Spring base, minimum 1/4" thick rubber acoustical friction pads at underside.
4. Spring isolators for equipment with operating weight different from installed weight shall have built-in adjustable limit stops to prevent equipment rising when weight is removed.
5. Limit stops shall be out of contact during normal operation. Similarly, springs having a deflection of 2 inches or greater shall have neoprene limit stop to prevent undue motion during starting and stopping, but unrestrained otherwise.

C. Hanger-Type Isolators:

1. Rubber-in-shear or combination rubber-in-shear and springs, mounted in a hanger box, as required to meet static deflection.
2. Provide lockout plates when required.

D. Vertically Restrained Spring Isolators:

1. Incorporate a single spring vibration isolator having characteristics specified and a steel mount assembly designed to limit vertical movement of isolated equipment.
2. Provide flat steel top load plate and base plate bonded to 1/4" thick neoprene noisestop pad.

E. Inertia Blocks:

1. Reinforced concrete.
2. Provide a common support for motors and driven equipment.
3. Frames for inertia blocks shall be structural steel with reinforcing bars welded in place and shall be provided by the isolator manufacturer.

PART 3 EXECUTION

3.1 INSTALLATION

A. Mount equipment and piping on or suspended from accepted foundations and supports, as indicated in construction documents or as required. Mountings shall be non-resonant with equipment operating or with building structure natural frequencies.

B. Concrete inertia bases and required reinforcing shall be furnished and installed under this section.

1. Furnish shop drawings showing adequate concrete reinforcing steel details and templates for concrete foundations and supports, and required hanger bolts and other appurtenances necessary for proper installation of the equipment.

2. Work shall be shown in detail on shop drawings, prepared under this section, and drawings submitted to A/E showing complete details of bases including necessary concrete and steel work and vibration isolation devices.

C. Place floor-mounted equipment on 4-inch-high concrete pads extending 6 inches beyond equipment outline, unless otherwise specified.

D. Vibration Isolation Systems:

1. Guaranteed to have deflection indicated on schedule on Construction Documents.
2. Mounting sizes shall be determined by vibration isolation manufacturer.
3. Install according to manufacturer's instructions.

E. Vibration isolation systems for each floor or ceiling supported equipment shall have a maximum lateral motion under equipment start-up or shut down conditions of 1/4". Motions in excess shall be restrained by accepted spring type mountings.

F. Mounting systems exposed to weather and other corrosive environments shall be protected with factory corrosion resistant coatings. Metal parts of mountings (except springs and hardware) shall be hot dip galvanized. Springs shall be cadmium plated and neoprene coated. Nuts and bolts shall be cadmium plated.

G. Where steel spring isolation systems are described in following paragraphs, mounting assemblies shall use bare springs with spring diameter not less than 0.8 of loaded operating height of spring. Each spring isolator shall be designed and installed with ends of spring to remain parallel. Spring deflection before becoming solid shall be at least 50 percent greater than specified minimum deflection.

H. Factory Assembled Air Handling Units:

1. Mount units directly on stable bare steel spring isolators.
2. Where units to be mounted are furnished with internal structural frames and external lugs, both of suitable strength and rigidity, or without any severe overhangs, no additional structural frame need be furnished and installed beneath unit.
3. Motor shall be integrally mounted to unit and shall be mounted on slide rails. Mountings shall provide static deflection shown on drawings.

I. Ceiling Supported Fans, Unit Ventilators, and Air Handlers:

1. Units shall be hung by means of vibration isolator hangers consisting of steel housing or retainer incorporating a steel spring and neoprene isolators.
2. If equipment to be mounted is not furnished with integral structural frames and external mounting lugs, both of suitable strength and rigidity, accepted structural subbase shall be installed in the field to support equipment to be hung and receive hangers.
3. Diagonal hanger rod isolators shall be provided as required to limit horizontal motion to 1/4" maximum under fan operating conditions.

J. Centrifugal Pumps:

1. Each pump with its driving motor shall be bolted and grouted to a spring supported concrete inertia base reinforced as required.
2. Concrete inertia base thickness shall be a minimum of 8 inches.
3. Spring supported concrete inertia foundation shall be poured within structural perimeter frame, reinforced as necessary, of required thickness specified above.
4. Mountings shall provide minimum static deflection as shown on drawings.
5. Structural perimeter frame, mounting templates, height saving brackets, and spring system shall be provided as an assembly by vibration control manufacturer.

K. Support Piping:

1. Water piping inside mechanical rooms shall be resiliently supported.

2. Resilient diagonal mountings or other accepted devices shall be provided as required to limit piping motion due to equipment start up or shut down, to a maximum deflection of 1/8".
3. Isolators for water piping shall be resiliently spring and neoprene supported with mountings providing a minimum static deflection of 1/2".
4. Where supplementary steel is required to support piping, supplementary steel shall be sized to limit maximum deflection between supports to 0.08" and shall be resiliently supported from building structure with mountings as specified. Supported piping from supplementary steel shall be rigidly suspended or supported.

L. Control Air Compressors:

1. Bolt and grout to reinforced concrete inertia block, 6 inches thick minimum mounted on bare steel spring isolators with 2 inch deflection.

M. Air Compressor Flexible Connectors:

1. Flexible stainless steel metal pipe connectors shall be installed in 2 planes 90 degrees to each other in discharge piping from compressor.
2. Flexible connectors shall have a minimum burst pressure of 4 times operating pressure.
3. Pipe sizes through 2 inch I.D. shall be furnished with hex male nipple fittings and pipe sizes 2-1/2" I.D. and larger shall be furnished with fixed steel flanges both sides.

N. Centrifugal Water Chillers and Rotary Water Chillers (Screw):

1. Each chiller shall be resiliently supported on vertical restrained steel spring vibration isolation mountings.
2. Spring mountings shall incorporate unrestrained stable springs with built-in leveling device and resilient vertical limit stops to prevent spring elongation when partial load is removed. The mountings shall be capable of providing rigid anchor, during erection of machine, so it can be erected at a fixed elevation.

O. Floor Mounted Centrifugal Fans:

1. Each fan with its driving motor shall be bolted to a spring supported structural steel base.
2. Mountings shall provide minimum static deflection as shown on construction documents.
3. Structural frame, height saving brackets, and spring system shall be provided as an assembly by vibration control manufacturer.

P. Roof Mounted Equipment:

1. No additional vibration isolation is required for curb mounted equipment.
2. Roof mounted equipment not installed on curbs shall be installed on a structural framing system as indicated on drawings. The clearance from the finished roof the bottom of the supporting steel shall be as required in Chapter 15 FBC.
3. Isolators shall be as specified for floor mounted equipment except spring isolators shall be the vertically restrained type.

END OF SECTION

15410
PIPING (PLUMBING)

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 15440 - Plumbing Fixtures, Trim and Supports.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM) - latest publications:

1. A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
2. A74 - Standard Specification for Cast Iron Soil Pipe and Fittings.
3. A106/A106M - Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service.
4. B32 - Standard Specification for Solder Metal.
5. B88 - Standard Specification for Seamless Copper Water Tube.
6. B306 - Standard Specification for Copper Drainage Tube (DWV).
7. C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
8. C1277 – Standard Specification for Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings.
9. D312 - Standard Specification for Asphalt Used in Roofing.
10. D1784 – Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride)(CPVC) Compounds.
11. D2241- Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure Rated Pipe (SDR Series).
12. D2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.

1.3 SUBMITTALS

A. Submit properly identified manufacturer's literature before starting work.

B. Shop Drawings:

1. Pipe and Fittings: Manufacturer's name and mill reports.
2. Expansion Joints: Catalog cuts.
3. Dielectric Unions: Catalog cuts.

PART 2 PRODUCTS

2.1 MATERIALS

A. Materials shall be new, unused, and best of their respective kinds, free from defects in labor quality, complying with latest publications in effect at time of bidding, and according to Construction Documents.

B. Cast Iron Drainage Pipe and Fittings:

1. Hub and Spigot: Service weight centrifugally spun cast iron, hub and spigot, tar coated inside and out, ASTM A74.
2. No-Hub: Service weight centrifugally spun cast iron, no-hub, tar coated inside and out, CISPI 310.

C. Galvanizing: By hot process on both inside and outside of pipe with zinc coating averaging at least 2 ounces per square foot and free from defects.

D. Threaded Cast Iron Drainage Pipe:

1. Uncoated service weight, ANSI A40.5.

E. Copper Tubing:

1. Type K or L: Seamless hard drawn or annealed, ASTM B88.
2. Type DWV: Seamless hard drawn, ASTM B306.

F. Steel Pipe: Seamless or welded steel, Schedule 40, black or galvanized threaded, ASTM A53 seamless Grade A.

G. Ductile Iron Pipe: ANSI/AWWA C151/A21.51.

H. Polyvinylchloride Pipe (PVC) or CPVC:

1. Non-Threaded, Type 1 Grade 1, ASTM D1784, for use with potable water NSF standard 61.

I. Cast Iron No-Hub Pipe Joint:

1. Cast Iron: ASTM A888.
2. Neoprene Gaskets: ASTM C564.
3. Aboveground: Stainless Steel Clamp and Shield Assembly: 300 Series, CISPI 301-69T.
4. Underground: ASTM C1277, cast iron couplings with neoprene compression gasket and stainless-steel bolts.

J. Cast Iron Threaded Drainage Fittings: Recessed pattern ANSI B16.12.

K. Cast Iron Threaded Fittings: Standard weight unless noted otherwise, ANSI B16.4.

L. Malleable Iron Fittings: Standard weight, threaded banded 150 pounds ANSI B16.3. Galvanized or black to match piping.

M. Cast Iron Fittings and Flanges:

1. Standard Weight: ANSI B16.1, unless otherwise noted.
2. Extra Heavy: ANSI B16.2.

N. Steel Flanges: 150 psi and 300 psi Class, ANSI B16.5, Grade 1.

O. Brass Fittings:

1. Copper Tubing Solder Drainage Fittings: Wrought copper, ANSI B16.22.
2. Copper Tubing Solder Fittings: Wrought copper, ANSI B16.22.
3. Threaded: Standard weight, banded, ANSI B16.15.

P. Press Fittings for Copper: Type K copper and bronze, ASME B16.18 or ASME B16.22. O-rings for copper press fittings shall be EPDM.

1. Viega, Lakewood, OH.
2. Ridge Tool Co., Elyria, OH.
3. Accepted equivalent.

Q. Polyvinylchloride (PVC) Solvent Cement: ASTM D2564.

R. Compression Gaskets, Cast Iron Soil Pipe: ASTM C564.

S. Solder Metal:

1. Similar to silver-tin-copper alloy ASTM B32.
2. All solder shall be certified no-lead.

T. Joint Compound: Tite-Seal or accepted equivalent.

U. Unions: As specified in Section 15430.

V. Protective Coating: Cabot's Flexi-Black or accepted equivalent.

W. Vent Flashing: Provide flashing for vents through the roof for installation as specified in Division 7.

X. Vandalproof Ventstack Caps: Provide vandalproof ventstack caps,

1. Vandalproof hood (threaded) and counterflashing (threaded) cast iron with standard rust resistant prime coating for installation under this section. No.1100-5 hood and 1520-2 counterflashing by Elimdor/Stoneman.
2. Vent extension/flashing by Vent Extensions, Inc., Wellington, FL.
3. Vandalproof cap, 18 gage, type 304 stainless steel by S.B.C., North Miami, FL.

Y. Glass Pipe: Borosilicate glass with compression type stainless steel coupling and tetra-fluorethylene gasket. Fed.Spec.DD-G-541-B and Mil.Spec.MIL-P-22561-B. Kimax by Schott Process Systems, Inc. or accepted equivalent.

Z. High Silica Cast Iron: 14-1/2 percent silicon content cast iron with mechanical joints and 300 stainless steel coupling with PFTE gasket torqued to 9-11 ft. lbs. or bells and spigots with acid-proof rope packing.

AA. Stainless Steel: Schedule 10, seamless with plain ends, ASTM D312, Type 304.

BB. Thermoplastic:

1. Polypropylene acid resistant piping joined by fusion collars of electrical resistance coils.

a. Enfusion by Enfield Industrial Corp.
b. Fuseal by R & G Sloane.
c. Fusion Lock by Zurn.
d. Orion Fittings Inc.

2. Polypropylene acid resistant piping joined by mechanical joint stainless steel compression fittings.

a. Orion Fittings Inc.
b. Accepted equivalent.

CC. Neutralization Tanks with Venting Provisions:

1. Polypropylene acid resistant tanks by Orion.
2. Knight-ware acid resistant stoneware by Koch Engineering Company, Inc.
3. Labline.
4. Neutratanks by Enfield.
5. Polypropylene acid resistant tanks by Schier.
6. Access covers by Josam or Zurn.

DD. Glass Fittings: Beaded ends with compression type coupling.

EE. Silicon Cast Iron Fittings: Plain end with mechanical couplings, or bell and spigot with acid-resistant packing.

FF. Exterior Wall Pipe Penetration: Provide a multi-section circular clamping device to the pipe. Link Seal, or accepted equivalent.

GG. Locator Tape for PVC: 2 inches wide, metallic. Suitable for the services protected, by Seton or accepted equivalent.

PART 3 EXECUTION

3.1 MATERIALS

A. Run piping as indicated in Construction Documents subject to modifications as required to suit field conditions, to avoid interference with other trades, and for proper, convenient, and accessible locations to parts of the piping system.

B. Run piping in wall chases, recesses, pipe shafts, and hung ceilings where provided.

1. Do not run gas or water piping in floor fill.
2. Run piping as high as possible under building, above ceilings, and close to slabs.
3. Do not permanently close, frame-in, or cover piping before examination and final tests.

C. Run piping straight and where concealed as direct as possible with risers erected plumb and true.

1. Install piping with minimum 1 inch clearance between finished pipe coverings and adjacent work.

2. Support piping from structure above, maintaining maximum headroom available.

D. Provide control valves where noted or required for complete regulating control of systems, plumbing fixtures, and equipment. Provide valves in accessible locations above ceiling with access panels.

E. Coat Underground metal piping, except cast iron or as noted on the Drawings, with 1/16" thick black bituminous protective coating.

F. Fittings, Valves, and Hangers on Chrome Plated Piping: Chrome plated finish to match.

G. Provide reducing fittings for changes in pipe sizes. Bushings will not be allowed.

H. Provide extra heavy pipe for nipples where unthreaded pipe is less than 1-1/2".

1. Do not use close nipples. Use saddle nipples.
2. Provide galvanized iron sleeves for pipes passing through roof slabs, interior floors, ceilings, walls, or partitions.

I. Provide at least 20 feet of bare copper pipe for exterior electrical ground at each domestic water service entering each building.

J. Expansion Swings:

1. Make adequate provisions for proper expansion and contraction of piping and for piping passing through building expansion joints.
2. Make branch connections from risers with ample swing or offset to avoid strain on fittings or short pipe lengths. Anchor horizontal runs of pipe over 50 feet in length to walls or supporting structure about midway of run to allow expansion evenly divided toward ends.
3. Provide sufficient number of elbow swings or accepted expansion joints to allow proper expansion and contraction of mains and risers.

K. Pipe Slopes:

1. Lay horizontal soil and waste pipes, unless otherwise noted on drawings, to:

   a. 1/8" per foot minimum for pipe 3 inches and larger.
   b. 1/4" per foot minimum for pipe less than 3 inches.
   c. Horizontal vent lines shall have a minimum grade back to the stacks or vertical lines and shall run as direct and free from bends as possible.

2. Lay storm drainage pipes to 1/8" per foot minimum, unless otherwise noted on drawings.

L. Exposed Piping:

1. Install horizontal runs maximum 4 inches below adjacent structure and run parallel or perpendicular to walls, ceilings, beams, and columns unless otherwise noted on Construction Documents.

M. Piping Materials by System:

1. Sanitary Soil, Waste, and Vent Piping:

    a. Aboveground: PVC, service weight no-hub cast iron pipe and fittings, DWV copper pipe with cast brass or wrought copper solder joint drainage fittings.
    b. Under Ground Floor Slabs:

        1) Cast iron bell and spigot pipe and fittings.
        2) Cast iron no-hub pipe and fittings with corrosion resistant couplings and neoprene compression gaskets.
        3) PVC schedule 40 with DWV pattern glue fittings.

2. Vandalproof Vent Caps:

    a. Install according to manufacturer's printed instructions.

3. Domestic Water Supply Piping: Drilling tubes for field manufactured fittings is not allowed.

    a. Aboveground Interior:

        1) Copper Tubing Type L:

            a) Wrought copper solder joint fitting without the use of lead components. Tubing used with this type shall not be soft drawn.
            b) Bending of tubing having a radius of not less than 4 tube diameters without deformation may be used for tubing diameters not exceeding 1 inch. Copper tubing used for this type connection shall be bending temper.
            c) Victaulic copper connection system with Style 606 couplings. Tubing used with this type connection shall be drawn temper.

        2) Domestic water piping over 2 inches in diameter and located above accessible corridor ceilings shall be CPVC, Schedule 40, with CPVC glued joint fittings.
        3) Domestic water piping located above inaccessible ceilings and/or in chases, regardless of size, shall be copper.

    b. Underground Exterior:

        1) PVC.
        2) Copper Tubing Type K:

            a) Soft tempered copper with cast bronze or soldered joint fittings coated with bitumen.

    c. Optional Press Connections for Aboveground Interior Copper Tubing Type L and Underground Exterior Copper Tubing Type K:

        1) Press fittings shall be made according to the manufacturer's installation instructions.
        2) The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting.

3) The fitting alignment shall be checked against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting.
4) The joints shall be pressed using the tool approved by the manufacturer.

N. Joints and Methods of Connections:

1. Cast Iron Bell and Spigot Pipe:

a. Compression Gaskets:

1) Gasket and pipe by same manufacturer.
2) Install according to manufacturer's instructions.

2. Cast Iron No-Hub Pipe:

a. Aboveground: Joint with neoprene rubber sleeve and stainless-steel ring clamp according to manufacturer's instructions.
b. Underground: Joint with cast iron coupling, neoprene gasket, and stainless-steel bolts according to manufacturer's instructions.

O. Pipe Cleaning Systems:

1. Domestic Water Piping: Entire domestic water distribution systems shall be flushed clean after the permanent water meter has been installed and before the bacteria testing is conducted.

3.2 TESTS

A. Furnish necessary instruments, test equipment, and personnel required to perform tests and remove test equipment and drain pipes after tests have been made and accepted.

B. After portions of mechanical work are completed and ready for testing, given 48 hours notice to A/E and perform tests in A/E's presence.

C. Tests may be made of isolated portions of piping to facilitate the general progress of installation.

1. Revisions subsequently made in piping system shall require retesting of such affected portions of piping systems.
2. Subject piping and connections to a hydrostatic or pneumatic pressure test before painting, installation of insulation or concealment.
3. Sanitary Drainage Systems:

a. Apply a water test to all parts of drainage systems before pipes are concealed or fixtures set in place.
b. Close openings of each system to be tested tightly except highest openings above roof and fill entire system with water up to overflow point of highest opening.
c. Subject systems to not less than 10 feet of hydrostatic head, except uppermost 10 feet of piping directly below opening.

1) Water shall remain in the systems for not less than 60 minutes after which time no leaks occur at any point and no lowering of water level at overflow point is visible.

4. Water Supply Piping:

a. Apply a pressure test to water system before piping is concealed or insulated and before fixtures and equipment are connected.
b. Apply a hydrostatic pressure of not less than 100 psig for 2 hours, with no leaks occurring in the system.

1) Water used for tests shall be obtained from a potable source of supply.

3.3 CLEANING AND ADJUSTING

A. Clean fixtures, equipment, piping, and exposed work.

1. Show traps, wastes, and supplies free and unobstructed.
2. Plated, polished bronze, or painted surfaces bright and clean.

B. After installation, adjust valves, faucets, and automatic control devices for quiet operation. Balance system as required for proper operation.

C. Disinfection: After cleaning and testing domestic water system, disinfect by introducing a solution of calcium hypochlorite with 50 parts per million of chlorine.
1. Open and close all valves while system in being chlorinated. After disinfecting agent has been applied for 24 hours, test for residual chorine at ends of pipe.
2. If less than 5 ppm is indicated, repeat process until it is equal to or greater than 5 ppm or according to AWWA C601 Standards.

END OF SECTION

15421
DRAINS AND CLEANOUTS

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 15410 - Piping (Plumbing).
2. 15430 - Piping Specialties (Plumbing)

1.2 SUBMITTALS

A. Product Data: Submit properly identified manufacturer's literature before starting work.

B. Submit Shop Drawings/Catalog cuts on the following:

1. Drains.
2. Cleanouts.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Model numbers are taken from Josam.

1. Accepted equivalents:

a. Jay R. Smith Mfg. Co.
b. Blucher-Josam.
c. Wade.
d. Zurn.

2.2 MATERIALS

A. Drains:

1. Toilet Room:

a. Same as Shower Stall above except with trap primer connections.
b. Josam Series 30000-6S or accepted equivalent.

2. Can Wash:

a. Coated cast iron, double drainage flange, weepholes, removable sediment bucket, bronze adjustable spray nozzle.
b. Series 39240 by Josam or accepted equivalent.

3. Area Drain:

    a. Coated cast iron with round heavy-duty anti-tilting grate with perimeter drainage slots, medium sump, bottom outlet.
    b. Series 24000 by Josam or accepted equivalent.

B. Cleanouts and Cleanout Access Covers:

1. Floor, Interior Finished Rooms:

    a. Cast iron, adjustable inside caulk outlet, brass internal plug, Nikaloy scoriated cover plate secured by countersunk plug.
    b. Series 56670 by Josam or accepted equivalent.

2. Stack Base for Use in Block, plaster and tile Walls;

    a. Cast iron "T" branch tee with plated cast iron countersunk plug, steel round access cover plate secured with countersunk screw.
    b. Series 58600PLG by Josam or accepted equivalent.

3. Exterior, Heavy Duty:

    a. Cast iron, outlet as required by pipe system bronze internal plug, ductile iron scoriated heavy duty cover.
    b. Series 58600 by Josam or accepted equivalent.

4. Cleanout Sizes:

    a. Full pipe size up through 4 inches, pipe cleanouts with bodies of standard pipe size and caulking ferrules conforming to thickness required for pipe and fittings of same metal.

5. Removable Cleanout Plugs:

    a. Cast bronze with screw threads and recessed bronze socket. Series 58540 by Josam or accepted equivalent.

C. Wall Access:

1. Cast bronze, square frame and cover, 9" X 9" minimum opening or larger, as required.
2. Series 58640 by Josam or accepted equivalent.

PART 3 EXECUTION

3.1 INSTALLATION

A. Provide drains and cleanouts as scheduled on drawings.

B. Cleanouts:

1. Place pipe cleanouts at the foot of each storm soil and waste stack in storm and sanitary system and place pipe cleanouts in horizontal runs in sanitary system not to exceed 75 foot spacing.
2. Install access covers as specified.

C. Interior Flush Cleanouts:

1. Flush cleanouts with recessed sockets (without access covers) may be used in non-finished areas such as equipment rooms, storage rooms, and the like, if top of hub is installed in level position and top of clean out plug is flush with the concrete floor.

D. Exterior Unfinished Grade Mounted:

1. Recessed plug mounted cleanouts flush with grade. Surround cleanout with concrete doughnut.

END OF SECTION

15430
PIPING SPECIALTIES (PLUMBING)

PART 1 GENERAL

1.1 SUMMARY

A. Related Section:

1. 15410 - Piping (Plumbing).
2. 15421 - Drains and Cleanouts.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM), latest publication:

1. A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.

1.3 SUBMITTALS

A. Submit properly identified manufacturer's literature before starting work.

B. Submit Shop Drawings/catalog cuts for the following:

1. Unions and Flanges.
2. Hangers and Inserts.
3. Trap Resealers.
4. Vacuum Breakers.
5. Gages and Thermometers.
6. Strainers.
7. Firestop Devices.
8. Backflow Preventors.
9. Water Hammer Arrestors.

PART 2 PRODUCTS

2.1 EQUIPMENT

A. Backflow Preventers for Domestic Water Service:

1. Reduced pressure zone, with 2 quarter turn, full ported, bronze ball valves, upstream strainer, and flanged adaptor ends. By Watts or other A/E accepted equivalent.

B. Trap Resealers:

1. Water Closet Valve: Chrome plated with tubing to wall and wall flange. Water closet shall be no more than 20 feet from floor drain. as furnished by flush valve manufacturer.
2. Lavatory or Sink: Cast brass chrome plated with 1/2" female union connection and 1/2" female outlets, integral vacuum breaker.
   a. Manufacturers:

1) Josam, No.88250.
2) Jay R Smith , No. 2699.
3) Zurn Industries, Inc., No.Z-1022XL.

3. Remote Location:

Machined brass valve with integral vacuum breaker, pressure adjustment and distribution units with visual operations inspection cover where required for multiple connections as manufactured by Precision Plumbing Products, or equivalent as approved by A/E.

C. Water Hammer Arrestors:

1. Sized per PDI-WH 201 at each branch of cold and hot water supplies as shown on Construction Documents.

a. Josam, No.75000, Sioux Chief or other A/E accepted equivalent.

D. Vacuum Breakers:

1. Hose Bibb Vacuum Breaker: Non-removable. 288A by Watts Regulator Co. or other A/E accepted equivalent.
2. For fixtures without an air gap between the supply valve and the drain, as specified in Section 15440.

E. Unions and Flanges:

1. Steel Pipe 2" and Smaller: Malleable iron unions with brass seat. Galvanized pipe requires galvanized unions.
2. Steel Pipe 2-1/2" and Larger: Flanged connections 150 pound Class. Galvanized pipe requires galvanized unions.
3. Copper Pipe 2" and Smaller: Bronze unions.
4. Copper Pipe 2-1/2" and Larger: Bronze flanged connections 150 pound Class.
5. Dielectric Unions or Flanges:

a. Meet dimensional requirements and tensile strength of pipe unions or flanges according to Fed. Spec. WW-U-531D.
b. Suitable for required operating pressures and temperature conditions.
c. Provide metal connections on both ends. Ends shall be threaded or soldered to match adjacent piping.
d. Separate metal parts at union to prevent current flow between dissimilar metals.

F. Escutcheons:

1. Provide escutcheons securely in place on exposed pipes passing through walls, partitions, floors, and ceilings of finished areas unless otherwise noted on Construction Documents.
2. Provide escutcheons with sufficient outside diameter to adequately cover sleeved openings.
3. Interior Walls, Partitions, and Ceilings: Solid or stamped chrome plated brass or stainless steel, one piece or split pattern.

4. Floors and Exterior: Solid cast brass, rough chrome plated or cast nickel bronze alloy, one piece or split pattern.

G. Flexible Connectors:

1. Rubber flexible pipe, 125 psi minimum working pressure rating, 9 inch maximum length.
2. Install according to manufacturer's recommendations.
3. By Metraflex or other A/E accepted equivalent.

H. Pressure Reducing Valves:

1. 25 to 75 psi range, union connection, lead free, built-in bypass, all bronze, monel screen.

a. 1/2" through 2": Model 600XLHTSC by Zurn Wilkins or other A/E accepted equivalent.
b. 1/2" through 3": for flow rates over 80 GPM, Model 500 XLHTSTSC by Zurn Wilkins or other A/E accepted equivalent.
c. 3/4" to 1": for flow rates under 20 GPM, Model 70XL by Zurn Wilkins or other A/E accepted equivalent.

I. Strainers:

1. Wye pattern, stainless steel screen, all bronze, 400 psi WOG, blow-off tapping, 1/2" to 2". YB Series by Zurn Wilkins or other A/E accepted equivalent.
2. Wye pattern, 2-1/2” and above ASTM 126, Class B Cast Iron, flanged connections, stainless steel screen, 200 psi WOG, 2-1/2 inch to 10 inches. FS series by Zurn Wilkins or other A/E accepted equivalent.

J. Pipe Hangers and Supports:

1. Provide hangers, supports, and supplementary steel as specified for different applications. All supports and parts shall conform to the latest requirements of the ASME Code for Pressure Piping B31.1 and MSS Standard Practice SP-58, SP-69, SP-89 and SP-90 except as supplemented or modified by the requirements of this specification.
2. Support spacing shall be as required by the appropriate Tables found in the FBC-Mechanical, Plumbing and Gas.
3. Insert, Hangers, Rods, and Clamps: Figure numbers used refer to Anvil International Inc., Grinnell, Fee and Mason or Elcen Metal Products are also accepted manufacturers.

a. Inserts:

1) Universal Concrete Insert: Fig.282.
2) CB Junior Concrete Insert: Fig.285.
3) Wedge Type Concrete Insert: Fig.281.

b. Hangers: Adjustable clevis type.

1) Cast Iron Pipe: Fig.590.
2) Copper Tubing: Fig.CT-65.

3) Insulated Steel Pipe: Fig.300.
4) Uninsulated Steel Pipe: Fig.260.

c. Clamps:

1) V.F.S. beam clamp with weldless eyenut, Fig.292, clamp size 1, rod size 3/4".
2) C-clamp with retaining clip, Fig.87.
3) I-beam clamp, Fig.133.
4) Universal side I beam clamp, Fig.217.

d. Rods: Galvanized with continuous thread, Fig.146.
e. Riser Clamps:

1) Black Steel, Fig.261.
2) Plastic coated, Fig.261C
3) Copper finish, Fig.CT121.

4. Diameter of Hanging Rods: Shall be as listed below.

Pipe Size	Rod Diameter
Up to 2"	3/8"
2-1/2 and 3 inches	1/2"
4 and 5 inches	5/8"
6 inches	3/4"
8 inches & larger	1 inch

5. Wall Support:

a. U-clamps as accepted.
b. Unistrut supports.

6. Vertical Support: Steel riser clamps.

K. Insulation Protection Shield: Fig.167.

L. Access Panels (Wall or Ceiling): As specified in –Division 8.

PART 3 EXECUTION

3.1 INSTALLATION

A. Inserts:

1. Use inserts for suspending hangers from reinforced concrete slabs or beams when possible.
2. Provide flush inserts at concrete to be a finished surface.

B. Flashing:

1. Flash and counterflash where mechanical equipment passes through exterior or waterproofed floors, walls, or roofs.

C. Sleeves:

1. Seal space between pipe or duct and surrounding floor, wall, or ceiling construction with intumescent caulking.

    a. Pipe Through Floors: Form from 18 gage galvanized sheet metal.
    b. Pipes Through Beams, Walls, Fireproofing, Footings, and Potentially Wet Floors: Use steel pipe or fabricate from 18 gage galvanized sheet metal.

2. Size sleeves to allow movement caused by expansion.
3. Seal and fireproof penetrations as required.

D. Pipe Hangers and Supports:

1. Provide adjustable hangers, inserts, brackets, rolls, clamps, and supplementary steel as required for proper support of pipelines.

    a. Design hangers to allow for expansion and contraction of pipelines. Size to allow pipe covering to run continuously through hangers. Allow for proper anchoring and movement of all hot pipes.
    b. Install hangers to allow 6" minimum clear space between finished covering and adjacent work.
    c. Place a hanger within 1 foot of each horizontal elbow.
    d. Use hangers with 1-1/2" minimum vertical adjustment after piping is erected.
    e. Provide multiple or trapeze hangers if several pipes can be installed in parallel and at the same elevation.
    f. Support riser piping independently of connected horizontal piping.
    g. Piping shall not be supported by equipment.
    h. Coordinate location of hangers with light fixtures.
    i. Wire brush steel or iron supports and prepare surfaces ready for painting specified under Division 9. Prime coat exposed non galvanized hangers and supports.
    j. Provide copper plated hangers and supports for copper piping. Dissimilar metal contact is not allowed.

2. Horizontal Cast Iron and PVC Pipe: Place hangers within 18 inches of hub or joint.
3. Hubless Joints: Provide support at every other joint. Support each joint when length between supports exceeds 4 feet.
4. Plastic Pipe: Provide roll hangers and install loose to allow for contraction and expansion.
5. Trapeze Clamp or Hangers:

    a. Secure pipes supported by trapeze clamp or hangers and not mounted on pipe rolls to trapeze with pipe clamps or ”U” bolts.
    b. Place clamp or hangers at each change of direction.
    c. Place clamp or hangers within 1 foot of valves and other appurtenances in horizontal piping.
    d. Place clamp or hangers maximum 3 feet from end of each branch runout.

6. Insulated Pipes:

    a. Provide hangers with a diameter large enough to include insulation.
    b. Install a protection shield with each hanger. 180 degree arc, 16 gage galvanized sheet metal covering, minimum 12 inches long.
    c. Provide support saddles for insulated piping over 2 inches in diameter.
    d. Where “U” bolts are applied, provide additional protection under bolt to avoid crushing insulation.

7. Special Supports: Clamps, hangers, and supports required by equipment manufacturers shall be installed according to equipment manufacturer's recommendations.
8. Plumbers tape, straps, chain, wire hangers, or perforated bar are not allowed for hanging pipe.

E. Backflow Preventers:

1. Install aboveground in 6'-0" high fenced enclosures with gate.

F. Unions and Flanges: Provide at connections to equipment and control valves.

G. Escutcheons: Fit and firmly secure escutcheons to pipes passing through finished floors, ceilings and walls.

END OF SECTION

15440
PLUMBING FIXTURES, TRIM, AND SUPPORTS

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. Division 10 - Toilet Room Accessories.
2. 15410 - Piping (Plumbing).
3. 15430 - Piping Specialties (Plumbing).

1.2 SUBMITTALS

A. Submit Shop Drawings for the following:

1. Fixtures: Catalog cuts with rough-in dimensions identified as designated in fixture schedule, riser diagrams, and as specified.
2. Faucets: Catalog cuts and templates for drilled openings.
3. Fixture Trim: Catalog cuts.
4. Carriers: Catalog cuts.

1.3 QUALITY ASSURANCE

A. Certification: Submit letters, signed by the installer of the product, attesting that no lead is contained in any piece of equipment or in the piping connections that could contaminate water, drinks, or food by contact.

B. Comply with Florida Building Code (FBC).

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Fixtures:

1. American Standard.
2. Acorn Engineering.
3. Bradley.
4. Fiat.
5. Elkay.
6. Kohler.
7. Kreolab
8. Toto.
9. Zurn

B. Fittings:

1. American Standard.
2. Chicago Faucets.

3. Fiat.
4. Elkay.
5. Powers Process Controls.
6. Symmons Industries.
7. Sloan.
8. T & S Brass.
9. Toto.
10. Zurn.

C. Equipment:

1. Guy Gray.
2. Haws.
3. Halsey Taylor.
4. Oasis.

WC-1	*Water closet,*
WC-2	*Water closet ADA accessible*
UR-1	*Urinal*
UR-2	*Urinal ADA accessible*
L-1	*Lavatory, wall hung, ADA accessible*
L-2	*Lavatory, counter top*
L-3	*Lavatory*
L-4	*Lavatory with hot water*
SK-1	*Sink, stainless steel, single compartment*
SK-2	*Sink, stainless steel, double compartment*
SSK-1	*Service sink*
MR-1	*Mop receptor*
EWC-1	*Electric water cooler,*
EWC-2	*Electric water cooler Hi-Lo ADA accessible*
FD-1	*Floor drain at finished areas*

2.2 FIXTURES

A. Water Closets:
1. Wall Hung Water Closet HC Accessible (WC -) with seat height as shown on drawings:

    a. White vitreous china, top spud, siphon jet flush action, 1.28 gpf, elongated bowl, with ceramic bolt caps.

        1) Afwall FloWise - 2294.011EC by American Standard, or other A/E approved equivalent by Kohler, Toto or Zurn.

    b. Flush Valve: Sloan Royal 111-1.28 or other A/E approved equivalent by Kohler, Toto, or Zurn.
    c. Seat: White, elongated, open front less cover, with self-sustaining, stainless steel posts and pintles check hinges and antimicrobial agent.

        1) As manufactured by Olsonite, Kohler, Toto or Zurn.

2. Wall Hung Water Closet not HC Accessible (WC -): Same as (WC -) above, but mount with seat height as shown on drawings.

3. Floor Mounted Water Closet HC and not HC accessible (WC -):

    a. White vitreous china, top spud, siphon jet flush action, 1.28 gpf, elongated bowl, with ceramic bolt caps.

        1) Madera FloWise 2259.001 (14 inches high); 2855.128 (15 inches high) or 2854.128 (16-1/2 inches high) model suited to the seat height shown on drawings, or other A/E approved equivalent by Kohler, Toto or Zurn.

    b. Flush Valve: Sloan Royal 111-1.28 or other A/E approved equivalent by Kohler, Toto, or Zurn.
    c. Seat: White, elongated, open front less cover, with self-sustaining stainless steel posts and pintles check hinges, and antimicrobial agents.

        1) As manufactured by Olsonite, Kohler, Toto or Zurn

B. Urinals:

1. Urinal HC accessible (UR -)

    a. Wall Hung, white vitreous china, siphon jet flush action, 3/4" top inlet spud, 0.5 gpf. Install with rim height of 17 inches above finished floor.

        1) Allbrook Flowise 6550.501 by American Standard, or other A/E approved equivalent by Kohler, Toto or Zurn.

    b. Flush Valve: Oscillating non hold open handle. 186-05 by Sloan Royal, or other A/E approved equivalent by Sloan Kohler, Toto or Zurn.

2. Urinal (UR-) not HC accessible same as (UR-) above, but mounted with rim height as shown on drawings.

C. Lavatories:

1. HC and not HC accessible (L- , L-):

    a. Wall Hung enameled cast iron, 20 inches x 18 inches, with lug holes for concealed carrier arms.

        1) Hudson K-2812 for cold water or K-2867 for hot and cold water. By Kohler or other A/E approved equivalent.

    b. Cold Water Fitting: Accessible, single lavatory fitting, self-closing metering, adjustable time cycle, push handle, vandal resistant aerator 0.5 gpm maximum flow.

        1) Chicago Faucets 333-E2805 or other A/E approved equivalent by Kohler, Moen or Symmons.

    c. Hot and Cold water Fitting: Accessible, 4 inch centers, 5 inch spout, lever handle, vandal resistant aerator 0.5 gpm maximum flow, with temperature and pressure compensation, ASSE 1070 compliant.

1) Powers TempTAP, Series 105/115, or other A/E approved equivalent by Kohler, Moen or Symmons.

d. Supply Pipes: 3/8” chrome plated flexible, with loose key control, by McGuire or other A/E approved equivalent.
e. “P” Trap: Adjustable with offset at HC accessible lavatories, and tubing drain to wall, cleanout plug and wall escutcheon, by McGuire or other A/E approved equivalent.
f. Grid Strainer: Perforated, chrome plated, 1-1/4" diameter offset tailpiece, swivel joint, HC compliant at accessible lavatories. By McGuire or other A/E approved equivalent.
g. Under sink Safety Covers: Shall conform to ADAAG.

1) Handi Lav-Guard Insulation Kit 101/106 as required, white, by Truebro or other A/E approved equivalent.
2) Use manufacturer fastening system.

h. Hot and Cold Water Fitting: Accessible, 4 inch centers, 5 inch spout, lever handle, vandal resistant aerator 0.5 gpm maximum flow, with temperature and pressure compensation, ASSE 1070 compliant.

1) Powers TempTAP, Series 105/115, or other A/E approved equivalent by Kohler, Moen or Symmons.

i. Supply Pipe: 3/8" chrome plated flexible, with loose key control. By McGuire or other A/E approved equivalent.
j. "P" Trap: Adjustable with tubing drain to wall, cleanout plug and wall escutcheon. By McGuire or other A/E approved equivalent.
k. Grid Strainer: Perforated, chrome plated, 1-1/4” diameter offset tailpiece, swivel joint. By McGuire or other A/E approved equivalent.
l. Under sink Safety Covers: Shall conform to ADAAG.

1) Handi Lav-Guard Insulation Kit 101/106 as required, white, by Truebro, or other A/E approved equivalent.
2) Use manufacturer's fastening system.

D. Sinks:

1. Service Sink (SSK -):

a. Enameled cast iron, 22 inches x 18 inches, plain back, stainless steel rim guard.

1) Kohler 6718 or other A/E approved equivalent by American Standard or Zurn.

b. Fitting: Accessible exposed yoke faucet, wall mounted, vacuum breaker, top brace, pail hook, stops in shanks and 3/4" hose threaded spout, rough plated.

1) Heritage 8354.112 by American Standard or other A/E approved equivalent by Chicago faucet, Fiat, Kohler or T & S Brass.

c. Supply Pipe: 3/8" chrome plated flexible, with loose key control. By McGuire or other A/E approved equivalent.
d. 3-inch "P" Trap: Standard and Strainer, with outlet to wall, by sink manufacturer.

2. Mop Receptor (MR -):

a. Molded resin, 24 inches x 24 inches x 10 inches, rim guards, center drain. Install in room corner.
b. Model MSR-2424 by Florestone or other A/E approved equivalent by Fiat.
c. Fitting: Same as Service Sink (SSK).
d. MR 370 5/8" diameter Hose.
e. MR-372 Mop hanger with 3 clamps.
f. Two MR 373 stainless steel 20 Gauge, 24" rim guards.
g. Two MR-377 stainless steel splash panels.

E. Hose Reel (HR-)

1. 35 feet of retractable 3/8” I.D. hose, hose bumper with hose spring and push lock hose end, for concealed installations, backflow preventer, shut-off valve, VOC concealed 2 valve fitting, loose key check valve, volume control with coupling.

a. 536-537WCNF with 548 stainless steel housing and main shaft and swivel, by Chicago Faucets or other A/E approved equivalent.

F. Electric Water Coolers HC Accessible (EWC -):

1. Bi-Level Application

a. Two Wall Mounted, 2-stream mound building bubbler, self-closing valve with automatic stream regulator, polished chrome plated brass bubbler, push bars in front and both sides, for handicapped and standard use, equipped with lead reduction filter, satin stainless-steel sides. Refer to Drawings for mounting height.

1) Halsey Taylor model HAC8FSBL-Q-SS or other A/E approved equivalent by Haws or Oasis.

2. No lead shall be allowed in the manufacture of any piece of equipment within water coolers or in any piping joint or connection within the unit or pipe leading to it.

G. Interceptors:

1. Trap type, solids interceptor, bottom access, 1-1/2" slip joint, gasketed covered, removable stainless-steel strainer basket, chrome plated.

a. Series 61000 by Josam, or other A/E approved equivalent.

2. On floor type, solids interceptor, top access, 2-inch threaded connections, gasketed cover, coated cast iron, galvanized steel basket with stainless steel screens.

a. Series 61040 by Josam or other A/E approved equivalent.

3. Hair/Lint interceptor, Dura-Coated cast iron hair and solids interceptor with slip joint inlet and threaded outlet, 16X16 mesh stainless steel basket removable from top, with flanged and gasketed cleanout cover with raised hex head.

    a. Series Series 61800 by Josam or other A/E approved equivalent.

H. Plaster Interceptors:

1. Low Volume: Z 1180 by Zurn or other A/E approved equivalent.
2. High Volume: Z 1181 by Zurn or other A/E approved equivalent.

2.3 CARRIERS

A. All carriers shall be fully bolted to floor and installed as recommended by manufacturer.

1. Lavatory/Lavatory HC:

    a. Rectangular structural steel uprights with integral welded heavy steel foot, cast iron concealed arms. Model 17100 by Josam or other A/E approved equivalent.

2. Urinal:

    a. Rectangular structural steel uprights with integral welded steel foot, hanger bracket and lower bearing plate. Model 17560 by Josam or other A/E approved equivalent.

3. Water Closet:

    a. 4-inch pipe size, with pylon feet, adjustable, provided with vandal resistant trim, supply pipe support and adjustable chase extensions. Josam 12000 Series Chase-Saver II or other A/E approved equivalent.

PART 3 EXECUTION

3.1 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.

3.2 EQUIPMENT AND FIXTURE CONNECTIONS

A. Provide necessary material and labor to connect fixtures and equipment having plumbing connections including fixtures and equipment specified and furnished in other sections.

B. Supply Pipe Cut-off Valves: On supply pipes to each item of equipment or fixture (except faucets furnished with an integral stop) install a cutoff valve to enable isolation of the item of equipment or fixture for repair and maintenance without interfering with operation of other items of equipment or fixtures

C. Anchor supply piping serving all items of equipment or fixtures to structure, to prevent pipe or fixture movement.

D. Templates: Furnish templates and rough opening dimensions to fabricators of countertops and case work for location and sizes of openings for faucets and sink.

END OF SECTION

15457
WATER HEATERS

PART I GENERAL

1.1 SUMMARY

A. Section Includes: A complete domestic hot water generating system with necessary accessories as indicated on Construction Documents, as specified, and as required by code.

B. Related Sections:
   1. 15180 – Mechanical System insulation.
   2. 15410 – Piping (Plumbing).
   3. 15430 – Piping Specialties (Plumbing).

1.2 SUBMITTALS

A. Submit properly identified manufacturer's literature before starting work.
B. Shop Drawings:
   1. Water Heaters: Catalog cuts, performance characteristics.
   2. Pressure and Temperature Relief Valve: Catalog cuts, capacity.

PART 2 PRODUCTS

2.1 EQUIPMENT

A. Electric - Storage Water Heaters:
   1. 6, 12, 20, 40 or 60 – gallon sizes, as indicated on Approved Permit Drawings.
   2. Double element, drain pan, wired for simultaneous use.
   3. Insulation jacket to meet current FBC energy code.
   4. Ruud, Lochinvar, A.O. Smith or other A/E approved equivalent.

B. Instantaneous – Type Electric Water Heaters (Tankless):
   1. Electric Instantaneous water heaters shall be tankless type with a flow activation switch operating only when hot water side of faucet is turned on.
   2. The heat exchanger shall be constructed of a noncorrosive metal alloy. The units shall have high temperature thermal cutoffs for a maximum temperature of 140 degrees F. to shut down the heating elements and avoid a scalding causing situation.
   3. The minimum flow activation shall be 0.5 GPM and minimum operating pressure requirements shall be 25 psi.
   4. Maximum operating pressure of 150 psi. Units shall be tested to UL 499.
   5. Controls shall not allow water temperature to exceed 110 degrees F.
   6. Provide 15-year warranty.
   7. Manufacturers:
      a. Cronomite Laboratories, Inc., Model S-90-1 or other A/E approved equivalent by Eemax Inc., Botsford, CT., or Hot Aqua Inc., Culver City CA.

PART 1 EXECUTION

1.1 INSTALLATION

A. Provide a gate valve and union at cold water connection to heater. A union shall be provided at hot water connection.

B. On storage type heaters, provide on cold water supply to heater a vacuum relief valve of sufficient size to protect tank from siphonage.

C. On storage type heaters, pressure relief valve and drain pan drain shall discharge to an approved location in accordance with Code.

D. At other than instantaneous electric water heaters provide thermometer on top of heater in oversized tee and nipple on outlet piping of heater.

E. On storage type heaters adjust individually controlled elements to start at 5 degrees F. temperature differential for each heater element.

F. The water heater shall fit properly in the floor space provided. Installation shall be according to local, municipal, state, and national codes.

END OF SECTION

15510
PIPING (HVAC)

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 07840 - Firestopping and Smoke Sealing.
2. 15515 - Valves, Hangers, and Specialties.
3. 15970 - HVAC Control System.
4. 15990 - Tests (HVAC).

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. A47-90(95) Specification for Ferritic Malleable Iron Castings.
2. A53-96 Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
3. A183-83(90) Specification for Carbon Steel Track Bolts and Nuts.
4. A197-87(92) Specification for Cupola Malleable Iron.
5. A234/A-96b Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
6. B32-96 Specification for Solder Metal.
7. B88-96 Specification for Seamless Copper Water Tube.
8. D1784-96 Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

1.3 SUBMITTALS

A. Pipe and Fittings: Manufacturer's name and mill test reports.

B. Piping Systems: 1/4" to 1 foot scale shop drawings.

PART 2 PRODUCTS

2.1 MATERIALS

A. PIPING TYPE "A":

1. Pipe: Up to 16" - Schedule 40, black steel per ASTM A53 Grade A or B seamless.
2. Fittings: a. Up to 2" - 150 PSI malleable iron per ASTM A197, screwed b. 2-1/2" and above - Schedule 40, black steel, seamless welding per ASTM A234.
3. Unions: Up to 2" - ASTM A47, 300 PSI wsp malleable iron, screwed, ground joint type.
4. Flanges: 2-1/2” and above - Welded, ANSI B16.5, 150 PSI primary steam rated, black steel, flat-faced, weld neck ir skip on.

B. PIPING TYPE "B":

1. Pipe: Up to 2" - Copper per ASTM B88, Type "L" hard drawn.

2. Fittings: Up to 2" - Wrought copper, solder joint type per ANSI B16.22 made with 95-5 or silver solder per ASTM B32, as specified.

C. PIPING TYPE "C":

1. Pipe: All sizes PVC, Schedule 40, ASTM D1784.

D. PIPING TYPE "D" (Underground-Exterior):

1. Underground piping system shall consist of integral sealed units insulated with rigid polyurethane foam sealed with outer jacket and compression fitted rubber end seals:
2. Pipe: All sizes - Pipe shall be as specified for Type "A" or "B" piping as indicated.
3. Insulation: All sizes - Rigid 90 to 95 percent closed cell 2-1/2” thick polyurethane. See section [15180].
4. Jacket: All sizes - Type I, Grade 1 PVC or with a minimum wall thickness of 0.060 inches, HDPE, or FRP.
5. Fittings: All sizes - ASTM A234, Schedule 40. For insulation of fittings see Section 15180.

E. PIPING TYPE "E" (Refrigerant):

1. Pipe: Up to 3" - Copper tubing marked ACR per ASTM B88 a, type "K" hard drawn, with silver soldered connections.
2. Fittings: Up to 3" - Wrought copper, soldered type. Where required for connection to gauges and control devices tubing not larger than 3/8" o.d. may be Type K soft (annealed) with flared tube or double ferrule compression fittings suitable for high pressure.

PART 3 EXECUTION

3.1 INSTALLATION

A. Furnish and install a system of piping and valves to control and isolate apparatus and appurtenances as shown on Construction Documents, or as necessary to complete working systems according to Construction Documents.

1. Construction Documents are diagrammatic and indicate general location and connections.
2. Piping may be offset, lowered, or raised as required or as directed at site. This does not relieve Contractor from responsibility for proper erection of systems of piping in every respect suitable for the work intended according to specifications and accepted by A/E.

B. Arrangement:

1. Piping shall not interfere with removal of other equipment or devices.
2. Piping shall not block access to doors, windows, panels, or other access openings. Piping shall be arranged to facilitate removal of heat exchanges.
3. Provide flanges or unions, as applicable for type of piping specified at connections to equipment and piping interfering with access or tube pull space.
4. Place and install piping to not interfere with installation of equipment and ducts.
5. Piping shall be installed to ensure noiseless circulation.
6. Place valves and specialties to allow easy operation and access. Valves shall be regulated, packed and have glands adjusted at completion of work before acceptance.
7. Piping shall be erected and pitched to ensure proper drainage.

C. Connections:

1. Install piping connections to pumps and other equipment without strain at piping connection.
2. Contractor shall be required as directed to remove bolts in these flanged connections or disconnect piping to demonstrate that piping has been so connected.
3. Provide flexible connections with at pump suction and discharge ends to match connecting pipe.

D. Where equipment requiring different arrangement or connections from those shown is accepted, it shall be responsibility of Contractor to install equipment to operate properly and with intent of Construction Documents and specifications.

1. When directed by A/E, submit documents showing proposed installation.
2. If proposed installation is accepted, make incidental changes in piping, duct work, supports, insulation, wiring, heaters, panelboards, etc. Provide additional motors, controllers, valves, fittings, and other additional equipment required for proper operation of system resulting from selection of alternate equipment, including required changes in affected trades.

E. Cut pipe accurately to measurements established at building, work into place without springing or forcing, and properly clear windows, doors, and other openings. Cutting or other modifications to building structures to facilitate piping installation will not be allowed unless accepted by A/E.

F. Install piping mains, branches and run-outs to allow for free expansion and contraction without developing leaks or undue stressing of pipe. Stresses to be within allowable limits of ANSI Code B31.1-73 for pressure piping.

G. Pipe Sizes: If size of any piping is not evident in Construction Documents, request instructions from A/E as to proper sizing. Changes resulting from Contractor's failure to request clarification shall be at his expense.

H. In mechanical rooms, avoid piping runs over electrical panels and other electrical equipment. If necessary, provide a suitable sheet metal shield or gutter. Submit shop drawings showing proposed shielding at each location.

I. Each mechanical trade is responsible for lines and levels of ductwork and piping based on reference lines and bench marks established by General Contractor for general work.

J. Provide the following:

1. Di-electric couplings between dissimilar metals.
2. Drain valves at low points of each system to enable complete drainage. Valves shall be full line size.
3. Drain piping from pump glands and relief valves, to spill over open sight drains, floor drains, or other acceptable discharge points terminating drain line with plain end (unthreaded) pipe.

4. Caps open ends of pipe lines and equipment during installation to keep dirt and other foreign matter out of pipe and equipment.
5. Temporary cross-connections, valves, oversize flushing connections, and pumps required to thoroughly flush systems.

6. Shut-off valves and unions or flanges at each branch and in supply and return to each item of equipment such as pumps, coils, automatic valves, etc., for isolation of equipment without complete system shutdown.
7. Gate valve on capped services for extension to equipment furnished under other sections or by M-DCPS when shown on Construction Documents.
8. Expansion loops with adequate anchors and guides to absorb pipe expansion as shown on Construction Documents or as required. Expansion joints are acceptable if accepted in advance by A/E.
9. Safety relief piping from fusible plugs, safety valves, relief valves, etc., full relief port size from equipment equipped with these devices, whether shown on Construction Documents or not. Discharge pipe safety relief piping to the building exterior in an accepted manner.
10. Auxiliary cooling piping and connections for compressors, etc., whether shown on the Construction Documents or not.

K. Cleaning and Flushing: Take every precaution to remove dirt, grease, and other foreign matter from each length of piping before making connections in field. After each section of piping is installed, flush with clean water, except where specified otherwise. A temporary flushing connection shall be arranged for each section of piping and flushing arranged for all piping. Water required for flushing shall be furnished by Contractor.

L. Threads on screwed piping shall be clean cut to exact length. Ream piping after cutting threads. Accepted joint compound shall be applied to male thread only. Lamp wick in joints is prohibited.

M. Welded piping shall be cleaned free of rust, scale and oxide. Pipe shall be beveled at each end and backing rings shall be used on systems with 2-1/2" and greater pipe size. After welding, pipe shall be hammer cleaned and flushed to remove scale, welding slag and other debris. If weld contains any defects, it shall be repaired to satisfaction of A/E.

N. Welded piping shall be according to ANSI B31.1-73, Power Piping, Chapter 4, Section VI. Welder shall be qualified per Section IX of the A.S.M.E. Boiler and Pressure Vessel Code. List of welders with date of last certification shall be available at job site. Safety procedures shall conform to ANSI Z49.1-73.

O. Long radius elbows shall be used except where space conditions do not allow and where indicated.

P. Reduction in pipe sizes shall be made with eccentric reducers or reducing elbows. Bushings are not allowed. Reducers in water piping shall have flat side up to facilitate venting.

3.2 PIPING TYPE

A. Above or below ground chilled water, hot water and condenser water piping shall be Type "A".

B. Above ground condenser water piping shall be Type "C".

C. Below ground chilled water and hot water piping shall be Type "A" or Type ‘D’ at the contractor’s option.

D. Make-up water and pump drainage piping shall be Type "B".

E. Chemical treatment piping shall be Type "C".

F. Refrigerant piping shall be Type "E".

3.3 OPTION: At the Contractor's option, subject to approval by the City, the following type connections may be used for aboveground chilled water pipe in chiller plant equipment rooms and condensing water systems only, instead of the screwed/welded connections specified for Type "A" pipe and fittings.

A. Mechanical Pipe Couplings:

1. Mechanical pipe couplings may be used instead of unions or welded, flanged, or screwed pipe connections.
2. Couplings shall be self-centering and shall engage and lock in place grooved or shouldered pipe and pipe fitting ends in a positive watertight couple. Fittings shall provide some degree of angular pipe deflection, contraction and expansion.
3. Coupling housing clamps shall consist of 2 or more malleable iron castings complying with ASTM A47. Housing clamps shall hold in place a composition water-sealing gasket designed to allow internal water pressure increase the seal's water-tightness.
4. Coupling assembly shall be securely held together by 2 or more track-head, square or oval neck, steel bolts. Bolts and nuts shall be heat treated carbon steel and shall be according to ASTM Al83.
5. Pipe fittings connected to mechanical pipe couplings shall have grooved or shouldered ends and shall be fabricated of malleable iron casting according to ASTM A47 or ductile iron Grade 60-45-10 according to ASTM A536.
6. Before couplings are assembled, pipe ends and outsides of gaskets shall be lightly coated with cup grease or graphite paste to ease installation.
7. Pipe grooving shall be according to pipe coupling manufacturer's specifications. Pipe sizes 3/4" through 24 inches may be cut-grooved or roll-grooved, except that pipe and tubing with wall thicknesses less than minimum recommended by manufacturer for cut-grooving shall be roll-grooved without removal of any metal.
8. Pipes, fittings and valves shall be provided with grooved or shouldered ends according to pipe coupling manufacturer's guidelines. Flanged or threaded end valves may be used with grooved adapters.
9. Couplings and fittings shall have a working pressure of 125 psig or 150 percent of system operating pressure, whichever is greater.
10. Entire coupling installation shall be according to manufacturer's guidelines.
11. Couplings shall be manufactured by Victaulic or approved equivalent.

3.4 PIPE JOINTS, FITTINGS, AND CONNECTIONS TO VALVES AND EQUIPMENT AND BENDS IN PIPING

A. 2 inches and smaller shall be made with screwed fittings and B. 2-1/2" and larger shall be made with welded and flanged fittings.

3.5 REFRIGERANT PIPING

A. Install refrigerant piping to insure continuous automatic return of oil to compressors at system capacities. Oil traps shall be properly sized, located, and installed. Install piping according to standard engineering practice as recognized by ASHRAE.

B. Refrigerant piping shall be installed to allow removal of DX coil.

C. Underground refrigeration piping runs shall be minimized. Where required, piping shall be installed inside a polyethylene or PVC sleeve having a diameter suitable to house the piping, insulation thicknesses and provide an additional nominal 1 inch clearance, but in no case shall sleeve be less than 4 inches in diameter. Pipe sleeve shall have watertight joints and shall use a maximum of two (2) 45 degree bends for changes in direction. Sleeve ends shall be sealed using a compound compatible with copper to prevent water intrusion and piping damage from thermal movement

D. Refrigerant pipe shall be cut with an accepted type of pipe cutter and reamed before brazing. Pipe shall pitch sharply toward the reamer during reaming and cutting. Metal filings shall be carefully removed after reaming. Moisture and dirt shall be removed from piping before joining as follows:

1. A clean, lint-less cloth shall be drawn through the tubing by means of wire or an electrician's tape, to remove coarse particles of dirt and dust.
2. A clean, lint-less cloth saturated with trichloroethylene shall be pulled through pipe, until the saturated cloth is not discolored by dirt.
3. A clean, lint-less cloth saturated with compressor oil, squeezed dry, shall be drawn through the tubing. A visual inspection shall be made to see that tubing is perfectly clean.
4. Cleaning shall be completed by pulling through a clean, dry, lint-less cloth.

E. Joints shall be brazed with silver solder containing 49 percent silver and having a melting point of 1,120 degrees F or higher.

F. Pressure test lines before charging. When testing is complete, evacuate lines by the double evacuation method, breaking each vacuum with the system refrigerant to 5.16 mm of pressure absolute. Bring first vacuum break to 2 psig and final break to normal operating pressure. The compressor shall not be used to evacuate the system.

3.6 PIPING PENETRATIONS TO FLOORS AND FIRE WALLS:

A. Joints around pipe 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.

3.7 UNDERGROUND CHILLED AND HOT WATER PIPING:

A. Fittings shall be installed according to manufacturer's recommendations.

B. The services of a factory trained field service instructor shall be required during critical stages of installation and testing.

C. After thrust blocks are poured and cured, a hydrostatic test of 125 psig (1-1/2 times operating pressure) shall be required for 4 hours. After hydrostatic test, a final backfill of selected earth shall be hand-placed and handtamped in 4-inch layers to 12 inches minimum over the top of the

jacket. Remainder of the backfill shall be free of large boulders, rocks over 6 inches in diameter or foreign matter. The backfill operation can now be completed by any convenient means. Do not use tracked or wheeled vehicles for tamping.

END OF SECTION

15515
VALVES, HANGERS AND SPECIALTIES

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 15090 - Supports, Anchors, and Seals.
2. 15047 - Identification
3. 15410 - Piping (Plumbing).
4. 15510 - Piping (HVAC).
5. 15540 - Pumping Equipment (HVAC).
6. 15855 - Air Handling Units.
7. 15970 - HVAC Control System.
8. 15990 - Tests (HVAC).

1.2 REFERENCES

A. The American Society of Mechanical Engineers (ASME) Publications: ASME Boiler and Pressure Vessel Code - Current edition.

1.3 SUBMITTALS A. Submit the following:

1. Thermometers and Pressure Gages: Catalog cuts, proposed range, and calibrated accuracy.
2. Strainers: Catalog cuts, pressure drop curves.
3. Pressure Relief and Reducing Valves: Catalog cuts; pressure range, and settings.
4. Air Vents: Catalog cuts.
5. Flexible Connectors: Catalog cuts.
6. All Valves: Catalog cuts, schedule of proposed installation locations, pressure ratings, and materials of construction.
7. Inserts: Catalog cuts and load tables.
8. Supports: Catalog cuts or drawings.
9. Anchors: Drawings and details of installation.
10. Water Flow Tube Station: Catalog cuts, pressure drop charts, and engineering information.
11. Expansion Tank: Shop drawings, catalog cuts of accessories and shop drawings of tank support.
12. Shop Drawings of support equipment.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Valves:

1. DeZurik.
2. Grinnell.
3. Homestead.
4. Hammond.

5. Kennedy
6. Mueller.
7. Milwaukee.
8. Nibco.
9. Stockham.

B. Expansion Tanks:
1. Taco.
2. Bell & Gossett.
3. Accepted equivalent.

2.2 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. Valves: Provide all valves with a 1-1/2" diameter brass tag having 1/2" high black filled numbers and 1/4" high letters, as manufactured by Seton or accepted equivalent.
    a. Service shall be identified by abbreviations such as: CHW (Chilled Water), CW (Condenser Water), HW (Hot Water), DW (Domestic Water), GAS, etc.
    b. Valve tag fasteners shall consist of No.6 brass beaded chain. The use of color coded one piece nylon ties is acceptable instead of beaded chain fasteners.
    c. Prepare schematic piping diagrams of systems controlled by valves with a schedule identifying all valves. Diagram and Valve Schedule shall be posted in the mechanical room where system depicted is located. All diagrams shall be printed on non-fading media and framed under a plastic laminate surface.
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. Up to 2": Class 150, bronze, union bonnet rising stem, inside screw, solid wedge disc, non-asbestos packing, soldered ends.

2. 2-1/2" and above: 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.

C. Globe and Angle Valves:

1. Up to 2": Class 150, bronze, union bonnet rising stem, inside screw, integral seat, renewable Teflon discs, non-asbestos packing, soldered or threaded ends.
2. 2-1/2" & above: 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.

D. Check Valves:

1. Up to 2": Class 125 or Class 200, bronze, screwed bonnet, Y pattern, renewable Teflon discs, soldered or threaded ends.
2. 2-1/2" & above: 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.

E. Butterfly Valves: 1. 2-1/2" to 6": 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 stems.

a. Valve shall comply with API-609 and MSS-SP-67.
b. Provide valves with lever-lock operator having position lock and 10-degree balancing notches.
c. Provide a memory stop capable of allowing valve closing and reopening to previously balanced position. 2. 8" and above: 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 stems. 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.

F. Balancing Valves: Up to 2": 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.

G. Ball Valves:

1. Plumbing: Allowed for all plumbing systems.
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": 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.

2.3 Piping Accessories

A. Strainers:

1. Design Flow Rate: Clean strainer shall not exceed 2 psi at the design flow rate.

2. Drain Valve and Reducer: Furnish each strainer for use in equipment rooms and at each AHU with a drain valve and reducer to 3/4" hose thread, capped.
3. Up to 2": "Y" type, cast iron body with 20 mesh stainless steel screen, 250 lb. w.s.p. with blow-off outlet and plug, threaded ends. Mueller #11M, or accepted equivalent.
4. 2-1/2" to 4": "Y" type, cast iron flanged body, 125 lb. w.s.p. with blow-off tapping and plug and stainless-steel screen with 1/16” perforations, Mueller #758 or accepted equivalent.
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: 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: 3/4", Brass body, micro finished bevel for seats, cadmium plated springs, manual chilled lift ring, ASME Std. Bell and Gossett or accepted equivalent.

D. Pressure Reducing Valves: 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 manual air vents at high points in chilled water systems.
2. Manual air vents shall be bronze needle or ball valves.

F. Thermometers:

1. Industrial, mercury filled, glass thermometers with 9-inch scale, "V" shape, and adjustable angle separable socket well.
2. Operating temperature shall display at midpoint of thermometer range.
3. Accuracy shall be +0.5 degrees F.
4. Casings shall be brass or aluminum.
5. Manufacturers: H.O. Trerice, Marshalltown, Ashcroft, or Taylor.

G. Thermometer Wells:

1. Brass construction with cap and chain.
2. Manufacturers: H.O. Trerice, Marshalltown, Ashcraft, or Taylor.
3. Provide extended neck wells in insulated piping.
4. Provide tees at lines 3 inches or smaller for thermometer wells.

H. Pressure Gages:

1. Standard depth, cast aluminum, black finished, chrome plated close type ring, clear glass window, bronze bourdon tube, precision movement and +0.5 percent accuracy.
2. Gage shall have a minimum 4-1/2 inch diameter face and with the operating pressure displaying at the middle range of the scale. Bottom connection shall be at least 1/4" diameter.
3. Manufacturers: H.O. Trerice, Marshalltown, Ashcroft or Taylor.

I. Gage valves:

1. Brass, 1/4" needle valve type.
2. Manufacturers: H.O. Trerice, or accepted equivalent.

J. 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.

K. Water Flow Sensors:

1. As manufactured by Annubar ANR-75, stainless steel.
2. Instrument connections shall be No.C-22.
3. 1/4" valves on 1-3/8" square head.
4. Valve rating shall be maximum 5,000 psi at 100 degrees F.
5. Flow sensor in steel pipe shall be weld nipple mounted.
6. Flow sensor in PVC pipe shall be saddle mounted.
7. Manufacturers: Dietrich Standard Corp or accepted equivalent.

L. In-line type air purger with tappings for an air vent and a makeup water line, as indicated, shall be Amtrol, 125 psi, flanged, cast iron.

M. Provide and install immersion wells and pressure taps as required for automatic control system.

N. Venturi Flow Meters:

1. Provide with quick disconnect valves, safety shut-off valves, and metal identification tags on chain giving pipe size, Venturi series, station identification, and meter reading at specified flow rate at locations where shown on Construction Documents.
2. Sizes:
    a. 2-1/2" Through 8 Inches: Plated cast iron with slip on flanges.
    b. 10 Inches and Above: Fabricated steel plate with welding ends.
3. Venturi Size: Same as pipe size
4. Manufacturers: Amity industries, Robertson or accepted equivalent.

2.4 EXPANSION TANKS

A. Size, capacity, and arrangement as shown on Construction Documents.

B. Designed, constructed and stamped according to ASME Code for 125 psig.

C. Welded black steel construction, rustproof coated, with base mount for vertical installation.

D. Provided with lifting ring and connection tappings.

E. Sealed in elastomer diaphragm suitable for 240 degrees.

F. Built-in air charger valve. Precharge tank to 20 psi.

2.5 PIPE HANGERS AND SUPPORTS

A. Provide hangers, supports, and supplementary steel as required for the different applications.

B. Support spacing shall be as required by the appropriate Tables found in the FBC – Mechanical, Plumbing and Gas.

C. Inserts, Hangers, Rods, and Clamps: Fee and Mason, or Michigan Hanger Co. Fig. numbers used refer to Grinnell.

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. I beam clamp, Fig.131.
    d. Universal side I 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. Copper tubing: Fig.CT-65.
    b. Insulated steel pipe: Fig.300.
    c. Uninsulated steel pipe: Fig.260.
    d. 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.

D. Diameter of Hanging Rods shall be as listed below: Pipe Size Rod Diameter Up to 2" 3/8" 2-1/2" & 3" 1/2" 4" & 5" 5/8" 6" 3/4" 8" & 12" 7/8" 14" & 16" 1"

E. Insulation Protection Shield: Fig.167.

F. Access Panels: As specified in Division 8.

PART 3 EXECUTION

3.1 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. Connections to cooling coils and refrigeration machines shall have flanges or unions next to equipment to allow tube removal without extensive dismantling of piping.

D. Strainers shall be full line size and shall be full size valved for servicing. Strainers shall be installed upstream of automatic control valves and other locations as shown on Construction Documents.

E. Pressure Relief Valves: Provide at cooling coil side of shut-off valves and where shown on Construction Documents.

F. Flexible Connectors: Provide between vibrating equipment and piping.

G. 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.

H. Thermometer Wells: Provide for thermometers and at the inlet and outlet of each cooling coil, next to sensing bulbs of controllers and remote temperature indicators, and as shown on Construction Documents.

I. Thermometers: Provide at the inlet and outlet of each air handling unit coil bank and as shown on Construction Documents.

J. Pressure Gages: Provide as shown on Construction Documents and at following locations:

1. At suction and discharge of circulating pumps.
2. At inlet and outlet of evaporator and condenser.
3. At makeup water inlet to expansion tanks and equipment.

K. 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.

L. Expansion Tanks:

1. Suspended from structure (horizontal type).
2. Connect to makeup water piping provided under plumbing work.
3. Pipe relief valve to nearest drain.

M. Water Flow Sensors: Install water flow tube stations according to manufacturer's published recommendations and as shown on Contract Documents.

N. Dielectric Fittings: Provide dielectric fittings between piping of dissimilar metals.

END OF SECTION

15670
AIR COOLED CONDENSING UNITS

PART 1 GENERAL

1.1 SUMMARY

A. Submit catalog cuts on unit showing fabrication details, capacity at scheduled conditions ratings and labels, and all information necessary to demonstrate compliance with requirements of construction documents.

B. Related Sections:
1. 15240 - Vibration Isolation.
2. 15510 - Piping (HVAC).
3. 15515 - Valves, Hangers, and Specialties.

1.2 SUBMITTALS

A. Submit properly identified product data before starting work.

B. Unit Schedule: Provide air cooled condensing units of type, size, efficiency rating, and capacity shown in unit schedule.

1.3 WARRANTY

A. Provide all labor, materials and equipment necessary to repair and/or replace any component and/or accessory that fails (except for items replaced under normal maintenance), for a period of two (2) years from the date of substantial completion of the project.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Air Cooled Condensing Units:

1. Bohn-Dunham-Bush.
2. Carrier.
3. Lennox.
4. McQuay.
5. Trane.
6. York.
7. Quantech.
8. TempMaster.

2.2 EQUIPMENTS

A. Air Cooled Condensing Units:

1. Casing:
    a. Fully weatherproof unit, suitable for outdoor installation.
    b. Fabricate casing of galvanized or zinc-coated steel and finish with baked enamel.
    c. Fabricate structural members of continuous galvanized steel with steel channel.

d. Provide openings for power and refrigerant connections and adequate removable panels for service access.
e. Unit shall be welded hermetic type with internal vibration isolation and be covered with a shield to muffle operating sound.
f. Compressor shall have both thermal and current sensitive overload devices and internal high-pressure protection.

2. Condenser Fans: Direct drive, propeller-type fans arranged for vertical discharge.
   a. Resilient mount fans factory statically and dynamically balanced and provide heavy gage safety guards.
3. Condenser Coils:
   a. Copper or Aluminum Plate Fins: Mechanically bonded to copper tubes.
   b. Adequately protect fins against hail damage on coils for 20 tons or greater.
   c. Fin Coating: Factory applied heresite or Bronze Glow epoxy coating.
4. Control Center and Accessories:
   a. Factory wired controls within a weatherproof cabinet.
   b. Accessories:
      1) Heating/cooling thermostat with sub-base suitable for continuous or automatic fan operation.
      2) Head pressure control to maintain proper condensing temperature at low ambient temperature.
      3) Low voltage control transformer.
      4) Indoor fan relay.
5. Capacity Control: Units up to 5 Tons refrigeration capacity shall be single compressor with 100%-0% capacity steps. Unit 6 Tons capacity and above shall be provided with multiple compressors. Units 6 to 20 Tons capacity will be capable of 100% 75% 50% 25% and 0% capacity steps. Units 21 to 50 Tons capacity will be capable or operating at 100%, 87.5%, 76%, 67.5%, 50%, 37.5%, 25%, 0% capacity steps. Capacity reduction may be accomplished by shutting down compressors, unloading cylinders, varying speed, hot gas bypass, or a combination of the above. Evaporator coils shall be intertwined, split by rows and maintain a full energized face at all times. Coils split by face are not acceptable.
6. Safeties shall include low and high-pressure cutouts.
7. Provide pump down control when available from the manufacturer.
8. Provide five-minute time delay to prevent short cycling.
9. Refrigerants:
   a. HCF 134a.
   b. HFC 410A.
10. Efficiency Rating: Air cooled condensing unit shall comply with FPL Commercial/Industrial Energy Conservation Program Standards.
11. Provide a copy of the AHRI sheets showing minimum equipment efficiency compliance.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install according to manufacturer's recommendations, accepted Shop Drawings, and as indicated on Construction Documents.

B. Refrigerant circuit shall include a liquid line solenoid, sight glass and moisture indicator.

END OF SECTION

15770 ROOF MOUNTED SINGLE PACKAGED AIR-CONDITIONING UNITS

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SPECIFIER:
CSI MasterFormat 2004 number: 237413
An optional keynote to the Drawings follows major product titles, for A/Es using National CAD Standard.

****

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: One-piece factory-assembled, pre-charged, pre-wired, tested, and ready to operate roof mounted single packaged air-conditioning units. Complete with factory fabricated roof curb, discharge plenum, platform, and remote-control panel in size and performance requirements as indicated on Construction Documents.

B. Related Sections:

1. 15240 – Vibration Isolation.
2. 15890 - Ductwork.

1.2 SUBMITTALS

A. Shop drawings.
B. Submit wind load calculations and connection details for the air-conditioning unit(s), framework and supports, all signed and sealed by a Florida registered engineer, demonstrating compliance with FBC and American Society of Civil Engineers (ASCE) 7.

1.3 QUALITY ASSURANCE

A. Efficiency Rating: Comply with FPL Commercial/Industrial Energy Conservation Program Standards.

1.4 WARRANTY

A. Provide all labor, materials and equipment necessary to repair and/or replace any component and/or accessory that fails (except for items replaced under normal maintenance), for a period of two (2) years from the date of substantial completion of the project.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Roof Mounted Single Packaged Air-conditioning Units.

1. Trane.
2. Carrier.

3. Lennox.
4. McQuay.
5. Petra.
6. TempMaster.

2.2 EQUIPMENT

A. Unit Casing:

1. Cabinet: Single, enclosed, and weatherproof casing constructed of heavy gage zinc coated steel, bonderized. Unit casing shall be capable of withstanding a 500-hour salt spray test exposure as per ASTM B117.
2. Cooling Section: Fully insulated to prevent condensation and to attenuate sound. Section shall have a sloped condensate pan with a steel drain connection.
3. Provide opening for electrical power connections. Side panels and top cover shall be removable for service access.
4. Finish: Baked enamel.
5. Fiberglass is not allowed in contact with airstream. The entire air path of this unit, shall be lined with closed cell elastomeric foam material of sufficient thickness to prevent condensation either inside or outside of unit cabinet. Double wall construction is acceptable In lieu of the lining specified.
6. Electrical point of connection for the unit shall be protected from the weather, electrical feed shall rise to the unit from the attic space below through a chase in the unit, which is external to and does not penetrate the unit floor pan to avoid leakage through accidental carry-over of condensate.

B. Fans:

1. Evaporator: Forward curved centrifugal, belt driven type. Fan bearings shall have a 200,000-hour operating life in accordance with ANSI B3.15.
2. Condenser: Propeller, direct driven type discharging up. Fan blades shall be corrosion resistant.

C. Coils:

1. Coils: Non-ferrous construction with mechanically bonded plate fins.
2. Evaporator and Condenser Tubes: Copper.
3. Condenser coils to be factory coated with Heresite, Bronze Glo, Adsil, or an alternate M-DCPS approved epoxy coating.
4. Provide hail guards for condenser coils.

D. Compressor: Welded hermetic type with internal vibration isolation, overload, reverse rotation and short cycling protection. Scroll or reciprocating type.

E. Plenums:

1. Discharge Plenums: Complete with services access door.
2. Suction Plenums: Intake hood for outside air with volume damper.

F. Filter: As indicated on drawings.

G. Accessories:

1. Controls: Factory wired and located in a readily accessible location.

    a. Overload Devices: Provide compressor and fan motor with both thermal and current sensitive devices.
    b. Capacity Control: Units up to 5 Tons refrigeration capacity shall be single compressor with 100%-0% capacity steps. Units 6 Tons capacity and above shall be provided with multiple compressors. Units 6 to 20 Tons capacity will be capable of 100% 75% 50% 25% and 0% capacity steps. Units 21 to 50 Tons capacity will be capable or operating at 100%, 87.5%, 76%, 67.5%, 50%, 37.5%, 25%, 0% capacity steps. Capacity reduction may be accomplished by shutting down compressors, unloading cylinders, varying speed, hot gas bypass, or a combination of the above. Evaporator coils shall be intertwined, split by rows and maintain a full energized face at all times. Coils split by face are not acceptable.
    c. Safeties shall include low and high-pressure cutouts. Provide pump down control where available from the manufacturer.
    d. Time Delay: Provide five-minute time delay to prevent compressor short cycling.
    e. Operation of the unit's outside air damper shall be interlocked with the evaporator fan.
    f. A moisture sensor in the condensate pan shall stop the unit's operation in case of backup in the condensate drainage line

2. Transformer: Factory installed 24V control circuit transformer.
3. Refrigerant circuit shall include a liquid line solenoid valve, sight glass and moisture indicator.

H. Refrigerants:

1. HCF 134a.
2. HCFC 410A.

PART 3 EXECUTION

3.1 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.

3.2 INSTALLATION

A. Locate foundations, platforms, curbs, and hangers for the proper installation of equipment.

B. Coordinate locations of equipment foundations and anchor bolts with concrete work specified elsewhere.

C. Install units on vibration isolators, as indicated, according to Section 15240:

1. Mount factory assembled air handling units directly on stable bare steel spring isolators, except where units are furnished with internal structural frames and external lugs, both of suitable strength and rigidity. Additional structural frames are not required beneath units without any severe overhangs.

2. Motor: Integrally mount to unit on slide rails.
3. Mountings shall provide static deflection shown on drawings.
4. Vibration: After installation, adjust equipment to operate without noticeable vibration.
5. Belt Guards: Arrange to allow the use of tachometer, oiling, and testing with the guards in place.
6. Rigidly anchor unit to roof slab to withstand wind velocity pressures as determined by FBC – American Society of Civil Engineers (ASCE) 7.
7. Unit and roof curb shall be certified to meet the Miami Dade County High Velocity Zone criteria for large missile impact resistance, air and water infiltration and wind load resistance as required by FBC.
8. Fit equipment and accessories to the space provided. Install level and locate equipment and accessories to provide working clearance space under overhead equipment, and working space for servicing, replacing and adjusting drives and motors, lubricating, and gaining access to controls.

END OF SECTION

15833
PACKAGED EXHAUST FANS

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:
   1. 01740 - Waste Management and Disposal
   2. 01786 - Closeout

1.2 REFERENCES

A. Air Movement and Control Association (AAMC)
   1. 1 AMCA 99, Standards Handbook.
   2. AMCA 300, Reverberant Room Method for Sound Testing of Fans.
   3. AMCA 301, Methods for Calculating Fan Sound Ratings from Laboratory Test Data.

B. American National Standards Institute (ANSI)
   a. ANSI/ASHRAE 51/AMCA 210, Laboratory Methods of Testing Fans for

C. Aerodynamic Performance Rating.
   1. National Fire Protection Association (NFPA) NFPA 96 Ventilation Control and Fire Protection of Commercial Cooking Operations.

D. American Bearing Manufactured Association (ABMA).

1.3 SHOP DRAWINGS AND PRODUCT DATA

A. Submit shop drawings and product data in accordance with Section 01330 Submittal Procedures.

B. Include:
   1. Fan performance curves showing specified point of operation Leakage Class 6 for rectangular ducts
   2. Sound rating data
   3. Installation Procedures

1.4 SUBMITTALS

A. Provide operation and maintenance data for incorporation into manual specified in Section 01770 Closeout of work.

1.5 CERTIFICATIONS

A. Catalogued or published ratings shall be those obtained from tests carried out by manufacturer from independent testing agency signifying adherence to codes and standards in force.

B. Provide confirmation of testing

1.6 EXTRA MATERIALS

A. Provide maintenance materials in accordance with Section 01780 Closeout Submittals.

B. Furnish list of individual manufacturer's recommended spare parts for equipment such as bearings and seals, and addresses of suppliers, together with list of specialized tools necessary for adjusting, repairing or replacing, for placement into operating manual.

PART 2 PRODUCTS

2.1 FANS GENERAL

A. Capacity: flow rate, static pressure Pa, r/min, bhp, model and size and sound ratings as indicated on schedule

B. Statically and dynamically balanced. Constructed in conformity with AMCA 99.

C. Sound ratings: comply with AMCA 301, tested to AMCA 300.

D. Performance ratings: based on tests performed in accordance with ANSI/ASHRAE 51/AMCA 210

E. Bearings: sealed lifetime ball bearings or heavy-duty grease lubricated ball or roller bearings of self-aligning type with oil retaining, dust excluding seals and a certified minimum rated to ABMA L10 life of 100,000 h.

2.2 ROOF EXHAUSTS

A. Centrifugal V belt or direct driven
   1. Housings: spun aluminum complete with resilient mounted motor and fan.
   2. Impeller: aluminum no overloading
   3. Adjustable motor sheave
   4. 12 mm mesh 2.0 mm dia. aluminum bird screen
   5. Motorized gasketed insulated aluminum back draft dampers to Section 15822
   6. Weatherproof disconnect switch within fan housing.
   7. Roof curb, 350 mm high, Continuous curb gaskets, cadmium plated or stainless-steel securing bolts and screws, and special mated sound insulating 350 mm high curbs where indicated. Hinge curb plate for access to internals for maintenance.

B. Eisenheiss coated wheel and up blast discharge for fume hood service with motor out of air stream.

C. Sound curbs: of same manufacturer as fan and built to suit model specified.
   1. Double baffle and self-flashing type. Required decibel sound attenuation spectrum:

Frequency Octave Band	1	2	3	4	5	6	7	8
dB Attenuation	3	5	11	16	22	20	17	13

   2. Pressure loss through curbs: 37 Pa max at rated L/s.

D. Two speed fan motors: two windings or split windings with speeds of approximately 1800 RPM high and 900 RPM.

E. Acceptable manufacturers: As indicated in plans or Penn, Carnes, Cook, ACME, Greenheck

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

END OF SECTION

15855
AIR HANDLING UNITS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes Factory Packaged, Modular units, providing cooling and heating for air distribution systems.

B. Related Sections:
1. 15240 - Vibration Isolation.
2. 15885 - Air Filtration Equipment.
3. 15890 - Ductwork.

1.2 REFERENCES

A. Air Moving and Conditioning Association (AMCA): Standard 611 Fan Performance Testing.

B. American National Standards Institute (ANSI): ANSI 9 Roller Bearings, Load Rating, and Fatigue Life.

C. National Fire Protection Association (NFPA): NFPA 90A Air- conditioning and Ventilating Systems.

D. Air-conditioning and Refrigeration Institute: Standard 410 Air Cooling and Heating Coils.

E. Florida Building Code (FBC) - Mechanical.

F. Florida Building Code (FBC) - Energy Conservation.

1.3 SUBMITTALS:

A. Shop Drawings, list of materials, cooling coil performance data, fan performance data, and fan curves. Performance data shall be certified by unit manufacturer.

1.4 QUALITY ASSURANCE

A. Cooling coils shall meet ARI standard 410.l

B. Air handlers shall be ARI 430 certified.

1.5 WARRANTY

A. Provide all labor, materials and equipment necessary to repair and/or replace any air handling unit components and/or accessories that fail (except for items replaced under normal maintenance, such as belts), for a period of two (2) years from the date of substantial completion of the project.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Air Handling Equipment:

1. Carrier.
2. Enviro-Tec.
3. McQuay.
4. Trane.
5. Temptrol.
6. York.
7. Krueger.

B. Reheat Coils:

1. Heat Pipe Technology, Inc., Gainesville, FL.
2. Accepted equivalent by unit manufacturer.

2.2 FACTORY FABRICATED MODULAR AIR HANDLING UNIT

A. Unit shall be of arrangement and type shown on Construction Documents with design capacities as scheduled. Design units for floor mounting. Central station air handler and components shall be ARI certified and complete with base frame fans, coils, motors, drives, belt guards where required, drains, filter sections, access doors and accessories as specified.

B. Casing:

1. Exterior casing walls shall be fabricated of minimum 0.08" aluminum, continuous hot dipped galvanized steel, or black steel phosphatized and coated with baked enamel finish not lighter than 18 gage. Removable panels shall provide access to the interior of the unit.
2. Interior walls shall be fabricated so that solid metal, aluminum, minimum 0.063", or other approved metal, separates the airstream from fiberglass, ductliners, and internal insulation. Casing panels shall have a minimum R value of 13.
3. The removal of access panels or doors shall not affect the structural integrity of the unit.
4. Unit casing panels (roof, walls, floor) and doors shall be provided with a minimum thermal resistance (R-value) of 13 BTU Hr *FT2* °F.
5. All doors downstream of the cooling coil shall be provided with a thermal break construction of door panel and door frame.
6. Gasketing shall be provided around the full perimeter of the doors to prevent leakage.
7. Handle hardware shall be designed to prevent unintended closure.
8. All drain pan threaded connections shall be visible external to the unit. Threaded connections under the unit floor shall not be accepted.

C. Fan Section:

1. Fan section shall encase 1 double-inlet, double-width forward curved or backward inclined fan suitable for static pressures and air quantities indicated.
    a. Fan wheel shall be dynamically and statically balanced at factory.
    b. Maximum fan rpm shall be 25 percent less than the first critical speed. Fan wheel diameter shall be as indicated.
    c. Fan outlet velocity shall not exceed 2500 RPM.
2. Fan shaft shall be solid or hollow, ground and polished steel, and coated with rust inhibitor.

a. V-belt driven fan shall have variable-pitch motor sheaves and drives shall be designed for 50% overload capacity.
b. Drives shall be selected for the mean rpm of the drive to match the fan operating rpm at design fan rpm.

3. Fan bearings shall be grease lubricated, ball bearings, self-aligning type. Bearings shall be designed for an average life of 200,000 hours. Provide extended lubrication lines with external grease fittings.

D. Coil Section:

1. Coil section shall encase cooling coils and drain pan.

a. Arrange coils for horizontal airflow.
b. Provide a minimum of 6 rows for chilled water service.
c. Provide intermediate drain pans for multiple coil installations.
d. Coil headers shall be completely enclosed within the insulated casing with only connections extended through the cabinet.

2. Drain pan shall be one of the following:

a. Stainless steel, double pan construction with the inner pan covered with a heavy coat of mastic, and thermally isolated from the exterior casing with 1-inch thick fiberglass insulation.
b. Welded heavy gage stainless steel, thermally isolated from the exterior casing with insulation of 1-1/2-inch-thick polystyrene or non-moving air space with the equivalent R value.
c. Drain connections shall be of the same material as the drain pan and shall extend a minimum of 2-1/2” beyond the unit base.
d. Drain pan threaded connections shall be visible, external to the unit floor are not acceptable.

3. Tubing for coils shall be copper 1/2" to 5/8" outside diameter.

a. Fins shall be (aluminum) (copper) mechanically bonded by tubing expansion with a maximum spacing of 10 fins per inch unless noted otherwise.
b. Coils shall have supply and return connections on the same end.

4. Refrigerant coils shall have venturi type refrigerant distributor arranged for down feed.

a. Proof test coils at 450 psig and leak tested at 300 psig air pressure under water, cleaned, dehydrated and sealed with a dry nitrogen charge.
b. Coils shall be suitable for a working pressure of up to 300 psig.
c. Units with both a DX refrigerant and chilled water coils shall have a separate section for each.

5. Chilled water coils:
a. Provide a minimum of 6 rows.
b. Coils shall be tested by subjecting each coil to a minimum air pressure of 350 psig with the coil submerged in water.

E. Filters:

1. As specified under Section 15885 - Air Filtration Equipment.

2.3 REHEAT COILS

A. Coordinate reheat coil installation with air handler manufacturer.

PART 3 EXECUTION

3.1 INSTALLATION

A. Equipment shall be installed according to manufacturer's recommendation.

B. Casing seams shall be airtight.

C. Condensate drains shall prevent any accumulation of condensate inside air handlers. Ptrap on condensate drain on unit shall have a vertical leg equal to the maximum static pressure of the air handler.

D. Seal coils at perimeter to prevent air bypass. Coils shall be installed to be completely drainable through header drains.

E. Rigidly anchor units to roof slab to withstand wind velocities pressures as determined by FBC - American Society of Civil Engineers (ASCE) 7.

F. Comply with calculations, signed and sealed by a Florida registered professional engineer, establishing wind velocity pressure values for the specific project according to FBC - ASCE 7.

END OF SECTION

15870
VARIABLE AIR VOLUME TERMINALS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Bypass, single-duct air terminal units.
2. Shutoff, single-duct air terminal units.

1.3 SUBMITTALS

A. Product Data: For each type of the following products, including rated capacities, furnished specialties, sound-power ratings, and accessories.

1. Air terminal units.
2. Liners and adhesives.
3. Sealants and gaskets.

B. Shop Drawings: For air terminal units. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.
3. Hangers and supports, including methods for duct and building attachment and vibration isolation.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".

2.2 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 BYPASS, SINGLE-DUCT AIR TERMINAL UNITS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Carnes.
2. Carrier Corporation.
3. Titus.
4. Trane.

B. Configuration: Diverting-damper assembly inside unit casing with control components inside a protective metal shroud.

C. Casing: 0.034-inch steel, single wall.

1. Casing Lining: Adhesive attached, 1-inch thick, elastomeric closed cell foam insulation complying with UL 181 erosion requirements, and having a maximum flamespread index of 25 and a maximum smoke-developed index of 50, for both insulation and adhesive, when tested according to ASTM E 84.
2. Air Inlet: Round stub connection for duct attachment.
3. Air Outlet: S-slip and drive connections.
4. Access: Removable panels for access to diverting damper and other parts requiring service, adjustment, or maintenance; with airtight gasket.
5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

D. Diverter Assembly: Galvanized-steel gate, with polyethylene linear bearings Aluminum blade, with nylon-fitted pivot points.

E. Multioutlet Attenuator Section: With 6-inch, 8-inch, and 10-inch diameter collars, with locking butterfly balancing damper.

F. Electric-Resistance Heating Coils: Nickel-chromium heating wire, free of expansion noise and hum, mounted in ceramic inserts in a galvanized-steel housing; with primary automatic, and secondary manual, reset thermal cutouts. Terminate elements in stainless-steel, machine-staked terminals secured with stainless-steel hardware.

1. Access door interlocked disconnect switch.
2. Downstream air temperature sensor with local connection to override discharge-air temperature to not exceed a maximum temperature set point (adjustable.)
3. Nickel chrome 80/20 heating elements.
4. Airflow switch for proof of airflow.
5. Fuses in terminal box for overcurrent protection (for coils more than 48 A).
6. Mercury contactors.
7. Pneumatic-electric switches and relays.
8. Magnetic contactor for each step of control (for three-phase coils).

G. Electric Controls: Damper actuator and thermostat.

1. Damper Actuator: 24 V, powered closed, powered open with microswitch to energize heating control circuit.
2. Thermostat: Duct-mounted electric type with temperature display in Fahrenheit , and space temperature set point.
3. Changeover Thermostat: Duct-mounted, field-adjustable, electric type reverses action of zone thermostat when air temperature reaches 70 deg F .

H. Electronic Controls: Bidirectional damper operator and microprocessor-based thermostat. Control devices shall be compatible with temperature controls specified in Section 15900 “Control and Instrumentation for HVAC” and shall have the following features:

1. Damper Actuator: 24 V, powered closed, powered open.
2. Thermostat: Wall-mounted electronic type with the following features:
    a. Temperature set-point display in Fahrenheit and Celsius.
    b. Auxiliary switch to energize heating control circuit.
    c. Changeover thermistor to reverse action.

2.4 SHUTOFF, SINGLE-DUCT AIR TERMINAL UNITS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, the following:

1. Anemostat Products; a Mestek Company.
2. Carnes.
3. Environmental Technologies, Inc.
4. Krueger.
5. METALAIRE, Inc.
6. Nailor Industries Inc.
7. Phoenix Controls Corporation.
8. Price Industries.
9. Titus.
10. Trane; a business of American Standard Companies.
11. Tuttle & Bailey.
12. Warren Technology.

B. Configuration: Volume-damper assembly inside unit casing with control components inside a protective metal shroud.

C. Casing: 0.034-inch, single wall.

1. Casing Lining: Adhesive attached, 1-inch thick, elastomeric, closed cell foam insulation complying with UL 181 erosion requirements, and having a maximum flamespread index of 25 and a maximum smoke-developed index of 50, for both insulation and adhesive, when tested according to ASTM E 84.
2. Air Inlet: Round stub connection or S-slip and drive connections for duct attachment.
3. Air Outlet: S-slip and drive connections, size matching inlet size.
4. Access: Removable panels for access to parts requiring service, adjustment, or maintenance; with airtight gasket.
5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1 and M-DCPS Design Criteria.

D. Regulator Assembly: System-air-powered bellows section incorporating polypropylene bellows for volume regulation and thermostatic control. Bellows shall operate at temperatures from 0 to 140 deg F , shall be impervious to moisture and fungus, shall be suitable for 10-inch wg static pressure, and shall be factory tested for leaks.

E. Volume Damper: Galvanized steel with peripheral gasket and self-lubricating bearings.

1. Maximum Damper Leakage: ARI 880 rated, 2 percent of nominal airflow at 3-inch wg inlet static pressure.
2. Damper Position: TBD.

F. Attenuator Section: 0.034-inch (0.85-mm) steel sheet.

1. Lining: Adhesive attached, 1-inch- thick, elastomeric, closed cell foam insulation complying with UL 181 erosion requirements, and having a maximum flame-spread index of 25 and a maximum smoke-developed index of 50, for both insulation and adhesive, when tested according to ASTM E 84.
2. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1 and M-DCPS Design Criteria.

G. Multioutlet Attenuator Section: With 6-inch- (150-mm-) 8-inch- (200-mm-) 10-inch- (250- mm-) diameter collars, each with locking butterfly balancing damper.

H. Electric-Resistance Heating Coils: Nickel-chromium heating wire, free of expansion noise and hum, mounted in ceramic inserts in a galvanized-steel housing; with primary automatic, and secondary manual, reset thermal cutouts. Terminate elements in stainless-steel, machine-staked terminals secured with stainless-steel hardware.

1. Access door interlocked disconnect switch.
2. Downstream air temperature sensor with local connection to override discharge-air temperature to not exceed a maximum temperature set point (adjustable.)
3. Nickel chrome 80/20 heating elements.
4. Airflow switch for proof of airflow.
5. Fan interlock contacts.
6. Fuses in terminal box for overcurrent protection (for coils more than 48 A).
7. Mercury contactors.
8. Pneumatic-electric switches and relays.
9. Magnetic contactor for each step of control (for three-phase coils).

I. Electric Controls: Damper actuator and thermostat.

1. Damper Actuator: 24 V, powered closed, spring return open .
2. Thermostat: Duct-mounted electronic type with clock display, temperature display in Fahrenheit, and space temperature set point.

J. Direct Digital Controls: Single-package unitary controller and actuator specified in Section 15900 "Control and Instrumentation for HVAC"Direct Digital Controls: Bidirectional damper operators and microprocessor-based controller and room sensor. Control devices shall be compatible with temperature controls specified in Section 15900 “Control and Instrumentation for HVAC” and shall have the following features:

1. Damper Actuator: 24 V, powered closed, spring return open.
2. Terminal Unit Controller: Pressure-independent, variable-air-volume controller with electronic airflow transducer with multipoint velocity sensor at air inlet, factory calibrated to minimum and maximum air volumes, and having the following features:
    a. Occupied and unoccupied operating mode.
    b. Remote reset of airflow or temperature set points.
    c. Adjusting and monitoring with portable terminal.

d. Communication with temperature-control system specified in Section 15900 "Control and Instrumentation for HVAC" Room Sensor: Duct mounted with temperature set-point adjustment and access for connection of portable operator terminal.

2.5 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Steel Cables: Galvanized steel complying with ASTM A 603

D. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

E. Air Terminal Unit Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

F. Trapeze and Riser Supports: Steel shapes and plates for units with steel casings; aluminum for units with aluminum casings.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install air terminal units according to NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems."

B. Install air terminal units level and plumb. Maintain sufficient clearance for normal service and maintenance.

C. Controlling thermostat shall be mounted on wall or temperature sensor behind return air grilled as shown on Plans.

3.2 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.

C. Hangers Exposed to View: Threaded rod and angle or channel supports.

D. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.3 CONNECTIONS

A. Connect ducts to air terminal units according to M-DCPS Master Specifications Section 15890 – Ductwork.

3.4 IDENTIFICATION

A. Label each air terminal unit with plan number, nominal airflow, and maximum and minimum factory-set airflows. Comply with requirements in Section 15047 "Identification " for equipment labels.

3.5 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. After installing air terminal units and after electrical circuitry has been energized, test for compliance with requirements.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Air terminal unit will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.6 STARTUP SERVICE

A. Perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Verify that inlet duct connections are as recommended by air terminal unit manufacturer to achieve proper performance.
3. Verify that controls and control enclosure are accessible.
4. Verify that control connections are complete.
5. Verify that nameplate and identification tag are visible.
6. Verify that controls respond to inputs as specified.

3.7 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain air terminal units.

END OF SECTION

15890
DUCTWORK

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 07840 - Firestopping and Smoke Sealing.
2. 15180 - Mechanical Systems Insulation (INDOOR).
3. 15910 - Duct Accessories.

1.2 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 90A - Installation of Air-conditioning and Ventilating Systems

C. National Electrical Code - NEC 70 (Edition applicable to the Project).

D. American Society of Heating, Refrigerating, and Air-conditioning Engineers, Inc. (ASHRAE) 62.1 - Ventilation for Acceptable Indoor Air Quality.

1.3 SYSTEM DESCRIPTION

A. 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.

B. Use of fiberglass or components containing coated or exposed fiberglass in contact with airstreams is prohibited.

1.4 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.
7. Joint Sealing

D. Duct Hanger System: Catalog cuts and shop drawing.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Flexible: Genflex or Flexible Technologies.

B. Ductwork and Fittings:
   1. Metalaire.
   2. Semco.
   3. Spiramatic.
   4. United Sheet Metal.

C. Duct Sealants: Water based, non-fibrated. Solid content 70% by weight.:

   1. Interior

      a. Foster #32-19.
      b. 3M.
      c. Childers CP-146.
      d. Hardcast 550.

   2. Exterior

      a. Flexomatic No 210 with fiberglass membrane; as manufactured by Weatherproofing Products Inc. or accepted equivalent.

   3. All sealants used on the construction of ductwork shall maximum VOC content of 420 grams per liter.

2.2 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.

C. Extractors and Dampers:

   1. Provide as shown and as necessary for proper regulation of air distribution system.
   2. Locate dampers to be easily adjustable after work is completed. Provide a set screw locking device for each splitter or damper. On insulated ducts, place locking device on a bracket so set screw is on surface of insulation and is easily operable. Provide

Armaflex plug. Use Ventlock or Young Regulator where damper or extractor is in accessible.

3. Sheet Metal Gage: Construct dampers of galvanized steel 1 gauge heavier than duct where installed.
4. Provide manufactured, gang operated vane volume extractors at duct branches.

D. The following ductwork and plenums shall be insulated, unless noted otherwise.

1. Outside air ductwork in plenums and mechanical equipment rooms at air handler’s closet.

2.3 LOW PRESSURE DUCTWORK

A. Includes ductwork from low pressure air handlers, exhaust, and outside and return air ductwork. Velocities shall not exceed 1,800 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. 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 SMACNA - HVAC Duct Construction Standards.

D. Ductwork and splitter dampers within the ductwork shall be made of the same material.

E. 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.

F. Fume hood ductwork shall be 316 stainless steel as specified in Section 15891 - Fume Hood Exhaust Duct.

PART 3 EXECUTION

3.1 GENERAL

A. Install ductwork as shown on drawings.

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.

3.2 INSTALLATION

A. Install ductwork materials and accessories according to the latest edition of SMACNA Duct Construction Standards as specified. These written specifications shall take precedence in case of conflict.

B. Seal all duct joints with sealer as specified for field sealing of high pressure ductwork according to SMACNA.

3.3 LOW PRESSURE DUCTWORK

A. Seams and joints in all ductwork shall be made airtight. 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.

3.4 DUCTWORK SUPPORTS AND HANGERS

A. Provide support and hangers according to SMACNA HVAC Duct Construction Standards.

B. Hangers: Hang horizontal ducts at intervals not exceeding 8 feet, with hangers of 16 gage by 1-inch wide galvanized band iron on ducts up to and including 30 inches wide and 12 gage by 1-1/2” wide galvanized band iron on ducts over 30 inches wide. Extend hangers down and fasten underneath duct in addition to both sides of duct.

C. 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. Concrete Joists: Use existing forming bolt-holes 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.

3.5 PRESSURE TESTING

A. All ductwork installed under these specifications shall be leakage tested as specified under Section 15990 - Tests (HVAC). Ductwork maximum leakage shall not exceed that for leakage class specified.

3.6 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 07840, Firestopping and Smoke Sealing.

END OF SECTION

15910
DUCT ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

A. Extent of duct accessories is indicated on drawings and by the requirements of this section.

B. Types of duct accessories required for project include the following:
   1. Volume Dampers/Regulators
   2. Flexible Connectors
   3. Fire and Smoke Dampers
   4. Duct Access Doors
   5. Ceiling Access Panels

C. Ceiling access panels furnished under this Section shall be installed in accordance with Section 08305 - Access Panels.

D. Related Sections:

   1. 15890 - Ductwork.

1.2 REFERENCES

A. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) - ”Duct Construction Standards (Metal and Flexible)”.

B. National Fire Protection Association (NFPA) 90-A Installation of Air-conditioning and Ventilating Systems.

1.3 SUBMITTALS

A. Duct Access Doors: Catalog cuts.

B. Volume Dampers: Shop drawings.

C. Fire Dampers: Catalog cuts.

D. Low Pressure Ductwork Round Fittings: Shop Drawings or catalog cuts.

E. Flexible Connections: Catalog cuts.

F. Test Holes: Pipe couplings, catalog cuts, and proposed installation locations.

PART 2 PRODUCTS

2.1 EQUIPMENT

A. Volume Dampers:

1. Dampers shall be manual or automatic as indicated on drawings. Dampers furnished with automatic actuators shall be furnished under the applicable section of these specifications and installed under this section.
2. Dampers shall have opposed blades.
3. Dampers shall be one gage heavier than the duct they are installed in and shall be reinforced to prevent vibration and noise.
4. Dampers shall be fabricated in accordance with SMACNA Standard. Dampers shall have an indicating device with lock to hold damper in position for proper setting.
5. Bridge lock type quadrant operators of dampers shall mount flush with surface of duct insulation.

B. Flexible Connectors: Size flexible connections at a minimum of 4 inches between connected items. Provide 30-ounce glass fabric fire retardant and air tight, coated with neoprene on both sides. Ventglass by Ventfabrics, Inc. or Neoprene Fabriduct by Elgen.

C. Fire Dampers: Provide UL 555 approved fire dampers where indicated on drawings. Dampers shall be constructed and installed according to requirements of UL 555, and each damper shall be provided with fusible link designed to melt at 165 degrees F. Damper blades shall be stacked outside of air stream.

D. Combination Smoke and Fire Dampers:

1. Damper shall bear fire damper label by UL or other OSHA approved Nationally Recognized Testing Laboratories (NRTL). Dampers shall be constructed of steel, with parallel blades.
2. Damper shall meet requirements specified for fire dampers and include operating shaft able to rotate 90 degrees and cause damper to operate between closed and open. Operating shaft and damper combination shall be suitable for linking to and operation by a damper operator. Damper and operator shall be listed as an assembly.

E. Duct Access Doors:

1. Access doors shall be hinged except where sliding or removable type is required and shall be insulated except in non-insulated ductwork and casings. Access doors shall be sized for proper access but shall not be less than 16 inches X 12 inches in size, except in small ductwork where a smaller door may be used.
2. Access doors for high pressure ducts shall be galvanized steel with dogs or cams, solid neoprene gaskets, moisture resistant and airtight. Provide door frames to extend over casing or duct insulation. Doors shall operate from outside. Construct for medium pressure application.

PART 3 EXECUTION

3.1 INSTALLATION

A. Flexible connections shall be provided as shown on drawings. Lengths shall be between 2 to 4 inches.

B. Fire Dampers:

1. Seal around fire dampers with therma-fiber at walls per UL and NFPA requirements.

2. Install dampers as shown on drawings and according to manufacturer's recommendations.

C. Low pressure ductwork round fittings shall be installed as shown on drawings and according to manufacturer's recommendations.

D. Provide test holes at mains and main branches and as required by test and balance contractor.

E. Duct Access Doors:

1. Airtight, hinged access door with catch shall be installed next to dampers sized for their inspection and maintenance.
2. Do not obstruct access doors with piping, conduits, hangers, braces, or other ducts.
3. Required ceiling access panels for areas other than removable ceilings shall be furnished under this section for installation under the general construction work.
4. Provide access doors on linkage side of automatic dampers, including fire and smoke dampers, and at duct mounted smoke detectors to allow inspection of the sampling tubes.

END OF SECTION

15940
OUTLETS (HVAC)

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:
1. 15890 - Ductwork.
2. 15910 - Duct Accessories.

1.2 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

2.1 MANUFACTURERS

A. Air Outlets:

1. Air Guide.
2. Anemostat.
3. Carnes.
4. Krueger.
5. Metalaire.
6. Nailor Industries Inc.
7. Price.
8. Titus.

2.2 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 provided indicating compliance with ANSI/ASHRAE Standard 70.

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 or perforated panel face type with neck adapters, 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 grilles shall be of the lay-in type.

G. Linear diffusers for wall mounting shall be fixed bar type. Bars shall be 1/8" thick with an extruded shape to provide 0 degrees or 15 degrees air deflection as indicated. Bar spacing shall be 1/2". Construction shall be aluminum, primed to accept finish paint.

H. Linear diffusers for ceiling mounting shall be Titus or Nailor linear diffusers with sizes as indicated. These devices shall be installed with end caps and alignment strips as required for a complete and finished installation.

I. 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.

J. 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.

K. 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

3.1 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.

3.2 INSTALLATION

A. Install and connect light troffer diffusers provided under Division 16.

END OF SECTION

15970
HVAC CONTROL SYSTEM

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Thermostats, temperature transmitters, controllers, automatic valves, dampers, damper operators, pneumatic/ electric switches, electric/pneumatic switches, control panels, compressed air system, accessory control equipment, and a complete system of air piping to provide the specified sequence of operation with the Energy Management system as shown in Construction Documents.

2. Control System shall employ electronic sensing and pneumatic actuation on all proportional, proportional integral, or 2 position control routines required by the sequence of operation or as specified.

B. Related Sections:

1. 13810 - Energy Management System.
2. 15510 - Piping (HVAC).
3. 15515 - Valves, Hangers, and Specialties.
4. 15985 - Point Schedule.
5. 16120 - Wire and Cable.
6. 16155 - Motor Power and Control Wiring.

1.02 SUBMITTALS

A. Control System: Temperature control and wiring diagrams and sequence of operations. Furnish sets of wiring diagrams to electrical contractor for wiring as provided in Division 16.

B. Control System Components: Catalog cuts.

C. Valves, Dampers, and Operators: Catalog cuts, performance data, schedules showing proposed installation location, sizes, and capacities.

D. System warranty.

E. Contract Closeout Submittals: After completion of control system installation, control system manufacturer shall furnish 4 sets of operating and maintenance instructions, including complete control system as-built diagrams.

1.03 MAINTENANCE

A. The Board shall be fully instructed in the operation and maintenance of the environmental control system before substantial completion or beneficial occupancy of the project by the Board.

B. Automatic temperature control manufacturer shall furnish a service contract for the system as specified, for 1 year after substantial completion of system.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Control Systems:

1. Andover.
2. Barber Coleman.
3. Carrier.
4. Honeywell, Inc.
5. Johnson Corp.
6. Landis Gyr/Steafa.
7. Robert Shaw/Seibe.
8. Trane.

2.02 EQUIPMENT

A. Pneumatic Actuated Valves:

1. Proportioning automatic valves shall have a plug and disc inner valve to insure modulation of flow.
2. Valve operators shall have power to insure tight seating against the specified working pressures.
3. Valves 2" and smaller shall have screwed connections and valves 2-1/2" and larger shall be flanged.
4. Valves shall have self-sealing packing, arranged to tighten the seal as the water pressure increases, to eliminate manual adjustments.

B. Damper Operators:

1. Damper operators shall be of the molded rubber diaphragm piston type and shall be fully proportioning unless otherwise specified.
2. Operators shall have ample power to overcome friction of damper linkages and air pressure acting on the louvers.
3. The damper operator mounting arrangement shall be outside the air stream wherever possible.
4. The operator shall be capable of operating at varying rates of speed to correspond to the controllers and variable load requirements.
    a. The operators shall be capable of operating in sequence when required by the sequence of operation.
    b. The operator shall have external adjustable stops to limit the stroke in either direction.
    c. The operator linkage arrangement shall allow for normally open or normally closed positions of the dampers as required.

C. Air Compressor:

1. Furnish and install a duplex high pressure (70-80 psi) air compressor assembly as indicated.
    a. Compressors shall be complete with ASME storage tank, pressure switches, oil filter, (dual) pressure reducing valves, relief valve, belt guards, and motors.
    b. Provide refrigerated after-cooler, automatic drain traps, and drain connections made to drain traps.

c. Provide air intake filters and mufflers at air intakes.
d. Provide an automatic alternator to allow continuous alternation of air compressors' operation.
e. Provide system relief valve. Each air compressor of the duplex unit shall be selected on 1/3 run time, 2/3 off time.
f. Compressor assembly shall be installed on a 6" high concrete pad with neoprene and cork isolators under each support leaf.

2. Air compressor and after cooler shall be sized to handle the entire building exclusive of HVAC systems that are part of tenant work.

D. Pneumatic Air Tubing:

1. Tubing in mechanical equipment rooms shall be hard drawn copper or polyethylene installed in EMT.

a. Single runs from the air compressors to control panels and to controllers shall be hard drawn copper.
b. Multiple runs to panels and controllers shall be polyethylene installed in EMT.

2. Inaccessible tubing outside mechanical rooms shall be polyethylene installed in EMT.

a. Tubing shall be installed above the ceilings or shall be concealed in the walls.
b. Junctions and splices shall be made in junction boxes.
c. Hard drawn copper tubing shall be installed using tool made fittings constructed of brass or copper with solder type joints.
d. Tubing and EMT shall be installed at right angles or parallel to the building structure.
1) Tubing and EMT shall be securely fastened to the building structure and equipment using brackets or fasteners.
2) Tubing and EMT shall be supported from equipment, piping, or ductwork.
3) Copper tubing shall be directly attached to ferrous or galvanized metals.
4) Where copper tubing is supported by ferrous supports, the copper shall be wrapped with plastic tape to isolate the two materials.

E. Dampers:

1. Control dampers shall be substantially built in steel frames fabricated from 2 inch channels or equal.

a. Frames shall be equipped with brass trunnions and bearings and blade end stops.
b. Damper blades shall be galvanized steel, maximum blade width shall be 6 inches.
c. Furnish corner braces for all damper frames exceeding a 4 square foot area.
d. Maximum width of any section shall be 48 inches and maximum height shall be 96 inches.
e. Furnish horizontal stiffening for any section exceeding 48 inches in height.

2. Where low leakage or shutoff dampers are indicated, provide replaceable butyl rubber seals with the damper.

a. Install seals along each blade and end stops.
b. Seals shall provide a tight closing low leakage damper.
c. Leakage and flow characteristic charts must be submitted to A/E before approval of dampers.
d. Outdoor air and exhaust air shall be the low leakage type as specified.

3. Modulating dampers shall be opposed blade operation type and 2 position dampers shall be parallel blade type. Smoke dampers shall meet NFPA 90A requirements.

F. Differential Pressure Switches shall be diaphragm actuated type with a single pole double throw snap acting switch.

1. Motion of the diaphragm shall be restrained by a calibrated spring that can be adjusted to set the exact pressure differential to actuate the electrical switch.

2. Motion of the diaphragm shall be transmitted to the switch button by means of a direct mechanical linkage.

G. Local Control Panels:

1. Controllers, relays, switches, etc., for equipment located within the mechanical equipment rooms shall be mounted next to the system controlled.

a. Temperature setting, adjustments, and calibration shall be made at the system control panel.
b. Panel shall be extruded alloy with a baked prime coat enamel finish.

2. Provide LED digital thermometers on the local panels. Temperature indications shall be provided for each point of temperature measurement for control and additionally for those points as outlined in this specification or shown on Construction Documents.

3. Details of each panel shall be submitted for approval before fabrication.

a. Locations of each panel are to be convenient for adjustment and service.
b. Provide engraved nameplates beneath each panel mounted control device and air gage clearly describing the function of said device and range of operation.
c. Manual switches, dial thermometers, and indicating air gages shall be flush mounted on the hinged door.

4. Electrical devices within the panels shall be factory prewired to a numbered terminal strip. Wiring within the panel shall be according to NEMA and UL standards and shall meet local codes.

H. Room Thermostats:

1. Room thermostats shall be of the 2 pipe, non-bleed or relay type design.

a. Thermostats shall be fully proportional with adjustable throttling range and tamper-proof locking settings.
b. Thermostats shall be single or dual temperature, direct acting, or reverse acting as detailed in the sequence of operation.

c. Thermostats shall be provided with concealing adjustments and metal cover with a satin chrome finish.

2. Single temperature thermostats shall be 2 pipe type with adjustable throttling range and lockable, but adjustable, range stops. They shall have gage plugs for accuracy of calibration and observation.

I. Temperature Elements: RTDs that provide rapid linear responses using a precision nickel wire wound element. No thermistors will be acceptable. Configuration will be available for mounting in:

1. Room.
2. Duct.
3. Well (Chilled Water and Condenser Water).

J. Flow Switches: Equivalent to FG1KB able to detect flow on refrigeration and heating systems. It shall provide a SPDT contact for liquid flow sensing. Paddles shall accommodate pipe diameters up to 10 inches.

K. Electro-Pneumatic Transducers:

1. The transducer shall allow 12 volt D.C. binary output signals to position pneumatic damper and valve actuators.

a. Transducers shall be capable of being mounted either remotely or in place of the pilot positioner on some actuators.
b. The single transducer shall be used if 2 position control of the actuator is required.
c. The dual transducer shall be used to extend, retract, or hold the actuator at any position.

2. The EPT shall be used to convert electrical signals to pressure change in high precision applications. The polarity of the drive motor shall determine motor direction. A feedback potentiometer shall be employed to indicate the position of the motor cam.

L. High Limit Safety Thermostats shall be electric high temperature thermostats with bimetal sensing element with at least 10 inches insertion length. Thermostats shall be 2 position manual reset type.

M. Miscellaneous Devices: Provide necessary relays, cumulators, 3-way air valves, positioners, pneumatic/ electric switches, solenoid valves, switches, relays, clocks, transformers, and other appurtenances to make a complete and operable system.

PART 3 EXECUTION

3.01 INSTALLATION

A. Sequence of Operation:

1. Sequence of operation shall be as indicated in Construction Documents.
2. Where motors are shown on the electrical drawings to be provided with Hand-Off-Auto switch in starter, automatic or remote control devices shall be connected in auto position.

Any safety device, such as firestats or smoke detector, shall be connected in hand and auto position.

3.02 FIELD QUALITY CONTROL

A. After completion of installation, Building Automation System manufacturer shall regulate and adjust thermostats control valve actuators, damper actuators, and additional equipment provided under this contract. Place components in operating condition subject to approval of A/E and supply any service incidental to proper performance of temperature control system under guarantee outlined above.

B. Control Air Supply: Test line at 30 psi for leaks.

C. Maintain test pressure within 1 psi for 14 hours without pumping. Supply pressure to building systems is 15 psi.

END OF SECTION

15991
TESTING AND BALANCING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Test and Balance Agency: City of Miami contracted firm that will perform the test and balance services required for this project.

PART 2 PRODUCTS

2.1 EQUIPMENT

A. Testing and balancing equipment and instruments will be provided by The City of Miami's contracted firm.

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

A. Test and Balance Agency will provide periodic inspection during construction and will provide water and air distribution test and balance.

3.2 CONTRACTOR'S RESPONSIBILITY

A. Furnish one complete set of approved equipment submittal data and the latest approved mechanical drawings or shop drawings to the Test and Balance Agency.

B. Before and during construction, assist Test and Balance Agency with inspection and pre-completion requirements.

C. Perform a preliminary balance to verify components and systems are operational and ready for test and balance agency.

D. Provide sufficient notice and time before final completion date for completion of testing and balancing within project schedule.

E. Prerequisite to Substantial Completion Inspection: Construction, starting, adjustment, testing and balancing, and instruction shall have been completed.

F. Provide at no additional cost to the City of Miami, labor, materials, and tools necessary to make corrections when required without undue delay.

G. Put applicable systems into full operation and continue operation during each working day until testing and balancing is complete.

H. Test and Balance Agency shall be kept informed of any major changes made to the system during construction and shall be provided with a complete set of "record" Construction Documents.

I. Prepare air side for balancing in following manner:

1. Fans, blowers and air handling equipment shall be mechanically checked and available to operate under design conditions.
2. Splitters, volume dampers, fire dampers and vanes shall be in neutral positions.
3. Controls: Electronic, electric, pneumatic, or any combination thereof, shall be mechanically checked and available to operate under design conditions. Provide a written letter attesting that the controls are installed and operating per design requirements.
4. Provide and install filters with design static drops for clean filters acceptable to the Test and Balance Agency.
5. Locking devices at dampers shall be marked to represent the position of the dampers.
6. Make any necessary adjustments.
7. Change pulleys, belts and dampers as required to correct system balance as determined by Test and Balance Agency.
8. Check variable air volume boxes in operation to verify no loose linkages, damper blades, etc. and that all parts move freely.
9. Check safety and operating controls of electric strip heaters and verify heaters operate at minimum air flow conditions.
10. Provide fixed diameter pulleys in place of adjustable pulleys at supply fans and at return air fans after test and balance has been completed. Pulley size shall be as determined by the Test and Balance Agency. Install new belts as required and as determined by the Test and Balance Agency.
11. Provide to the Test and Balance Agency a start-up report including rated nameplate volts and amps and actual volts and amps on HVAC equipment.
12. Provide scaffolding as required for Test and Balance.

J. Prepare water side for balancing as follows:

1. Open valves to full position, including coil stop valves, close bypass valves, and open return line balancing cocks.
2. Clean strainers.
3. Examine water and system to verify a clean and treated system.
4. Check pump rotation.
5. Check system is full of water.
6. Set temperature controls to have coils call for full cooling.
7. Check operation of automatic bypass valves.
8. Check and set operating temperatures of chillers to design requirements.
9. Provide scaffolding as required for Test and Balance Agency.

END OF SECTION

16023
CODES AND STANDARDS

PART 1 GENERAL

1.1 REFERENCES

A. Comply with the following:
   1. Florida Building Code (FBC).
   2. National Electrical Code - (NEC), (NFPA 70).
   3. National Fire Protection Association (NFPA), NFPA 101 and other NFPA codes as applicable.
   4. American National Standards Institute (ANSI) A117.1.
   5. American Society of Civil Engineers (ASCE).
   6. Florida Accessibility Code
   7. Americans with Disabilities Act Accessibility Guidelines (ADAAG).

1.2 QUALITY ASSURANCE

A. Where materials and equipment are available under the continuing inspection and listing service of an OSHA approved Nationally Recognized Testing Laboratory (NRTL), furnish materials and equipment so listed.

B. A maximum of 3 helpers to 1 journeyman are allowed according to Metropolitan Dade County.

C. NOT USED

PART 2 NOT USED

END OF SECTION

16100
BASIC MATERIALS AND METHODS

PART 1 GENERAL

1.1 SUMMARY

A. Provide a complete electrical system as shown on the Plans. This work includes but is not limited to the following:

1. Complete distribution system for lighting and power, wiring devices, equipment and controls, panel boards and equipment provided by others.
2. Complete raceway system.
3. Transformer, bus stubs, underground duct bank, grounding, etc. rework as required for primary and secondary power system under the provisions of Florida Power and Light Company.
4. Fire Detection Alarm System..
5. Normal and Emergency Lighting System and Luminaries.
6. Interior and Exterior Light and Control Systems.
7. Conduit and wiring system for air conditioning electrical controls.
8. Marking of all junction boxes with system voltage inside and outside of box.
9. Painting of electrical and special equipment.
10. Furnishing and installing necessary access panels.
11. Complete electrical testing.

B. Coordination with Other Trades:

1. Examine drawings and specifications. Visit site to determine work to be performed by Electrical, Mechanical, HVAC, and other trades.
2. Follow as closely as possible, the drawings and riser diagrams, indicated in diagrammatic form which show the arrangements desired for the connection of electrical equipment, fixtures, principal apparatus, kitchen equipment, etc.
3. Provide required electrical materials and equipment to put work into operation, completely wired, tested, and ready for use including raceways, conductors, disconnects, starters/contactors, or other devices for proper operation and sequences of electrical, mechanical, or other systems or equipment.
4. Unless otherwise noted, conduit, wire for controls, and devices, both line and low voltage, shall be provided and installed as described in this or other parts of the Construction Documents.

    a. Install boxes or housings necessary for conduit and wire to controls, excluding items to be installed in piping, ducts, tanks, machinery, solenoid valves, pressure switches, aquastats, or similar devices.
    b. These items are specified for installation in other sections. Connecting wiring is specified in this Division.
    c. Temperature control equipment and water heater will be furnished. Installed and tested under provision of Division 15 and wired under provisions of Division 16.

5. Control wiring in separate conduit between HVAC sensing devices and control panels or motors, shall be installed under this Division after verification from approved shop drawings of the required locations and connections.

6. All motors, unless otherwise specified herein shall be furnish and set in place under provision of Division 16.
7. Seal penetrations through fire rated floors or walls with fire resistant compound as specified in Section 07840.
8. Connect electrical equipment and devices as parts of the equipment or furniture furnished under other sections.
9. Comply with provisions of Instructions to Bidders and General Conditions and Section 01340.

C. Tradesperson Qualifications:

1. Contractor shall provide or cause to be provided by the appropriate subcontractors in the electrical trade for all work required by this Division 16, a ratio of one licensed master or journeyman for every three trainees at all times as those terms are defined by Chapter 10 of the Miami-Dade 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.

1.2 SUBMITTALS

A. Manufacturer’s Data:

1. Complete list of materials to be furnished under this section.
2. Manufacturers' specifications and other data required to assure specification compliance.
3. Catalog cuts, clearly marked for identification of items to be provided, including disconnects, breakers, fuses, starters, lighting fixtures, transformers, or other materials not requiring specially prepared Shop Drawings.

B. Within thirty (30) days of Notice-to-Proceed, submit in loose-leaf bound form and indexed properly, at least ten (10) copies of shop and detail drawings, factory certified prints and material lists for items included but not limited to those listed below:

1. Switchboards and Panelboards.
2. Disconnect switches, motor starters, fuses, time clocks, contactors and relays.
3. Transformers.
4. Terminal cabinets.
5. Wiring devices and plates.
6. Luminaires, dimmers and accessories.
7. Conduit, fittings, supports, pull boxes, wire and cable.
8. Fire Alarm System.
9. Emergency Generator and Transfer Switches System.
10. Motor control centers

C. Shop Drawings for nonstandard items, including but not limited to anchoring layouts and details, lighting fixtures, or similar products.

PART 2 PRODUCTS

2.1 HARDWARE

A. Provide all hardware, accessories and fittings for the intended use, and to complement the items with which they are used. All materials shall have corrosion protection suitable for the atmosphere in which they are installed. All such hardware shall be U. S. Standard Size.

2.2 EQUIPMENT

A. Ensure that equipment of a similar nature are of the same manufacturer. Example: All panelboards are of the same manufacturer and of the same style.

2.3 MATERIAL PROTECTION

A. Store and protect all materials from damage prior to installation. Do not store materials directly on the ground or floor and keep as clean and dry as possible and free from damage or deteriorating elements. Do not install damaged materials.

2.4 ELECTRIC SHOCK PROTECTION

A. Provide ground fault protection in all temporary services.

PART 3 EXECUTION

3.1 INSTALLATION

A. Factory paint or finish all enclosures, panels, cabinets, relays, safety switches, fixtures, gutters and other exposed equipment or accessories except as indicated otherwise.

B. Group mounted items shall be similar in finish and color.

3.2 IDENTIFICATION

A. Tag all conductors and identify major conduits in or at wire-ways, panels, pull boxes, switchboards, motor controllers, cabinets and similar items to assist in future circuit tracing. Conductor tags: non-conductive.

B. Use Paint markers, or other approved methods except as indicated otherwise.

C. All junction box covers shall be labeled on both sides indicating type of system and voltage.

D. All gutters, terminal cabinets, starters, transformers, switchboards, panels and disconnects shall be identified with stencil labels indicating type of system, voltage, panel circuit designation and equipment being serviced. Provide screw on engraved white on black phenolic nameplates or permanent labeling for panelboards, switchboards and similar equipment (Do not use markers).

3.3 TESTS

A. Show by demonstration in service that all circuits and devices are in good condition to operate.

B. Test that each item of control equipment will function.

C. Test all circuits for grounds, shorts and continuity.

D. Provide all materials and equipment necessary for testing.

3.4 DEMONSTRATION

A. Demonstrate the essential features of the following electrical systems upon completion of satisfactory testing:

1. Emergency System.
2. Lighting System.
3. Motor Control.
4. Contactors.
5. Clock and Intercom System.
6. Electrical Motors and Starters.
7. Fire Alarm System.

B. The demonstration by the Contractor shall be held in the presence of the Owner or his designated.

1. Demonstrate how to “start-stop”, reset, replace and emergency procedures.
2. Demonstrate one system at a time.

3.5 CONTRACT CLOSEOUT SUBMITTALS

A. Record Drawings.

B. Warranties.

C. Operating Instructions, maintenance manuals, and parts lists.

D. Point-to-point wiring diagrams.

3.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Storage:

1. Deliver materials to jobsite in their original unopened containers with labels and certifications intact and clearly legible at time of use.
2. Store materials according to manufacturers' recommendations and as approved by A/E.

B. Replacement: In case of damage, pilferage, or other loss, make immediate repair or replacement of materials necessary to obtain approvals of A/E, without cost to THE CITY.

C. Protection: Use necessary means to protect materials of this section before, during, and after installation, including protection of installed work and materials of other trades.

END OF SECTION

16112
RACEWAYS AND CONDUIT

PART 1 GENERAL

1.1 SUMMARY

A. Provide all labor, materials, equipment and services necessary to complete the conduits, fittings and support work, as indicated on the drawings, and as specified herein.

B. All materials provided under this section shall be listed by an OSHA-approved, Nationally Recognized Testing Laboratory (NRTL).

1.2 RELATED SECTIONS:

1. 01150 - Mechanical and Electrical Coordination
2. 02221 - Excavating, Backfilling, and Compaction for Utilities.
3. 07840 - Firestopping and Smoke Sealing.
4. 07900 - Joint Sealers.
5. 09200 - Metal Studs, Metal Lath, Suspensions Ceilings, Plaster, and Stucco.
6. 09900 - Painting.
7. 16120 - Wire and Cable.
8. 16131 - Outlet, Pull, and Junction Boxes.
9. 16450 - Grounding.

1.3 SUBMITTALS

A. Submit product data depicting manufacturer's literature, including printed installation instructions, and recommendations before starting work. Submit samples if requested.

B. Shop Drawings:

1. Provide layout for all floor plans with elevations depicting the entire cable tray system throughout the structure.
2. Designate components and accessories for cable trays including, clamps, brackets, hanger rods, splice plates connectors, expansion joints assemblies, straight lengths, fittings, and grounding.
3. Show accurately-scaled components and spatial relationships to adjacent equipment. Show cable tray types, dimensions, and finishes.
4. Submit shop drawings and product data under provisions of Section 01330 Shop Drawings and Product Data and samples.

C. Provide certified copies of factory test reports performed according to NEMA Standard VE 1 on cable trays of types and size specified for this project.

1.4 QUALITY ASSURANCE

A. All cable trays and components shall comply with NEMA Standard VE 1, "Cable Tray Systems".

B. Electrical Component Standard: Components and installation shall comply with NFPA 70 - National Electrical Code - latest edition (NEC).

C. All Cable tray components shall be the products of a single manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Cable Tray Manufacturers:

1. B-Line Systems, Inc.
2. The George-Ingraham Corp.
3. GS Metals Corp.
4. Square D Co.

B. Fibrated Emulsion Conduit Coatings:

1. Karnak Chemical Corp., 220 Fibrated Emulsion.
2. Monsey Products Co., Monsey Asphalt Emulsion Roof Coating Fiber.
3. Sonneborn Building Products, Hydrocide 700B.

2.2 EQUIPMENT

A. Conduit shall be sized according to NEC, unless otherwise noted. Feeders and home runs shall not be less than 3/4" diameter.

B. Rigid Conduit:

1. Galvanized Rigid Steel Conduit (GRS): Hot dip galvanized or electro-galvanized, with corrosion resistant coating on the inside, threaded, standard weight steel conduit complying with Federal Specifications WW-C-581, ANSI-C80.1, UL-6 and Article 344 of the NEC.
2. Intermediate Metal Conduit (IMC): Hot dip galvanized or electro-galvanized, threaded, steel conduit complying with ANSI C80.6 and Article 342 of the NEC.
3. Rigid Non-Metallic: Schedule 40, PVC plastic 90 degrees C. complying with ANSI/UL 651, and Article 352 of the NEC.

C. Electrical Metallic Tubing (EMT):

1. Galvanized steel tubing with smooth interior coat of lacquer enamel or zinc coat.
2. Comply with Federal Specifications WW-C-563, ANSI-C80.3, UL 797 and Article 358 of the NEC.

D. Flexible Metal Conduit:

1. Steel: Flexible galvanized steel conduit (Greenfield) complying with Federal Specification WW-C-566, ANSI C33.92, UL 360 and article 348 of the NEC.
2. Liquid tight flexible metal conduit shall consist of a core of flexible galvanized sheet tubing over which is extruded an oil resistant and liquid-tight jacket of polyvinyl chloride (PVC), complying with Article 350 of the NEC.
3. Minimum size for flexible metal conduit shall be 1/2".

E. Conduit Fittings:

1. Rigid Steel Conduit and Intermediate Metal Conduit: Zinc or cadmium plated steel or galvanized malleable iron complying with ANSI listings. Fittings shall be threaded type. Bushings for Rigid Steel Conduit: 1-1/4 inch and larger, provide the threaded grounding insulated type. Insulating inserts: Thermo-setting plastic or fiber material which conforms to the flame test requirements of UL 514, molded or locked into the metallic body of the fitting. The grounding means may be either pressure type wire terminals or copper grounding lugs.
2. Rigid PVC conduit: 90 degrees C., PVC fittings UL listed. Fittings shall match conduit and complying with ANSI/UL listings.
3. EMT fittings: Zinc or cadmium plated steel or malleable iron of the compression type or steel multiple point locking (set screw) type. Couplings and connectors for EMT: Made of steel only, rain and concrete tight, and be gland, rolled steel set screw or compression type. Provide all connectors with insulated throats. Fittings larger than 2 inches: Concrete tight only. Fittings shall comply with ANSI listings.
4. Flexible metal conduit fittings: Steel or malleable iron only with insulated throat, complying with Fed. Spec.W-F-406B.
5. Fittings for Liquid-Tight Flexible Conduit shall incorporate a threaded grounding cone, a steel or plastic compression ring and a gland for tightening and shall be made of steel only with insulated throats.
6. Bushings and connectors shall incorporate an insulating insert of at least 150 degrees C. rated plastic or 105 degrees C. rated nylon. Conduit bushings made entirely of nonmetallic material are not allowed. Grounding and bonding bushings shall have clamp type terminal for copper conductor.
7. Expansion Fittings and Sealing Fittings: Shall be listed by a NRTL, with ground continuity means. Expansion fittings shall be deflection and expansion type.
8. Conduit sleeves shall be galvanized steel, cast iron, plastic or ductile iron pipe when they are located in concrete walls, foundations or floors.
9. Die cast zinc alloy fittings are not allowed on any type of conduit.

F. Conduit Supports:

1. Pipe Straps: Formed zinc coated steel or malleable iron one-hole pipe straps or conduit clamps sized for conduits or tubing. Individual and multiple pipe hangers and riser clamps including all parts and hardware: hot-dipped galvanized throughout. Provide all U-bolts, clamps, attachments and hardware for hanger assembly and conduits. Design each multiple hanger to support load equal to or greater than the sum of the weights of the conduits, wires and hangers itself, plus 200 pounds. Hangers and hardware: Federal Specification WW-H-171d. Manufacturers shall be Allied Tube, Triangle Conduit or Carlon products.
2. Fastenings: Zinc coated or cadmium plated steel screws, bolts, toggles, and expansion anchors as required. Nailin or nail-n anchors are not allowed.
3. Electrical steel channels shall be equivalent to Unistrut P-3000 Series. Provide trapeze, clamps, supports, concrete inserts, galvanized steel or plated steel with galvanized conduit clamps, and threaded 1/4" diameter minimum suspension rods.
4. For individual branch circuit EMT or flexible metal conduit concealed above accessible hung ceilings only, "caddy clips" spring steel conduit clamps.

G. Conduit Coatings: Steel conduit buried directly in the earth shall receive a factory applied PVC coating or 2 coats of fibrated emulsion conduit coating. Comply with manufacturer's application recommendations.

H. Surface Raceways: Use only where specifically indicated. NRTL listed and comply with Fed.Spec.W-C-582, and Articles 376 of the NEC.

1. Manufacturers:

a. Walker, Division of Butler Manufacturing Co.
b. Wiremold.

2. Pull Wires (Pull String): Galvanized steel or nylon rope of sufficient strength to pull in the maximum size conductors through trade size conduit. Minimum strength shall be 200 lbs.
3. Non-metallic surface raceways are allowed in limited use on renovation projects, and only with prior approval from of M-DCPS Facilities Design and Standards.

I. Wireways and Auxiliary Gutters:

1. Hot dip galvanized code gauge sheet steel, complete with knockouts, enclosures, and removable covers unless indicated as hinged.

a. Manufacturers:

1) Hoffman.
2) Keystone.
3) Square D.

2. Exterior locations shall have weather-tight gasketed covers, joints, and drip-proof rain shields. Paint after installation with exterior enamel paint.
3. Wireways and gutters shall comply with NEC requirements.

PART 3 EXECUTION

3.1 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.

3.2 INSTALLATION

A. Provide where indicated and where required, ducts, conduits, tubing, wireways, and gutters to form a complete and integrally grounded raceway system. The system shall be installed according to NEC and local code requirements. Components of the system shall be of sufficient size, strength, and capacity to allow for placements, pulling-in, or other installation of conductors, wires, cables, splices, taps, and terminations whether included in this Contract or for future use without strain or damage to those items being installed.

B. Provide pull wires in empty raceways where no conductors are installed in this Contract. Allow 10 inches minimum slack at each end of pull wire and securely caulk in place. Provide marking tags showing opposite destination noting building and closet number at each end.

C. The minimum size of rigid conduit, EMT, and flexible metallic conduit shall be according to NEC except as follows:

1. Unless otherwise specified under "Products" or shown on the Drawings.
2. Unless otherwise shown on the Drawings, telephone conduits shall be not less than one-inch (1") trade size.
3. Feeders and homeruns shall not be less than 3/4" diameter.

D. Check sizes of raceways to determine the green equipment ground conductor specified, shown, or required can be installed in the same raceway with phase and neutral conductors according to the percentage of fill requirements of NEC. If necessary, increase the duct, conduit, tubing, or raceway sizes shown or specified to accommodate conductors without additional cost to the City of Miami.

E. Raceway and Conduit Locations: Unless indicated otherwise, conduit types specified shall be used in the following locations. Any deviation from this schedule shall be submitted for approval with corresponding price adjustments before installation. Any conduit installed and not of the specified type shall be removed and replaced with the specified type at no additional cost to the City of Miami.

1. Exterior Raceways:

a. Below Grade:

1) Below Grade Direct Buried:

a) Galvanized rigid steel (GRS), painted or PVC jacketed.
b) PVC Schedule 40, as noted on plans.

2) Below Grade Concrete Encased:

a) GRS.
b) PVC Schedule 40.

b. Exterior Exposed – Wet Locations:

1) GRS conduit.
2) IMC conduit.
3) PVC flexible conduit, PVC jacketed with liquid tight fittings.
4) Gutters, wireways, and troughs of the gasketed, raintight type.

c. Exterior Exposed – Damp Locations:

1) GRS or IMC conduit
2) PVC flexible conduit, PVC jacketed with liquid tight fittings.
3) EMT conduit with steel fittings minimum of 8 feet above finished floor.
4) Gutters, wireways and troughs of the gasketed type.

2. Interior Raceways:

a. Under Slabs on Grade:

1) GRS (painted or PVC coated).
2) PVC Schedule 40, with 12 inches clear to bottom of slab.

b. Embedded in Concrete Walls or Floor on or Below Grade:

1) PVC or GRS with threaded or concrete tight steel fittings.

c. Embedded in Concrete Walls or Floors Above Grade:

1) PVC Schedule 40.
2) GRS or IMC with threaded or concrete tight steel fittings.
3) EMT with concrete tight steel fittings.

d. Concealed in Masonry Walls:

1) GRS or IMC with steel fittings.
2) EMT with concrete tight fittings.

e. Concealed in dry wall construction, or in suspended ceilings:

1) EMT or flexible metal conduit with steel fittings.

f. Interior Exposed:

1) GRS or IMC at 8 feet or less above finish floor.
2) EMT with steel fittings more than 8 feet above finish floor.
3) Option: EMT installed below 8 feet from floor in electrical, mechanical, and telephone rooms.

3. Sealing fittings shall be installed at the following points and as otherwise indicated:

a. Where conduits enter or leave hazardous areas and enclosures for explosion-proof lighting fixtures, switches, receptacles, etc., use sealing compounds according to NEC of a type approved for the conduits.
b. Where conduits pass from warm locations to cold locations, such as refrigerated spaces and air-conditioned spaces, use to prevent passage of water vapor.
c. Where required by the NEC.

4. PVC conduit shall not be used indoors either exposed or concealed, except embedded in concrete or under slabs on grade.

a. The depth of conduits under interior slabs shall be based on the minimum allowable bending radii of stub-ups and NEC requirements.
b. Stub-ups on exterior and exterior walls shall be GRS, with transitions from PVC to GRS occurring below grade. Curves to stub-ups shall be GRS.
c. PVC conduit elbows into in-ground handholes are acceptable.
d. PVC Indoor Exception: Exposed in the Main Electrical Room for protection of the main electrical grounding conductor.

F. Raceway and Conduit Installation:

1. Conduit Routing:

a. Route feeders, homeruns, and conduits as indicated on drawings, except for minor deviations as accepted by the A/E.
b. Maintain a minimum separation of 12 inches between conduits containing emergency feeders and conduits containing normal feeders.
c. The routing of conduits, as shown on the plans, is general and diagrammatical.
d. Before installing any work, examine the working layouts of all other trades to determine exact locations and clearances.
e. Where equipment is installed by other trades requiring connection as specified in this section, determine exact conduit entry locations from the approved shop drawings.
f. Modifications to conduit runs shown on the electrical drawings, based on this section, shall be made without additional cost to the City of Miami, and shall be subject to A/E approval.
g. In determining clearances, conduit shall not be run within 6 inches of any heated pipe or duct, or if unavoidable, the conduit must be kept at least 1 inch from the outer covering.
h. Directional Boring:

    1) The use of directional boring meeting NEC requirements is acceptable as a cost savings feature, per condition basis with prior written approval by the City of Miami Facilities Design and Standards.
    2) Directional boring shall not be used in sandy and/or loose stone soil conditions.

2. Conduits in Finished Spaces:

    a. Conduits, fittings, outlet boxes, and pull boxes shall be concealed in ceilings, floor slabs, walls, or partitions of the buildings.
    b. Provide sufficient space at concealed conduits over conduit and coupling for the applications of finished floor, walls, and ceilings.
    c. Examine the Drawings, and if necessary, confer with the A/E to determine the type of construction containing the concealed conduits and the space available for such conduits.
    d. Unless otherwise shown on the Drawings, conduit may be run exposed on unfinished walls, on un-furred basement ceilings, in mechanical rooms and in penthouses, attics, and roof spaces.

3. Roof Conduit:

    a. Avoid running conduit on the roof wherever possible.
    b. If absolutely necessary, roof mounted conduit shall be GRS, a minimum of 16 inches above roof. Coordinate with roofing specifications for penetration and support requirements.

4. Conduits Penetrating Waterproof Membranes Under Floor Slabs on Grade:

    a. Coordinate installation of conduits before installation of waterproof membrane.
    b. Membrane to be sealed waterproof to conduits as specified in Section 07120 before pouring of slab over membrane.
    c. Provide Schedule 40 galvanized steel pipe sleeves for conduits penetrating floor slabs as specified in the section of the Master Specifications applicable to the Project.

5. Conduits Penetrating Waterproof Membranes on Walls: Provide properly coordinated Schedule 40 galvanized steel pipe sleeves for conduits in concrete forms as specified in the section of the Master Specifications applicable to the Project. Membrane to be sealed waterproof to conduits as specified in the section of the Master Specifications applicable to the Project.

6. Conduit Embedded in Concrete:

    a. Conduit embedded in poured concrete shall be of the specified type, unless otherwise indicated.
    b. Metallic conduit buried in the ground shall be of the specified type and painted with a rust inhibitor.
    c. The outside diameter of any conduit buried in concrete shall not exceed one-third of the thickness of the structural slab, wall or beam in which it is placed. The conduit shall be located entirely within the middle third of the member whenever possible.
    d. Lateral spacing of conduits buried in concrete slabs shall be not less than three diameters except where drawings indicate the concrete slab has been specially designed to accommodate a closer spacing of conduits entering signal or electric closets, panelboards, etc., or the arrangement is accepted by the A/E.
    e. In general, conduits shall not be run through beams, except where clearly indicated on the drawings, specified, or where allowed by the A/E. Specifically note such conditions on shop drawings for A/E review.
    f. No vertical conduit passing through horizontal concrete beams shall interfere with reinforcing. Where accepted by the A/E, horizontal conduit may pass through beams, provided they are not closer than 6 inches clear and are confined to upper half of beam section.
    g. Properly support conduit to be embedded to maintain correct location and spacing during concreting operations. If necessary, provide suitable metal supports for this purpose.
    h. Where a concrete embedded conduit passes through an expansion or contraction joint in the structure, install the conduit at right angles to the joint, and provide an approved conduit expansion fitting at the joint installed according to the manufacturer's instructions. Paint the conduit with an approved bituminous compound for 1 foot on either side of the expansion joint.
    i. Conduits concealed in slabs on grade shall be installed over vapor barrier. Underground rigid conduit not encased in concrete shall receive the specified conduit coating.
    j. Factory applied plastic resin or epoxy coated metal conduit and fittings may be used, provided that coating holidays and abrasions to coating are repaired with compatible mastic.
    k. At any 1 point, not more than 2 lines of conduits shall intersect in any portion of slab.

        1) In all such cases, any additional conduit shall be rerouted through other areas, or run under the slab and stubbed through the slab at the required locations.
        2) Conduits and pipes shall have a minimum cover of 1 inch of concrete.
        3) Do not install conduit in slabs 3 inches thick or less.
        4) Under no conditions shall aluminum conduit be buried in concrete slabs.

5) Conduits installed in slabs and rising CMU walls shall be stubbed within webbing of block and shall be extended vertically concurrently with laying of block.

7. Conduit Bending, Cutting, and Placement:

a. Conduit bends and offsets shall be avoided where possible.
b. Required bends shall be made with standard benders designed for the purpose and with a minimum radius of 6 times the internal conduit diameter.
c. Make conduit bends according to the NEC unless otherwise shown on the contract Drawings. Use of a pipe tee or vise for bending conduit is not allowed.
d. Conduit crushed or deformed shall not be installed.
e. Bends shall be free from dents or flattening. Bends more than 360 degrees are not allowed in conduit between any 2 terminations of pull boxes, as per NEC requirements.
f. Make no bend in surface raceways. Use factory formed fittings for surface raceways.
g. The ends of conduit shall be carefully reamed out free from burrs before installation and after threading.

1) Cuts shall be made square.
2) Coupling of conduit by means of running threads is not allowed.
3) Where it is impossible to run the conduit and coupling sections together, an Erickson coupling or other accepted combination coupling shall be used.
4) Joints shall be made up mechanically tight.
5) Joints in conduits concealed in slab, floor fill, earth, etc., shall be made using approved silicone paint on threads.

h. Prevent lodgement of plaster, dirt, or trash in raceways, boxes, fittings, and equipment during course of construction. Clogged raceways shall be entirely freed of obstructions or replaced.
i. During installation of conduit, unfinished runs and terminations in pull boxes, cabinets, etc., shall be capped until conductors are installed.
j. Plastic caps designed for this specific purpose shall be used to cover and align conduits before concrete pours and shall remain on conduit stub-ups until conduit is extended. Caps shall have self-aligning, interlocking male or female wings molded on each side. Duct or electrical tape and wire are unacceptable.

8. Conduit Connections:

a. Conduit and EMT runs shall be mechanically and electrically continuous from service entrance to outlets. Unless otherwise specified, each conduit shall enter and be securely connected to a cabinet, junction box, pull box or outlet box by means of a locknut on the outside and a bushing on the inside or by means of a liquid-tight, threaded, self-locking, cold-weld type wedge adapter. Where nominal circuit voltage exceeds 250 volts:

1) In rigid conduit, an additional locknut shall be provided, 1 inside locknut and 1 outside locknut.
2) In EMT or flexible metal conduit, the 1 locknut shall be made wrench-tight.
3) Locknuts shall be the bonding type with sharp edges for digging into the metal wall of an enclosure and shall be installed to provide a locking installation.

4) Locknuts and bushings or self-locking adapters will not be required where conduits are screwed into tapped connections.
5) Conduit bushings for power and branch circuits in sizes larger than 1 inch shall be metal and for sizes 1 inch or smaller may be PVC. Conduit bushings for all low voltage conduit sizes may be PVC.
6) Protect vertical runs of conduit or EMT terminating in the bottoms of wall boxes or cabinets, etc., from the entrance of foreign material before the installation of conductors.

b. Plastic conduit joints shall be made by brushing a plastic solvent cement on the inside of the plastic coupling fitting and on the outside of the conduit ends. Slip together the conduit and fitting, until seated, with a slight twist to set the joint tightly, and the conduit then rotated one-half turn to distribute the cement evenly. Remove excess cement built-up on the surface of the conduit.
c. The end of each conduit one inch and smaller shall be provided where it enters a junction box, outlet box, cabinet, etc., with the locknut and bushing. For conduits 1-1/4" and larger, use insulated bushings with ground stud. If insulated bushings are of the fully insulated type, use additional locknuts inside the junction box or cabinet before installing the bushing. Provide conduit entering main distribution switchboard feeder pull boxes with insulated bushing with ground stud regardless of size.
d. Install the conduit system complete before any conductors are drawn in. Each run of conduit shall be blown through and swabbed after plaster is finished and dry, and before conductors are installed.
e. Install conduit to drain any moisture, collecting in the conduit, to the nearest outlet or pull box, where possible.
f. Where metallic conduit is exposed to different temperatures, seal the conduit to prevent condensation and passage of air from one area to the other.
g. Light and power conduit shall run from a permanent and continuous ground return back to the service ground connection point. Conduits used on systems entirely isolated from the light and power distribution system shall be electrically continuous and grounded in an approved manner. Ground cable trays to the conduit system.

9. Conduit Penetrations and Supports:

a. Sleeves, conduits, or other pipes passing through floor slabs, beams, or walls shall be located to not impair the strength of the structure.
b. Conduits penetrating the walls or smoke partitions shall be fire stopped (sealed). Filling materials for openings in floors shall be fire-resistive, and finished to prevent passage of water, smoke and fumes. Filling material for openings in walls shall be fire-resistive where it occurs in fire walls and shall be installed to prevent the passage of air, smoke or fumes. Where conduit and wiring pass through fire walls or floor slabs, the Contractor shall fill the opening with fireproof sealant, as specified in Section 07840.
c. Roof penetrations shall be made using approved flashings and counter-flashings. Do not penetrate can’t strips or expansion joint covers with conduits. Do not run conduits up through roof nearer than 12 inches from toe of can’t strip. Where conduits penetrate exterior walls near flashings, penetration shall be at least 3 inches above the flashing reglet.
d. Where conduits passing through the openings are exposed in finished rooms, the finishes of the filling materials shall match and be flush with the adjoining floor, ceiling, or wall finishes.

e. Where unused sleeves or slots are provided for future installation of conduit, etc., they shall be suitably identified if not readily recognizable.
f. EMT and conduits not embedded in concrete or masonry shall be securely and independently supported so that no strain will be transmitted to outlet box and pull box supports, etc. Supports shall be rigid enough to prevent distortion of conduits during wire pulling.
g. Run conduits exposed in unfinished spaces, mechanical equipment spaces, where specifically indicated on the Drawings, or with the expressed permission of the A/E.

    1) Feeder conduits shall be run exposed or in hung ceilings, except as noted.
    2) Where exposed conduits are installed, they shall be run parallel to the building walls or partitions, using approved conduit fittings.
    3) Exposed conduits shall be securely supported with malleable iron pipe straps, angle iron pipe straps, angle iron or steel channel racks or other approved means as required for clearance of other piping or ductwork.
    4) Wood hangers and perforated sheet metal hanger straps are not allowed.
    5) Spacing of conduit supports shall not exceed 7 feet.
    6) Horizontal feeder conduit banks shall have their hangers fastened to the building structure by approved means.
    7) Hangers for banks consisting of 1 or 2 conduits may be fastened from inserts in the slab.
    8) Auxiliary steel for fastening shall be furnished and installed under this section.

h. Support individual conduits not larger than 1-1/2" diameter by means of one-hole pipe straps or individual pipe hangers. Support individual horizontal conduits larger than 1-1/2" diameter by individual pipe hangers.
i. Conduit located in hung ceilings shall be supported in approved manner similar to exposed conduits.
j. Branch circuit conduits above suspended ceilings may be supported from the floor construction above or from the main ceiling support members, however, the finished installation shall not interfere with the removability of ceiling panels. Individual branch conduits above suspended ceilings with removable panels may be supported from the ceiling suspension wires provided the load imposed on any individual wire is not greater than 64 pounds, including the ceiling weight.
k. Unsupported vertical drops over 10 feet from bus ducts or at motors shall be in rigid steel conduit. For vertical drops of less than 10 feet EMT may be used. Brace conduit to prevent swaying.
l. Space conduits installed against concrete or masonry surfaces away from the surface by clamp backs or other approved means.
m. In dry locations, spring steel fasteners, clips, or clamps specifically designed for supporting exposed single conduits may be used instead of pipe straps or pipe hangers.

    1) Hanger rods used with spring steel fasteners shall be not less than 1/4" diameter steel with corrosion resistant finish.
    2) Spring steel fasteners shall be specifically designed for supporting single conduits or EMT
    3) Type, size and spacing of spring steel fasteners with accessories shall by approved by the A/E and the Contractor.
    4) Submit applicable load and rating data for approval.
    5) Wire shall not be used for support.

6) Nails are not allowed for the support of conduit.

n. Where 2 or more horizontal conduits or EMT run parallel and at the same elevation, they shall be supported on multiple trapeze pipe hangers. Each conduit or EMT shall be secured to the horizontal hanger member by a U-bolt, one-hole strap, or other suitably designed and approved fastener.
o. U-bolts, clamps, attachments, and other hardware necessary for hanger assembly, and for securing hanger rods and conduits shall be provided. Each multiple hanger shall be designed to support a load equal to or greater than the sum of the weights of the conduits, wires, hanger, plus 200 pounds. Hardware shall be hot-dip galvanized after fabrication.

10. Fittings:

a. Expansion Fittings: Each buried conduit in or rigidly secured to the building construction on opposite sides of a building expansion joint and each long run of exposed conduit that may be subject to excessive stresses shall be provided with an expansion fitting. Expansion fittings shall be made of hot dip galvanized malleable iron and shall have a factory installed packing that will prevent the entrance of water, a pressure ring and a grounding ring.
b. In addition to the grounding ring, a separate external copper bonding jumper secured by grounding straps on each end of the fitting shall be provided.
c. Sealing Fittings: Sealing fittings for use with rigid steel conduits shall be of the threaded, zinc or cadmium coated, cast or malleable iron type. Fittings used to prevent passage of water vapor shall be of the continuous drain type.
d. Sealing fittings shall be installed and sealed according to the manufacturer's recommendations at suitable, approved, accessible locations. In concealed work, each fitting shall have an access door or panel to allow access to the fitting.
e. Set screw and compression steel fittings shall be made up mechanically tight according to manufacturer's recommendations.

11. Conduit Fastening: Fasten raceways as follows:

a. To Wood: Wood screws, sheet metal screws, or screw type nails.
b. To Hollow Masonry: Toggle bolts or expansion bolts as required. Holes not used to be filled.
c. To Concrete or Solid Brick Masonry: By steel expansion bolts. Holes drilled to a depth of more than 1-1/2".
d. To Steel Work: Machine screws, welded threaded studs, or spring-tension clamps. Raceways or pipe straps shall not be welded to steel structures.
e. To Light Steel Construction Partitions: Sheet metal screws. Bar hangers may be attached with saddle ties of 16 gage double strand zinc-coated steel wire.
f. Explosive charge setting devices are not allowed for any type of fastening on the project.
g. Conduits, tubing, or raceways shall be continuous from outlet to outlet, cabinet, junction box, or pull box.
h. Surface Wireways and Auxiliary Gutters: Fasten according to manufacturer's directions with fastenings appropriate for surface as specified.
i. Cable Supports in Vertical Raceways: According to NEC Article 300-19.

12. Flexible Conduit:

a. Flexible conduits shall be used for connections to motors and other electrical equipment when it is subject to movement, vibration, misalignment, cramped

quarters, or where noise transmission is to be eliminated or reduced. Flexible conduit used to meet the above requirements shall be of the liquid-tight type when installed under any of the following conditions:

1) Exterior locations.
2) Moisture or humidity laden atmosphere where it is possible for condensation to accumulate.
3) Corrosive atmospheres.
4) Where water or spray due to wash-down operations is frequent or possible.
5) Wherever there is a possibility of seepage, dripping, etc., of oil, grease, or water.

b. Flexible conduit shall be used for short connections to control devices, recessed fixtures, and similar items with enough slack to avoid tension. Connection between structure and first point of attachment to vibrating equipment shall be flexible.

13. Surface Raceways:

a. Surface metal raceways shall be used where noted on Drawings. Surface metal raceways shall be securely grounded to outlet boxes or to back-plates and fixtures by means of bolts, screws, or other approved means. Ends of raceways shall be provided with bushings at entrances to boxes or canopies. A separate green ground conductor shall be installed in the raceway from the junction box supplying the raceway to receptacle or fixture ground terminals.
b. Fasten surface raceways to surface in manner similar to methods specified.
c. Each surface metal raceway outlet box with an attached lighting fixture shall be of sufficient diameter to provide a seat for the fixture canopy.
d. Where a surface metal raceway is used to supply a fluorescent lighting fixture having central stem suspension with a backplate and a canopy, with or without extension ring, the backplate and canopy will serve as the outlet box and no separate outlet box need be provided.
e. A surface metal raceway outlet box shall be provided, in addition to the backplate and canopy, at the feed-in location of each fluorescent lighting fixture having end stem suspension.
f. Where a surface metal raceway extension is made from an existing outlet box on which a lighting fixture is installed, a backplate slightly smaller than the fixture canopy shall be provided and no additional surface mounted outlet box need be installed.

14. Cable Trays:

a. Install cable trays according to equipment manufacturer's written instructions.
b. Remove burrs and sharp edges of cable trays.
c. Support cable tray independently from the building structural components.
d. Comply with manufacturer's recommendations for selection and installation of supports.
e. Strength of each support including fastenings to the structure shall be adequate to carry present and future load multiplied by a safety factor of at least four or 200 lbs., whichever is greater.
f. Support Locations: Locate supports according to the recommendations of Article 6.6 of NEMA Standard VE 1.
g. Installation of supports shall be according to cable tray manufacturer's written instructions and the recommendations of Paragraph 6.5 of NEMA Standard VE 1.

h. Fastening Supports: Unless otherwise indicated, fasten cable tray supports securely to the building structure as specified in Division 16 Section "Supporting Devices".
i. Direction Changes: Make changes in direction of cable tray with standard cable tray fittings.
j. Locate cable tray above piping except as required for tray accessibility and as otherwise indicated.
k. Firestopping: Where cable trays penetrate fire and smoke barriers including walls, partitions, floors, and ceilings, install fire-stopping at penetrations after cables are installed.
l. Sleeves for Future Cables: Install capped sleeves for future cables through firestopped cable tray penetrations of fire/smoke barriers.
m. Working Space: Install cable trays with sufficient space to allow access for installing cables.
n. Grounding: Electrically ground cable trays and ensure continuous electrical conductivity of cable tray system. Use tray as an equipment ground conductor for itself only, not for connected equipment.
o. Warning Signs: After installation of cable trays is completed, install warning signs on or in proximity to cable trays where easily seen by occupants of space.

15. Empty Conduits: Where empty conduit or tubing is indicated for wiring to be installed in future by utility company or by separate contract, install conduit or tubing according to previous requirements for conduit and tubing with following additional requirements:

    a. No length of run shall exceed 75 feet for 1/2" size, 100 feet for 3/4" size, and 150 feet for 1 inch or larger sizes.
    b. Raceways shall not contain more than four 90-degree bends or equivalent.
    c. Install additional pull or junction boxes to comply with above limitations, whether or not indicated.
    d. Inside radii of bends in conduits of 1 inch or larger shall be not less than 10 times nominal diameter.
    e. Provide pull wire in empty raceways.

16. Painting: Paint exposed conduit to match the surrounding wall or ceiling it is mounted against according to Section 09900 Painting.

3.3 FIELD QUALITY CONTROL

A. Grounding: Test cable trays to ensure electrical continuity of bonding and grounding connections.

3.4 ADJUSTING AND CLEANING

A. Upon completion of installation of cable trays, inspect trays, fittings, and accessories, remove burrs, dirt, and construction debris and repair damaged finish including chips, scratches, and abrasions.

END OF SECTION

16120
WIRE AND CABLE

PART 1 GENERAL

1.1 SUMMARY

A. Provide all labor, materials equipment and services necessary to complete for the Wire and Cables work, as indicated on the drawings, and as specified herein.

B. Related Sections:

1. 01150 - Mechanical and Electrical Coordination
2. 16112 - Raceways and Conduit.
3. 16155 - Motor Power and Control Wiring.

1.2 SYSTEM DESCRIPTION

A. All materials shall be listed by an OSHA approved Nationally Recognized Testing Laboratory (NRTL).

B. Provide wires and cables comprised of copper conductors under provisions of the American Society for testing and materials (ASTM) and insulated Power Cable Engineers Association (IPCEA) Standards.

1.3 SUBMITTALS

A. Submit shop drawings, product data, and descriptive literature before starting work, and as specified in other section of the Master Specifications applicable to the project.

B. Delivery, Storage and Handling shall conform to Section 16100, Basic Materials and Methods". Deliver, store, and handle all wire and cable in complete coils, boxes, or reels with manufacturer's name and approval tag attached. Tag to indicate wire size and type of insulation.

PART 2 PRODUCTS

2.1 EQUIPMENT

A. Wire and Cable:

1. Wire and cable shall be soft annealed 98 percent conductivity copper with 600-volt A.C. thermoplastic insulation unless otherwise noted.
2. Wire and cable shall be new and manufactured not more than 12 months before installation.
3. Each coil or reel shall bear UL label and wire marked with AWG or circular mil wire size, voltage rating, insulation type, type stranding, and the manufacturer's name.
4. Unmarked wire found installed shall be replaced at no additional cost to the City of Miami.
5. Wiring shall comply with NEMA WC-5, NEMA WC-7, IPCEA S-61-402 and IPCEA S-66-524.

B. Light and Power Wiring Circuit Conductors:

1. Light and power wiring circuit conductors may be stranded in sizes No.10 AWG and smaller, and concentric strand Class B for conductors No.8 AWG and larger.
2. Stranded copper conductors may be used for final connections to individual recessed lighting fixtures, devices, and for control and signal circuit wiring only with crimp-on type terminations.
3. Do not use stranded wire for wiring to receptacles, unless insulated crimp-on connectors are installed on the wiring ends.

C. Wiring Insulation shall be as follows:

1. Lighting and receptacle branch circuit protected at no more than 20 amperes: solid copper having THHN/THWN-2 insulation, in trade size #12 AWG rated 600 volts, 90 degrees Centigrade in dry and wet locations.
2. All control and alarm wiring: type THHN/THWN-2 stranded copper in trade size #14 or smaller, rated 600 volts, 75 degrees Centigrade in dry and wet locations.
3. Unless otherwise specified or shown, all other branch or feeder conductors: stranded copper having THHN/THWN-2 insulation, in trade sizes No. 10 AWG TO 600 MCM, inclusive.
4. Provide, where required, the following types of insulation and meet the requirements specified below:

    a. Type AVA: under provisions of Federal Specifications J-C-30.
    b. Type SF-2: 2/64-inch-thick silicone-rubber, 125º C minimum, with outer covering of heat-resisting glass braid.

5. Provide distinctive markings for the covering of wires and cables designed to meet the above specification so that they may be readily identified in the field. Provide a distinctive color code for the covering of the individual conductors for identification of individual conductors.

D. Color Coding:

1. Color Code secondary service feeder and branch circuit conductors throughout the electrical system as follows:

208/120 Volts	Phase	480/277 Volts
Black	A	Brown
Red	B	Purple
Blue	C	Yellow
White	Neutral	Gray
Green	Ground	Green

On existing locations new wiring shall match color of existing phase wiring.

2. Conductors:

    a. As manufactured by Colonial Wire and Cable, Southwire Company, or American Insulated Wire and conform under provisions of NFPA and IPCEA.
    b. 98 percent conductive copper under provisions of Matheisen's Standard rated for 600 volts.
    c. Aluminum conductors are not acceptable.

d. Stamped for voltage, type, temperature, size, etc.

3. All other colors (violet, traced, etc.) shall only be used for switch legs, control, or communication circuits.
4. Conductors for control wiring shall be color coded, using different color coding than the energy conductor coding specified above. Control wires shall be numbered.

E. Minimum Wire Size shall be No.12 AWG for control over 200 feet, unless otherwise noted. Control wiring may be No.14 AWG if distance is less than 200 feet.

1. Fire alarms, CCTV, intercoms, and intrusion systems shall have cable and wiring according to manufacturer's specifications or as specified.

F. Wire and Cable Connectors and Terminations:

1. For splices in branch circuit conductors solid or stranded size No.10 AWG and smaller, use UL listed soft plastic wire nut with sharp self-cutting interior threads, 3M Scotchlok, Ideal Supernut, or T&B Piggy of the size to match the wire.
2. For terminations of stranded or solid wire in size No.10 AWG and smaller at equipment terminals, use UL listed, tin-plated copper, 600-volt vinyl insulated compression type ring or fork type equivalent to T&B "Sta-Kon" or Burndy "Vinylug".
3. For No.8 AWG and Larger: T&B "Locktite" connectors, Burndy "Versitap" connectors, or OZ-Gedney solderless connectors, with insulating covers, tape or heat shrink insulation system.

    a. Terminations and splices in feeders may be made with solderless pressure type connectors complete with composition insulating covers, field insulating tape, or heat shrink insulation system.
    b. Connectors and lugs for 250 mcm cable and larger shall be of the 2-hole type and for compression type shall have at least 2 indents.
    c. Compression lugs and connectors shall be tin plated wrought copper, of size to match the cable.

4. Splices in underground exterior wiring shall be made fully waterproof by potting or encapsulating. 3M ‘Scotchcast’ in-line resinpower cable splice kit or equivalent for wire sizes #4 AWG and larger, and 3M direct bury splice kit or equivalent high impact, UV resistant tube pre-filled with water-resistant gel for wire sizes #6 AWG and smaller. Underground waterproof splice kits shall be listed by an OSHA approved NRTL.
5. Insulating tapes shall be of a type approved for the application and shall be flame retardant. Tapes shall be as manufactured by 3M or Bishop Electric.
6. Cable Ties: T&B "Ty-Rap" or Burndy "Unirap".
7. Cable Identification: Branch circuits wire markers 3M "Scotch Code" or accepted equivalent. For feeder sizes, non-ferrous metal stencil tags.
8. Thermal Fusion Connections: "Catalytic thermal weld" by Cadweld or accepted equivalent.
9. Arc/Proofing Tape

    a. A tape consisting of a flexible, conformable fabric of organic composition coated one side with a flame-retardant elastomer.

1) Tape shall not support combustion, shall be self-extinguishing and shall retain not less than 65 percent of its original tensile strength when tested by the cut-strip method of ASTM.
2) Include test information of exposure to distilled water, 3 percent salt water, ultraviolet light and sunlight in compliance with ASTM requirements.

10. Control Wiring:

    a. Control conductors for 75 volts or less: #18 AWG stranded copper.
    b. Wiring: comply with NEC Art. 725 Class 1, Class 2, Class 3 Remote Control, Signaling and power limited circuits.
    c. Communication, sound and intercommunication conductors: 100 percent shielded.

11. Portable Cords:

    a. Stranded copper shall be listed by an OSHA-approved NTRL, and shall be resistant to water, acid, and alkalies.
    b. Provide each cord with one (1) green covered conductor to be used as the grounding conductor.
    c. 300 Volt: #14 AWG Type SJ.
    d. 600 Volt: #14 AWG Type SO.

PART 3 EXECUTION

3.1 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.

3.2 INSTALLATION

A. Wire and Cable Installation:

1. Wire and cable shall be suitably protected from weather or damage during storage and handling and shall be in first-class condition when installed.
2. Conductors shall not be pulled into conduit until raceway system is substantially complete. Wiring shall be continuous within conduit runs. Splices will be allowed only at outlet and junction boxes. Joints shall be mechanically and electrically secure.
3. Pulling lubricants, if used, shall comply with UL requirements for the type of conduit material and cable insulation being used.
4. Commercially produced wire lubricant may be utilized to ease wire pulling. Lubricant of a type to produce no deteriorating effect on conductor installation or on the interior of associated wire way and shall be approved by the wire manufacturer.
5. Care shall be taken to prevent cutting and abrasion of cable insulation during the pulling of feeders.

    a. Ropes used for pulling of feeders shall be made of polyethylene or other suitable nonmetallic material.
    b. Pulling lines shall be attached to conductor cables by means of either woven basket grips or pulling eyes attached directly to the conductors.
    c. Rope hitches shall not be used.

d. Cables to be installed in a single conduit shall be pulled in together.
e. Where polyethylene insulation is used and a pulling lubricant is required, the lubricant shall be certified by the manufacturer to be non-damaging to such insulation.
f. Cables without a metallic sheath, the cable support: of the split wedge composition type with clamps each individual conductor firmly and tightens due to the weight of the cable. All boxes: hot-dipped galvanized after fabrication.

6. Do not bend cables during installation, either permanently or temporarily, to radii less than 12 times the outer diameters, except where conditions make the specified radius impracticable and shorter radii are allowed by the NEC and NEMA Standards.
7. Neatly and securely bundle conductors located in branch circuit panelboards, cabinets, control boards, switchboards, and motor control centers. Use nylon bundling straps.
8. Provide suitable installation equipment to prevent cutting or distortion of conduits during the pulling of feeders. Use masking or other means to prevent obliteration of cable identification when solid color coating or colored tracers are used.
9. Control wiring color codes, shall be of type as required by its equipment manufacturer. Interconnections of control wiring shall be on numbered terminal strips.
10. Where 2 neutrals are installed in same conduit, their sets of wiring shall be grouped and clearly identified by permanent tags or other means.
11. At each outlet, a loop or end-of-wire not less than 9 inches long shall be left for connection to lead.
12. Leading end of each conductor pulled shall be carefully examined for damage to jacket. If damage is evident, cable shall be extended and further checked for damage, with good cable only to remain.
13. Cables in junction and pull boxes shall be properly trained and racked.
14. Branch circuit wiring in panelboard gutters shall be installed vertically in the gutter with a 90-degree bend at the supply circuit breaker, wire shall enter the circuit breaker lug horizontally.
15. Install cable supports and boxes at vertical feeders and according to the schedule in the NEC. Boxes shall be built of heavy steel plates not less than No.10 USS gage fastened to an angle iron frame with removable covers secured by brass machine screws. The cable support shall be of the split wedge type that clamps each conductor firmly and tightens due to the weight of the conductor.
16. Install wires in conduit runs after concrete and masonry work is complete and moisture is swabbed from conduits.

B. Wire and Cable Splicing and Terminations:

1. Splices and terminations of conductors shall be made using specified materials and methods installed according to the manufacturer's recommendations. Make conductor length for parallel feeder’s installation of exactly the same length.
2. Splices in branch circuit wiring shall be made by stripping conductor insulation, twisting conductors until mechanically secure, and installing a self-threading insulated type connectors. In the making of a splice, connectors shall be brought up upon the conductors so that all the conductors are equally engaged, the insulation is not ruptured, no bare wires are exposed or have backed-off due to application of pressure and the connector will not loosen due to cycling or vibration, in order to insure an efficient splice. Splices are not allowed within panelboards.
3. Conductors shall be squarely cut and fully inserted into the lug barrel or connector. Insulation shall be stripped without cutting the conductor or removing strands,

exposing the conductor for the minimum distance required for connection. Splice connectors shall be of a type and be so installed that the conductor is fully insulated by a skirt of such design or taped so cold flow of the conductor insulation will not be induced when the conductor is positioned in its final operating position. No splices or joints will be permitted in either feeder or branch, circuits, except at outlets or accessible junction boxes.

4. Do not combine conductors under the same lug. Provide individual lugs for individual conductors. Re-tighten bolt type connectors 24 to 48 hours after initial installation and before taping.
5. Connectors shall be insulated by approved type, integral or separate cover, or by means of taping with approved plastic or rubber and friction tapes to provide insulating value equal to that of the conductors being joined. The number and size and combinations of conductors allowed by UL as listed on manufacturers' packaging of connector shall be strictly complied with.
6. Terminations at equipment terminal blocks shall be made using compression type connectors suitable to match terminal type.
7. Continuity of neutral on multi-wire branch circuits shall not be made on any device at terminal blocks, but shall be spliced and a tap brought out, thereby assuring no openings of the neutral in the replacement of a device.
8. Feeders shall be identified by means of nonferrous tags or pressure-sensitive labels securely fastened to all cables, feeders, and power circuits in vaults, pull boxes, manholes, switchboard rooms, terminations of cables, etc. Tags or labels shall be stamped or printed to include the feeder number, source and equipment supplied. If suspended type tags are provided, they shall be attached by nylon cables ties or other nonconductive permanent means.
9. Branch circuit conductors shall be identified at supply circuit breakers, with the circuit number using pressure sensitive adhesive wire markers.
10. Branch circuit wiring for lighting and other single phase 277 volt or 120-volt applications shall be multi-wired utilizing common neutrals. Under no circumstances shall any switch break a neutral conductor.
11. Circuiting work shall comply with the following:

    a. Loads on panel busses shall be balanced on phases as evenly as possible.
    b. No neutral conductor shall be common to more than 1 circuit conductor connected to the same phase leg of the supply system.
    c. Circuiting of panelboards shall allow breakers to be grouped logically by functions.

C. General Wiring Methods:

1. Provide wiring complete from point of service connection to all receptacles, luminaires, power outlets, pull and junction boxes and other devices as shown. Provide slack wire for all future connections. Unless otherwise specified, branch circuit conductors, provide No. 12 AWG or larger. In outlet boxes for future installations, tape ends of wires and blank covers installed.
2. Do not bend cables during installation to radii less than that recommended by the manufacturer.
3. Bundle conductors not larger than No. 10 AWG located in branch circuit panel boards, signal cabinets, signal control boards, switchboards and motor control centers. Cable in individual circuits, conductors larger than No. 10 AWG located in switchboards, motor control centers and pullboxes.

a. Bundling and cabling shall be provided with straps made of self-extinguishing nylon.
b. Each strap shall be constructed with a locking hub or head on one end and a taper on the other.
c. Apply Arc-proofing, as specified, after cabling.

4. Where the length of a homerun, from panel to first circuit, exceeds 100 feet for a 120-volt circuit or 150 feet for a 277-volt circuit, the conductor size shall be No. 10 AWG.
5. Where homerun circuit numbers are shown, follow such numbers in connecting circuits to panel boards. Where panel board cabinets are recessed, stub up concealed conduits (with sufficient capacity to carry the number and size of future conductors) to a junction box for future connections and extensions located as follows:

   a. In an area with removable ceiling, provide accessibility above the suspended ceiling for the junction box.
   b. In an area with non-removable ceiling, recess the junction box in the ceiling directly over the panel board location.
   c. In an area without suspended ceiling but with finished wall, recess the junction box in the wall directly above the panel board as directed by the A/E.
   d. In an area without suspended ceiling but with unfinished wall, expose the junction box on the ceiling directly over the panel board location.

6. Do not utilize channel support members for suspended type fluorescent lighting fixtures for building branch circuit wiring unless otherwise indicated. Connections between units in continuous rows shall be made within the fixture wireway.
7. Provide dedicated neutral conductors for computer power outlets.

D. Phasing and Identification

1. The plans designation of all secondary conductors are the same and are indicated in or on all 3-phase outlets, transformers, panel boards and disconnect switches, and they shall be connected with uniform phase sequence.
2. Maintain A, B, C phase relation left to right when viewed from the front.

E. Voltage Drops at New Construction:

1. Total Allowable Voltage Drop for Service Source to Load: Limit to a maximum drop of 5 percent. Increase wire size, where necessary, to comply with this requirement.

   a. Branch Circuits: Limit to a maximum voltage drop of 3 percent.
   b. Service Source to Individual Panelboards: Limit to a maximum voltage drop of 2 percent.

F. Voltage Drops at Existing Construction:

1. Total Allowable Voltage Drop for Service Source to Load: Limit to a maximum voltage drop of 5 percent. Increase wire & conduit sizes, where necessary, to comply with this requirement.

   a. Branch Circuits: Limit to a maximum drop of 3 percent.
   b. Service Source to Individual Panelboards: Limit to a maximum drop of 3 percent.

END OF SECTION

16131
OUTLET, PULL, AND JUNCTION BOXES

PART 1 GENERAL

1.1 SUMMARY

A. Provide all labor, materials, equipment and services necessary to complete the Outlet, Pull and Junction Boxes work, as indicated on the drawings, and as specified herein.

B. All materials shall be listed by an OSHA approved Nationally Recognized Testing Laboratory (NRTL).

C. Related Sections:

1. 09900 - Painting.
2. 16112 - Raceways and Conduits.

1.2 SYSTEM DESCRIPTION

A. Performance Requirements:

1. Box size shall comply with NEC for number and size of conductors in boxes.
2. Box size shall comply with NEC for number and size of conduits entering and exiting each box.

1.3 SUBMITTALS

A. Submit manufacturer's literature and technical data as required.

PART 2 PRODUCTS

2.1 EQUIPMENT

A. Outlet Boxes:

1. Provide outlet boxes at required locations, where shown on the drawings, and as specified.

a. Fixture studs shall be securely fastened in an acceptable manner.
b. Plaster covers shall have depths suitable to the finish being applied to the walls.
c. Sheet steel boxes shall be properly drilled and tapped.
d. There shall not be more holes in any of the outlet boxes than are required for the entering conduits.
e. Depth of boxes shall allow for easy wire pulling and proper installation of wiring devices.

2. Outlet boxes shall be galvanized steel or rust-resistant malleable iron alloy and comply with ANSI C33.65.
3. Outlet Boxes shall be as follows:

a. For Recessed Ceiling Fixtures: 4-inch square sheet steel box with blank cover and suitable hanger bar-box to be fastened to ceiling suspension members in an acceptable manner not more than 1 foot from fixture opening.
b. For Surface or Stem Mounted Ceiling Fixtures from Slab with Concealed Conduit: 4-inch sheet steel octagon concrete ring of a depth suitable to the construction and furnished with top cover having a 3/8" fixture stud.
c. For Ceiling and Wall Bracket Outlets on Exposed Conduit in Dry Locations: 4-inch octagon sheet steel box with 3/8" fixture stud.
d. For Surface Mounted Ceiling Fixture or Hung Ceilings: 4-inch octagon sheet steel hung ceiling box with suitable hanger bars and 3/8" fixture stud. Box shall be fastened to ceiling suspension in an acceptable manner.
e. For Surface Mounted Wall Bracket Fixtures with Concealed Conduit: 4-inch square sheet box with round opening plaster cover and 3/8" fixture stud.
f. For Ceiling and Wall Bracket Outlets on Exposed Conduit at Damp or Wet Locations:4-inch malleable iron.
g. For Switches and Receptacles in Tile, Plaster, or Gypsum Board Walls: 4-inch square sheet steel box or multi-gang box with proper plaster covers as required. Two gangs may be provided by means of a 4-inch square box with two gang plaster cover.
h. For Switches and Receptacles in Enameled or Face Brick walls, Unfinished Walls, and Woodwork: Single or multi-gang sheet steel utility boxes as required.
i. For Switches and Receptacles on Exposed Exterior Conduit Work: Type FS or FD conduit box, single or double gang with multiple entry points, as required for installation.
j. For Telephone or Computer Outlets: 4-11/16" square x 2-1/2" deep.

4. Boxes for fire alarm or signal systems, clocks, pilot lights, and other specialty equipment shall be by the manufacturer of the equipment.
5. Wet/Damp Locations:

a. Provide gasketed, weathertight, screw covers, code gage galvanized steel pull boxes with weatherproof conduit hubs for pull boxes with multiple conduit entries.
b. Provide steel or malleable iron metal hub type, dipped in rust inhibitor and with gaskets for individual conduit runs.

6. Extension Rings: Do not use to increase the volume of boxes, except where necessary due to multiple conduit run conflicts. Where such conflicts occur, an extension ring may be allowed for changes in direction of conduit to make necessary clearances. Not more than one extension ring may be used for each box where necessary.

B. Pull and Junction Boxes:

1. Where indicated in the plans and specifications or where necessary for compliance with code requirements for cable installation, install junction and pull boxes of the proper size for conduits over 1-inch trade size. Pull and junction boxes shall be of adequate size to accommodate installation of conductors without excessive bending of conductors that could damage insulation.
2. Pull and junction boxes shall comply with Fed.Spec.WJ-800F and be of all steel construction, spot or seam welded at joints and hot dip galvanized after fabrication.
3. Boxes shall be drip proof with screw attached covers. Each box shall have a turned-in lip welded at joint to develop full strength. Lip shall be drilled and tapped for 1/8" or

3/16" round head screws, symmetrically placed. To provide adequate length of thread, nuts shall be tack welded on inside of lip, or lip shall be made double thickness.

4. Pull and junction boxes shall be sufficiently rigid to withstand moderate twisting strains. Steel boxes shall comply with the following:

    a. Sheet steel boxes 100 cubic inches or less shall not be less than 0.0625 inch thick steel.
    b. Sheet steel boxes over 100 cubic inches shall not be less than 0.053 inch thick steel.
    c. Barriers and reinforcing angles shall be supplied as required.

PART 3 EXECUTION

3.1 INSPECTION

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

3.2 INSTALLATION

A. Locations of outlets on electrical drawings are approximate only.

1. Do not scale drawings.
2. Locate outlets and equipment in accordance with architectural plans, sections, elevations and details.
3. Note the direction of door swings on architectural drawings for properly locating light switches on latch side of doors, unless otherwise shown on the drawings.
4. Coordinate wall outlet locations with chalkboards, tackboards, cabinets, and equipment.

B. Determine the proper position of outlets and receptacles. Relocate any outlet or receptacle not located in accordance with furniture and equipment plans without additional cost to the City of Miami.

C. The City of Miami reserves the right to change the location of any outlet, apparatus, or equipment up to the time of roughing in without additional cost, provided conduit runs are not substantially increased.

D. Fasten and secure boxes to the building structure independent of the conduit. Provide acceptable plaster stops for boxes to be set in plastered walls and ceilings.

E. Boxes and supports shall be fastened as follows:

1. To concrete or brick: Bolts and expansion shields.
2. To hollow masonry: Toggle bolts, or bolts and expansion shields.
3. To steel work: Machine screws or welded studs.
4. Explosive charge setting devices are not allowed.

F. Recessed wall outlets shall be flush with the wall surface. Install box in wall with cover to allow block or wall surface to fit tight against lip of cover.

G. Gang switches and receptacles together only where plans specifically indicate such combinations.

H. Outlets for duplex receptacles shall be arranged for vertical mounting of the receptacles unless otherwise specifically indicated on plans.

I. Barriers shall be provided as necessary to isolate voltage classes.

J. Under no circumstances shall outlet boxes for adjoining spaces be placed back to back in partition walls.

K. Circuit breakers and switches shall not be grouped or ganged in outlet boxes unless they can be arranged where the voltage between exposed live metal parts of adjacent switches does not exceed 300 volts. Provide barriers between 120 and 277 volt switches where ganged together.

L. Align rows of outlet boxes for ceiling lights.

M. Unless noted, specified, or directed otherwise, wall outlets shall be centered above finished floor as follows:

1. Convenience outlets: 18 inches to bottom of box.
2. Utility outlets: 18 inches to bottom of box.
3. Clock outlets: 90 inches to center.
4. Exit lights: 6 inches over doorway.
5. Switch outlets: 46 inches to bottom of box.
6. Special purpose outlets: as directed.
7. Telephone outlets: 18 inches to bottom of box.
8. Fire alarm visuals with or without horns: 78 inches to bottom of box.
9. Fire alarm horns: 6" minimum below adjacent surface, but not less than 8'6" or greater than 10'0" above finish floor.
10. Fire alarm pull station: 46 inches to bottom of box.
11. Refer to Architectural drawings for additional mounting heights.

N. Pull and junction boxes shall be provided at locations required to reduce length of cable pull or reduce number of elbows between outlets.

O. Provide blank covers for outlet boxes when devices or wiring has been removed or not installed.

P. Paint exposed boxes to match the color of the wall or ceiling to which they are mounted.

Q. Where several feeders pass through a common pull box, tag each feeder to clearly indicate electrical characteristics, circuit number, and panel designation.

END OF SECTION

16132 FLOOR BOXES

****

SPECIFIER:
CSI MasterFormat 2004 number: 26 05 33

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PART 1 GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, equipment and services necessary to complete the Floor Boxes work, as indicated on the drawings, and as specified herein.

B. All Materials shall be listed by an OSHA approved Nationally Recognized Testing Laboratory (NRTL).

1.2 Related Sections:

1. 09900 - Painting.
2. 16112 - Raceways and Conduits.

1.3 SUBMITTALS

A. Submit manufacturer's literature and technical data before starting work.

B. Shop Drawings and product data shall give materials, dimensions, finishes, accessories, and installation directions where required.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Boxes and Covers:

1. Hubbell.
2. Steel City.
3. Legrand Wiremold.

2.2 EQUIPMENT

A. Floor Boxes:

1. Boxes:

a. Boxes shall be UL listed.
b. Boxes shall be approximately 4-11/16" square, 2 to 3.5" deep stamped steel box body, flush knockouts on sides and bottom (one 3/4" and one 1" each side), electro-galvanized, and with brass edge ring.

1) Hubbell B-2529.
2) Steel City Series 68, Catalog No.68 D.
3) Legrand Wiremold 880.

c. Tops shall have interior leveling screws to adjust floor plate to meet finished floor conditions.

2. Covers for Duplex Receptacles:

a. Brushed brass with brass screws and 180˚ swing hinged lids, allowing use of either or both receptacles.

1) No flange.

a) Hubbell S3925.
b) Steel City P-60-DS.
c) Legrand Wiremold Series 895.

2) Integral flange at carpeted areas.

a) Hubbell SF3925.
b) Steel City P-60-CACP.
c) Legrand Wiremold Series 895.

b. Locate the 2-hinged lids in a 4 inch diameter brass floor plate. Secure each lid by a special locking screw with a straight slotted head. One half turn of the screw shall release the hinged lid.

3. Covers for Telephone Outlets:

a. Brushed brass with brass screws and 2 separate hinged lids, allowing use of either or both receptacles.

1) No flange.

a) Hubbell S2925.
b) Steel City – P-60-2.
c) Legrand Wiremold Series 896.

2) With integral flange at carpeted areas.

a) Hubbell SF2925.
b) Steel City equivalent.P-60-2
c) Legrand Wiremold Series 896.

b. Provide one plastic split bell nozzle with for each telephone floor box.

4. Covers for AV and Other Outlets: Same as telephone.

B. Gang Boxes: Watertight construction with cast iron body, painted inside and out, 2 or 3 gang boxes, as shown on the drawings, fully adjustable with interior leveling screws for precise adjustment.

1. Hubbell B4233/B4333 Series.
2. Steel City Series 640.
3. Legrand Wiremold Series 880.

C. Concealed Service Floor Box:

1. To deliver both power and communications without exposed service fittings housing.
2. Underfloor box shall be galvanized No.14 steel, approximately 8.5 to 13.2 inches long, 5 to 6.5 inches wide, 2 to 4 inches deep, with slot-head screws at each corner through a leveling plate welded to the bottom of the box. Box to house 1 duplex 20A, 120 volt, grounded, mounted on a slanted face place at one end, leaving ample space (±60 cubic inches) for communication connections.

    a. Hubbell 3-SFBSS.
    b. Steel City 664-SC.
    c. Legrand Wiremold RFB-2.

3. Box shall be covered with a hinged floor plate, level with the finished floor. Concealed service top shall include the floor flange and the hinged floor plate reinforced with a 5/32" plate. The floor plate to accept a piece of flooring material selected for the space by the A/E. Include a retractable exit port for power cords and communication cables.

PART 3 EXECUTION

3.1 INSTALLATION

A. Floor boxes shall be installed with top ring flush with concrete floor. Floor box shall be leveled after concrete has hardened by means of interior leveling screws.

B. Location: Coordinate placement with furnishings, built-in counters and equipment. Locate outlets to minimize interference with furniture and foot placement.

END OF SECTION

16140
WIRING DEVICES

PART 1 GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, equipment and services necessary to complete the Wiring Devices work, as indicated on the drawings, and as specified herein.

B. All Materials shall be listed by an OSHA approved Nationally Recognized Testing Laboratory (NRTL).

C. Related Sections:

1. 01043 - Mechanical and Electrical General Requirements.
2. Division 16 - Electrical.

1.2 SUBMITTALS

A. Submit properly identified manufacturer's literature and data before starting work.

1.3 QUALITY ASSURANCE

A. Comply with Florida Building Code (FBC).

B. Comply with Florida Department of Education, State Requirements for Educational Facilities - (SREF) and the following:

1. Convenience outlets installed in toilet rooms, wet locations and within 6 feet of water supplies shall have a ground fault circuit interrupt (GFI) protection device.
2. Outdoor outlets shall be weather proof outdoor GFI.
3. Use of isolated ground receptacles is prohibited.
4. Outlets, switches, and boxes located adjacent to cooling towers, or in other corrosive environments, shall be rated NEMA 4X.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Wiring devices shall be as manufactured by Hubbell, Leviton or Pass and Seymour.

2.2 COMPONENTS

A. Wiring Devices: Comply with NEMA WD6 and NEC (NFPA 70).

1. Switches:

a. Rated at 20 amps, 120/277 volts AC, horsepower rated for 1HP at 120 volts.
b. Provide for back (not push-in) or side wiring.
c. Key-type switches shall all be keyed alike.

d. Flammable Storage Rooms: Use explosion proof switches.
e. Manufacturers: Hubbell CSB 120 Series or accepted equivalent by Leviton, or Pass and Seymour.

2. Duplex Convenience Receptacles:

a. Comply with NEMA 5-20R as applicable, be of specification grade, back (not push-in) and side wired, U-slotted grounding type, 3-wire, rated 20 amp, l25 volts AC.
b. Double Duplex: Consist of 2 receptacles under a common plate. Single receptacles shall be similar to duplex receptacles.
c. Manufacturers: Hubbell CR20 or accepted equivalent by Leviton, or Pass and Seymour.

3. Ground Fault Receptacles:

a. NEMA 5-20R type, rated at 20 amps, 120 volts with 5 $\pm$ 1 mA trip threshold, and UL nominal trip time of 0.025 sec.
b. Manufacturers:

1) Hubbell GF20, feed thru type, or accepted equivalent by Leviton or Pass and Seymour.

4. Special Purposes Receptacles:

a. Comply with NEMA 5-20R, of specification grade, back (not push-in) or side wired.
b. Provide ratings and type as indicated on Drawings.

5. Wiring devices shall be white color unless noted otherwise.

B. Cover Plates:

1. Impact resistant nylon, by Hubbell or Leviton. Color shall match switch or receptacle unless otherwise selected by A/E. Plate design shall be smooth without ornamentation.

2. Cover plates shall be listed by an OSHA approved NRTL, and meet the following minimum requirements:

a. Metallic Outlet Boxes: UL 514A.
b. Non-metallic Outlet Boxes: UL 514C.

3. Switches or receptacles in kitchens shall have brushed stainless steel plates.
4. Provide ganged switches to a maximum of three. If more are required on Drawings, provide in multiples of two or three.
5. Provide weatherproof receptacles with cast aluminum, spring loaded dock-type gasketed wet location cover.

PART 3 EXECUTION

3.1 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.

3.2 INSTALLATION

A. Install wiring devices according to manufacturer's recommendations.

B. Verify location of wiring devices before rough-in of outlet boxes and conduit with Architectural Drawings for door swings and furniture details. Duplex receptacles in finished areas shall be vertically mounted.

C. Boxes mounted back-to-back are not allowed.

D. Install devices tightly within box with screws provided. Do not rely upon plate for device alignment and support to assure devices are grounded to box. In receptacles, use self-grounding screws, separate ground conductor or bond wire to box.

END OF SECTION

16402
ELECTRICAL SITE UTILITIES

PART 1 GENERAL

1.1 WORK INCLUDED:

A. Section Includes: Electrical site utilities and coordination of requirements with the utility company and service specifications.

B. Provide all labor, materials, equipment and services necessary to complete the conduits, fittings and support work, as indicated on the drawings, and as specified herein.

C. All materials provided under this section shall be listed by an OSHA approved Nationally Recognized Testing Laboratory (NRTL).

D. RELATED SECTIONS

1. 02221 - Excavating, Backfilling, and Compaction for Utilities.
2. 03300 - Cast-In-Place Concrete.

1.2 SUBMITTALS

A. Submit manufacturer's product data including materials, finishes, accessories, and installation instructions, as required.

B. Dimensioned drawings of manholes and handholes/pull boxes.

C. Specification sheets including splice prints of primary cable.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Precast Concrete Manholes and Handholes/Pull boxes

1. Brooks Products, El Monte, CA or accepted equivalent.

B. Precast Polymer Concrete Manholes and Handholes/Pull boxes.

1. Quazite by Strongwell, Lenoir City, TN or accepted equivalent.

2.2 EQUIPMENT

A. Manholes (for Electrical Utilities):

1. Manholes shall be constructed approximately where shown. The exact location of each manhole shall be determined after careful consideration has been given to the location of other utilities, grading and paving. Manholes in corridors or pedestrian traffic areas are not allowed.

2. The location of each manhole shall be approved by the A/E before construction of the manhole is started.
3. Manholes shall be the type noted on the layout drawings and shall be constructed according to the applicable details as indicated.

    a. Top, walls, and bottom shall consist of reinforced concrete.
    b. Walls and bottom shall be of monolithic construction.
    c. Concrete shall be Class B or 2,500 psi at 28 days.
    d. Concrete, forms, mixing, pouring, and reinforcing steel shall comply with applicable Division 3 sections.

4. At locations not exposed to vehicular traffic, the Contractor may, at his option, use precast concrete or precast polymer concrete manholes having the required strength and inside dimensions.

    a. Precast Polymer Concrete Products:

        1) Provide standard cover logos and colors as selected by A/E.

5. Frames and Covers:

    a. Gray cast iron construction.
    b. A machine-finished seat shall be provided to insure a perfect joint between the frame and cover.
    c. Frames and covers shall be delivered on the job unpainted and, after inspection and approval by the A/E, shall be given 2 coats of asphalt paint.
    d. In paved areas, the top of manhole covers shall be flush with the finished surface of the paving.
    e. In unpaved areas, the top of manhole covers shall be approximately 1/2" above the finished grade.
    f. Where existing grades are higher than finished grades, a sufficient number of courses of brick shall be installed between the top of manhole and manhole frame to elevate temporarily the manhole cover to existing grade level.
    g. Where duct lines enter manholes, the sections of duct may be either cast in the concrete or may enter the manhole through a rectangular window opening of suitable dimensions provided in the manhole walls.
    h. Where openings are provided for entrance of duct lines, the space between ducts and between ducts and manhole walls shall be caulked tight with lead wool or equivalent.
    i. A cast metal grille-type sump frame and cover shall be installed over the manhole sump.
    j. A cable-pulling iron shall be installed in the wall opposite each duct line entrance.

6. Cables:

    a. Support on walls by hot dip galvanized cable racks equipped with adjustable hooks and insulators.
    b. Cable racks shall be installed in each manhole.
    c. Not less than 2 spare hooks shall be installed on each cable rack.
    d. Insulators shall be made of best-quality, high-glazed porcelain.
    e. Insulators are not required on spare hooks.

B. Ground Rods:

1. In each manhole, at a convenient point close to the wall, a 3/4" by 10-foot copper clad steel ground rod shall be driven into the earth before the floor is poured with approximately 4 inches of the ground rod extending above the manhole floor.

    a. When precast-concrete manholes are used, the top of the ground rod may be below the floor and a No.1/0 AWG tinned copper ground conductor brought into the manhole through a watertight sleeve in the manhole wall.
    b. All non-current carrying metal items within the manhole shall be bonded to the ground rod.
    c. When non-metalic manholes are used, ground rods are not required.

2. Exterior of concrete manholes shall receive 2 coats of 220 Fibrated Emulsion by Karnak Chemical Corp., Monsey Products Co., Monsey Asphalt Emulsion Roof Coating Fiber, or Sonneborn Building Products, Hydrocide 700B.

C. Ducts:

1. Underground ducts of the sizes indicated on the drawings shall consist of a number of individual PVC or steel ducts:

    a. Unprotected feeder conductor raceways before the service(s) disconnect shall be encased in a reinforced concrete envelope with a minimum depth of 24 inches between finished grade and top of the concrete envelope.
    b. Protected service conductor raceways past the main disconnect may be direct buried if at least 24 inches below grade.

2. Plastic conduit shall be single bore and shall be Schedule 40 polyvinyl-chloride conduit conforming to NEMA TC 2. Conduit fittings shall comply with the applicable NEMA Standards, except if NEMA standards for conduit fittings do not exist for the type of plastic installed, fittings shall be as recommended by the conduit manufacturer.

3. Conduit and Fittings:

    a. Free, within commercial tolerances, of objectionable lines, striations, bubbles, welds and other manufacturing defects that would impair the service of the conduit.
    b. The bore of the conduit shall be straight and circular in cross section with smooth interior surfaces free from obstructions and rough and flaky areas.
    c. The conduit and fittings shall be free of all substances that could damage wire or cable covering used on rubber-covered wire, polyethylene-sheathed or polyvinyl-chloride-sheathed cable.
    d. The conduit and fittings shall be corrosion-resistant and not adversely affected by acids, alkalies, salts, bacteria, and other organic matter that would normally be encountered in the ground.
    e. The conduit length for each size shall be the length that is standard with the manufacturer with a permissible tolerance of 1/4" per 10-foot length.
    f. Bends, elbows and other fittings shall be capable of freely passing a ball that is 1/4" less in diameter that the nominal bore of the conduit.

g. Fittings shall be of a type especially made for use with plastic conduit for electrical service.
h. Conduit and fittings shall be capable of being joined by means of a solvent-welding cement to provide a watertight and root-proof joint.

4. Provide No.12 AWG galvanized iron drag wire in empty power and signal ducts.
5. Steel ducts shall be Schedule 40 hot dip galvanized rigid steel conduit.

D. Underground Concrete Pull Boxes:

1. Concrete pull boxes, with sizes as shown on drawings, can be either precast concrete or precast polymer concrete manholes having the required strength and inside dimensions.
2. Boxes shall be provided with vehicular traffic covers. Covers shall have 1/2" hex bolts at 2 places to bolt cover to pull box walls.
3. Install boxes plumb and level with final grade. Do not install boxes in walkways.
4. Boxes shall be accessible and only for the use intended. Do not mix power and communication cables in the same box or normal power with emergency power unless system cables are completely isolated in a manner compliant with NEC.
5. Boxes shall be installed in locations to not allow more than 200 feet of cable pulling. Provide ground rods where shown on drawings.

PART 3 EXECUTION

3.1 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.

3.2 INSTALLATION

A. Duct lines shall be laid to a minimum grade of 4 inches per 100 feet.

B. Grade may be away from buildings, from one manhole to the next or both ways from a high point between manholes, depending on the contour of the finished grade. Low points that may trap water are not acceptable.

C. Duct lines shall be installed with the top of conduits or concrete in encased duct lines not less than 24 inches below finished grade or finished paving at any point.

1. 3-inch minimum concrete cover on all sides and 2-1/2" minimum clear separation between power conduits.
2. 3-inch minimum separation between power conduits and signal conduits in the same concrete encasement.

D. 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 used at the ends of the run.

1. The long sweep bends may be made up of one or combinations of curved or straight sections.

2. Manufactured bends shall have a minimum radius of 18 inches for use with ducts of less than 3 inches in diameter and a minimum radius of 36 inches for ducts of 3 inches in diameter and larger.

E. Conduits shall terminate in end bells where duct lines enter manholes.

F. Conduit shall be thoroughly cleaned before using or laying.

G. During construction and after the duct line is completed, the ends of the conduits shall be plugged to prevent water washing mud into the conduits or manholes.

H. Keep the conduits clean of concrete, dirt and any other substance during construction.

I. After the duct line has been completed, a standard flexible mandrel not less than 12 inches long, having a diameter approximately 1/4" less than the inside diameter of the conduit, shall be pulled through each conduit. After mandrel pull, a brush with stiff bristles shall be pulled through each conduit to remove particles of earth, sand or gravel from the line.

J. Pneumatic rodding may be used to draw in the lead wire.

K. Where connection is made to an existing duct that is of different material and shape that the duct line being installed, a suitable coupling of a type recommended by the duct manufacturer shall be used.

L. Conduits shall be stored to avoid warping or deterioration. Plastic conduit shall be stored on a flat surface and protected from the direct rays of the sun.

M. Conduit joints in concrete encasement may be placed side-by-side horizontally but shall be staggered at least 6 inches vertically.

N. At locations where transition couplings between different types of conduits are installed and either run of conduit is concrete encased, unless otherwise shown on the drawings or required, the encasement shall include the conduit joint plus a 30 inch extension of the encasement behind the conduit joint measured along the centerline of the conduit unless the 30 inch extension carries to a point more than 8 inches above grade level in which case the encasement may be terminated at the 8 inch level.

O. Each single conduit of the duct bank shall be completely encased in concrete as indicated.

1. The thickness of concrete encasement indicated is the minimum thickness, and may be increased to fit the actual shape of the trench.
2. Separators or spacing blocks shall be made of steel, concrete, plastic, or a combination of these materials placed on not greater than 5-foot centers. Wood spacers are not acceptable.
3. Ducts shall be securely tied down and anchored to prevent movement during the placement of concrete.

P. Installation of Couplings:

1. Joints in conduit shall be made up according to the manufacturer's recommendations for the particular conduit and coupling selected.

2. Without specific recommendations, the various types of conduit joint couplings shall be made watertight.

Q. Plastic conduit joints shall be made by brushing a plastic solvent cement inside the plastic coupling fitting and outside the conduit ends.

1. The conduit and fitting shall then be slipped together, until seated, with a slight twist to set the joint tightly, and the conduit then rotated one-half turn to distribute the cement evenly.
2. Excess cement built up on the inside surface of the conduit shall then be removed.

R. Ends of ducts entering through concrete foundation walls, manholes, concrete pads, and at the duct bank termination points shall be of rigid steel conduit for a minimum of 10 feet in length. Connections between duct line conduits and steel conduits shall be made with approved couplings. At ends of cable carrying ducts shall be adequately sealed against water entry. Provide end bells on conduit entries into manholes and walls as specified under manholes.

S. Duct openings in manholes shall have extended reinforcing rods and shall be keyed-in reinforcing rods of duct bank.

T. Steel reinforcing rods shall be installed during construction of the duct bank.

U. Spare conduits shall be capped inside building wall. Spare ducts shall be plugged with plastic duct plugs in all manholes.

V. A No.6 bare stranded copper ground conductor shall be laid in concrete. It shall be continuous in duct work and through manholes and shall be attached to ground rods in each manhole.

W. Where primary cable is installed inside buildings it shall be run in Schedule 40 rigid galvanized steel conduit marked "High Voltage", 10 feet on centers along the conduit. Steel conduit shall be grounded.

X. Bond all metal underground pull box covers.

END OF SECTION

16430
METERING AND SUB-METERING

PART 1 GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, equipment and services necessary to complete the Distribution Panelboards work, as indicated on the drawings, and as specified herein.

B. All materials shall be listed by an OSHA approved Nationally Recognized Testing Laboratory (NRTL).

1.2 RELATED SECTIONS:

1. 16112 - Raceways and Conduit.
2. 16120 - Wire and Cable.

1.3 QUALITY ASSURANCE

A. Coordinate requirements for metering with local utility company. In addition to the monitoring meter installed in the switchboard, sub-meters may be required and shall be installed where indicated on the Drawings and as requested in other sections of THE CITY Specifications.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Monitoring Sub-Meters: Smart KWH meter in weatherproof enclosure, by EKM Metering of Santa Cruz, CA, or other A/E approved equivalent, of the type and characteristics of the load being monitored.

PART 3 EXECUTION

3.1 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.

3.2 INSTALLATION

A. Install conduit and meter as directed and required by utility company for connection to meter.

B. Meter Can: Provided by Contractor.

C. Sub-meter to be installed per manufacturer's instructions, semi-permanent to be reused in other areas.

END OF SECTION

16440
DISCONNECT SWITCHES

PART 1 GENERAL

1.1 WORK INCLUDED:

A. Provide all labor, materials, equipment and services necessary to complete the Disconnect Switches work, and as indicated on the drawings, and as specified herein.

B. All Materials provided under this section shall be listed by an OSHA approved Nationally Recognized Testing Laboratory (NRTL).

C. RELATED SECTIONS

1. 09900 - Painting.
2. 16475 - Overcurrent Protective Devices

1.2 SYSTEM DESCRIPTION

A. Performance Requirements: Label for "SERVICE ENTRANCE" where so applied.

1.3 SUBMITTALS

A. Submit manufacturer's literature and technical data as required.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Disconnect Switches:

1. G.E.
2. Siemens.
3. Square D.

2.2 EQUIPMENT

A. Disconnect switches shall comply NEMA KSI for type HD and shall be of heavy duty type, enclosed, of quick-make, quick-break construction. Rating shall be as indicated on drawings. Switches shall be horsepower and I2t rated.

B. Disconnect Switch Enclosure:

1. NEMA 1 for indoor use.
2. NEMA 3R for outdoor use.
3. NEMA 4X for use in kitchens and exterior corrosive environments like cooling tower locations.

C. Disconnect switch operating handle shall be of insulated box mounted type that directly drives switch mechanism suitable for padlocking in "OFF" position.

D. Defeatable, front accessible, "coin-proof" interlocks shall be provided to prevent opening of cover when switch is in "ON" position and prevent turning switch ON when door is open. Securely fastened metallic nameplate shall include highly visible "ON-OFF" indication.

E. Motor Disconnect Means: Provide each motor with an in-sight disconnect means, when required by NEC, and where shown on the drawings.

F. Provide fuses for disconnect switches so indicated. Fuses shall be dual element type as specified in Section 16475 - Overcurrent Protective Devices.

PART 3 EXECUTION

3.1 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.

3.2 INSTALLATION

A. Install the disconnect switches vertically with top not more than 6 feet above the floor, and rigidly and securely attached to the building. Disconnect switches shall not depend upon conduit for support.

B. Where used as service entrance main disconnects, switches shall be permanently labeled "MAIN SWITCH 1 of 4", "MAIN SWITCH 2 of 4", etc.

C. Mountings:

1. Plywood Panel: Mount panelboards on backboard of 3/4" exterior grade plywood, finished one side, primed all surfaces, painted with two coats gray of fire retardant paint on all sides (front, back and all edges) and secure to wall with approved shields or screws as directed by the A/E.
2. Unistrut: Mount disconnect switches on Unistrut P-3000 mounting channels at top and bottom, secured similarly to wall.

D. Label switch covers in 1-inch high stenciled letters showing equipment served.

END OF SECTION

16450
GROUNDING

PART 1 GENERAL

1.1 SUMMARY

A. Related Work:

1. 16120 - Wire and Cable.
2. 16112 – Conduits, Fittings and Supports.
3. 16470 – Panelboards.

1.2 SYSTEM DESCRIPTION

A. All materials shall be tested and listed by an OSHA approved Nationally Recognized Testing Laboratory (NRTL).

1.3 SUBMITTALS

A. Submit manufacturer's literature giving materials, finishes, accessories, and installations where required.

B. Ground resistance tests.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Install a complete grounding system installation shall comply with Article 250 NFPA 70 Latest Edition of the National Electrical Code-(NEC).

B. Coordination: Arrange with Plumbing Contractor to have the main metallic water line accessible for ground connection at point entrance to the building. The metallic water line shall be buried and have at least 20 feet in contact with earth.

C. Maximum resistance to ground shall not exceed 5 ohms. Provide written report of acceptance test and performance verification to the A/E and the City of Miami.

1.5 SUBMITTALS

A. Submit shop drawings and product data under provisions of Sections 01330, “Submittals”.

1.6 TESTS

A. Submit under provisions of Section 01452, “Testing and Inspecting Services”.

B. Measure ground grid resistance with a Megger ground resistance tester, and install additional ground rods and conductors as required until resistance to ground does not exceed 5 ohms.

1. Testing and recording of results shall be by the Electrical Contractor in the presence of the A/E or his authorized agent.

2. Conduct test after the complete system has been fully grounded and under provisions of the latest editions of the N.E.C. and I.E.E.E. standard 142 recommended practice.

PART 2 PRODUCTS

2.1 EQUIPMENT

A. Grounding System.

1. Grounding system shall comply with ANSI C33.8, IEEE-81.
2. The electrical system and equipment shall be grounded according to the requirements of the NEC and as specified herewith.
3. The grounding conductor shall be an insulated copper wire of size indicated on drawings and following requirement of the NEC.
4. Where not indicated, the conductor shall be according to the requirements of the NEC except that minimum size shall be No.8 copper for system ground.
5. Inaccessible connections shall be made with the exothermic welding process using equipment manufactured by Burndy or Erico Products.
6. Accessible connections shall be made with multiple bolt silicon bronze connectors specifically designed and accepted for the connection to be made.
7. Connectors shall be as manufactured by Burndy or O.Z. Electric.
8. Grounding jumpers shall be provided across metal parts separated by non-conducting materials, such as conduits with expansion joints or when joined, so there is a high resistance at the joint connections.
9. Grounding electrical conductors shall not be buried directly in concrete. Provide a conduit sleeve where each cable passes through concrete. If buried in earth, they shall be tinned.
10. Grounding for the lightning protection system shall be as specified under "LIGHTNING PROTECTION SYSTEM" and as shown on the drawings. Lightning protection system shall be connected to the building grounding system as required by NEC article 250.
11. Refer to electrical drawings for additional grounding requirements.

B. Grounding Source:

1. Grounding electrical system shall comply with NEC Article 250. All the grounding electrodes shall be bonded together.
2. Ground sources shall be connected to the 4" wide x 1/4" thick of necessary length (length to be determined by the number of ground terminals to be connected to the bus). Ground copper bus shall be mounted on insulating standoff on the switchgear room wall. Ground bus shall be complete with lugs for connecting grounding cables. Maximum resistance to ground shall be limited to 5 ohms. Additional ground rods shall be driven if required to maintain this level.
3. Maximum ground resistance to each of individual rods shall be 25 ohms or less.
4. Submit test results to the A/E and the City of Miami for acceptance indicating that these values have been met, using the fall of potential method as directed in IEEE latest Standards.

C. System Grounds: Neutral bus and ground bus in switchgear shall be connected by means of an accepted bus link.

D. Ground Rods: Copper clad steel not less than 3/4" in diameter, 10 feet long, driven full length into the earth.

E. Cold Water Pipe:

1. Connection to cold water pipe shall be made by a suitable ground clamp.
2. If flanged pipes are encountered, connections shall be made with the lug bolted to the street side of the flange connection.

F. Parts to be Grounded: Switchgear frame, panelboard frames, fittings, fixtures and devices, cable sheaths, neutral of transformers, boxes and raceways, motor frames, outdoor lighting poles, emergency generator set, non-current carrying parts of appliances and devices, and all other parts and equipment as required by NEC. Neutral wire shall never be used as grounding means.

G. Conductor: Grounding cable shall be green insulated copper stranded cable, soft drawn or annealed, sized as indicated on drawings, from the main switchboard to each panel, power outlet, or load, except as specified for lighting branch circuits.

PART 3 EXECUTION

3.1 POWER SYSTEM GROUNDING

A. Supplement the grounded neutral of the secondary distribution system by an equipment grounding system. Arrange the equipment grounding system so that all non-current carrying items in close proximity with electrical circuits are maintained continuously at ground potential and provided with a low impedance path for ground fault currents. The system shall comply with the National Electric Code Article 250, modified as indicated and as specified.

B. The basic grounding system utilize reinforcing bars in the footings of the building supplemented by two (2) ground rods in the Main Electrical Room and a connection to a cold-water pipe, where required to meet the test requirements specified.

C. Provide a green insulated copper ground conductor, in conduit, as shown to the main metallic water service entrance and connect to the supply side of same by means of ground clamps. The conduit shall be bonded to the ground conductor at each end. The use of PVC conduit for the green insulated copper ground conductor is acceptable only within the Main Electrical Room.

D. Low voltage system neutrals: grounded at the related transformers to the feeder ground and to the nearest cold-water line all in accordance with the National Electric Code requirements in Article 250.

3.2 COMMUNICATION GROUNDING

A. Voice/Data:
1. Provide one (1) #6 from main ground bus to ground bus on telephone equipment board.

B. Fire Alarm and Detection:

1. Provide one (1) #8 to nearest ground bus.
2. Provide equipment ground through entire system.

3.3 INSTALLATION

A. Install grounding system as shown on drawings and as required by the latest edition of the NEC Article 250.

B. Connections to equipment, bus, or conduit shall be made with approved type of solderless connector and shall be thoroughly cleaned and made bright before connection is made to insure metal contact.

C. Connections inaccessible after completion of project shall be made by exothermic weld process.

D. The grounding medium for lighting branch circuits shall be the conduit system.

1. Ground the lighting fixture by means of a conductor between the outlet box and the fixture.
2. Locknut connections to cabinets, pull boxes, junction boxes, etc., shall be drawn up sufficiently tight to ensure a continuous metal-to-metal bond, where a separate ground conductor is not provided.
3. Where GFCI type receptacles are indicated, provide a separate ground conductor directly from the panelboard.

E. Bond conduits stubbing under switchboard, motor control center, and similar locations using bonding bushings.

F. Do not use flexible conduit as a grounding medium. Provide a bonding wire in flexible conduits and connect to the boxes at each end in an approved manner. Bonding conductor in flexible conduit runs to connect low voltage control and monitoring devices is not required.

G. Unless otherwise indicated, provide an equipment grounding conductor in each feeder conductor. For parallel runs, provide a ground conductor in each parallel conduit run.

H. Bond to ground all metal underground pull box covers.

I. End-to-End Luminaires: continuously bonded.

J. Grounding contacts of receptacles shall be connected to a system-grounding conductor (not the system neutral) by a stranded copper wire not smaller than #12 AWG. The resistance between the contacts and solid earth ground shall not exceed 3 ohms.

K. Bond all metal parts. Make equipment and bus connections with suitable lugs or clamps. Cadweld all wire-to-ground rod joints. Cadweld all wire-to-wire joints #1/0 AWG or larger.

L. Bond all conduits stubbing under switchboards, transformer and similar locations using bonding bushings.

M. Provide a bond wire in all flexible metal conduits and connect to the boxes at each end in an approved manner.

N. Use PVC for outdoor applications for sleeving grounding electrode conductors, except that where sleeves are subject to damage, use rigid metal conduit bonded at both ends.

O. The TV antenna ground wire shall be connected to the main grounding system.

P. Paint buried joints with red glyptal.

Q. Ground all transformer secondaries under provisions of NEC-250 unless shown otherwise on the drawings.

R. Light Poles: Provide a ground rod driven near pole bases and cadweld a #8 wire to the top of the rod and extend the wire to a grounding lug in the base and bond to all metal parts.

END OF SECTION

16460
DRY-TYPE TRANSFORMERS

PART 1 GENERAL

1.1 SUMMARY

A. Provide a complete Dry-type Transformer System as indicated on the drawings, and as specified herein.

1.2 Related Work:

1. 16120 - Wires and Cables.
2. 16450 - Grounding.
3. 16112 - Raceways and Conduits

1.3 REFERENCES

A. Florida Building Code (FBC).

B. National Fire Protection Association, Inc. (NFPA):

1. NFPA 70 - National Electric Code (NEC)

C. Underwriters Laboratories (UL), latest edition or other OSHA approved Nationally Recognized Testing Laboratory (NRTL).

1. UL 1561 - Dry-Type General Purpose and Power Transformers
2. UL 506 - Safety for Specialty Transformers

D. National Electrical Manufacturers Association:

1. NEMA ST-20 - Dry Type Transformers for General Applications
2. NEMA ST-1 - Specialty Transformers
3. NEMA TP-1 - NEMA Standard for Defining the Energy Efficiency Performance of Transformers
4. NEMA TP-2 - NEMA Standard for Testing Procedures for Meeting the Requirements of TP-1.

E. Institute of Electrical and Electronics Engineers:

1. IEEE C2 - National Electrical Safety Code

1.4 SYSTEM DESCRIPTION

A. All materials shall be tested and listed by an OSHA approved Nationally Recognized Testing Laboratory (NRTL).

1.5 SUBMITTALS

A. Submit manufacturer's catalog cuts and technical data before starting work.

B. Submit test data for transformers as requested.

C. Submit shop drawings and product data under provisions of Section 01330,”Submittals”.

1.6 QUALITY ASSURANCE

A. Dry type transformer installation shall comply with NFPA 70.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Dry Type Transformers:

1. General Electric Corp.
2. Siemens.
3. Square D.
4. Eaton Corp.

2.2 EQUIPMENT

A. Rating:

1. Transformers 15KVA and larger shall be ventilated dry type, 3 phase, 60 Hertz, 480 volts delta primary and 208Y/120 volts secondary, with four 2-1/2 percent FCBN taps and two 2-1/2 percent FCAN taps. KVA rating shall be as shown on drawings.
2. Transformer insulation shall be Class "H", 220 degrees Centigrade insulation systems and shall be rated for operation (150 degrees C. rise above 40 degrees C. ambient). Insulating materials shall be according to NEMA ST20 standards.
3. Transformer sound level shall not exceed following values when measured according to ANSI C89.2:

    a. 0 to 5 KVA-40 db.
    b. 6 to 25 KVA-45 db.
    c. 26 to 150 KVA-50 db
    d. 151 to 225 KVA-55 db
    e. 226 to 300 KVA-55 db
    f. 301 to 500 KVA-60 db.

4. Transformers shall be low loss type with minimum efficiencies per NEMA TP-1 when operated at 35% of full load capacity. Efficiency shall be tested in accordance with NEMA TP-2.

2.3 DESIGN AND CONSTRUCTION

A. Core and coil assembly shall be vacuum impregnated for maximum resistance to moisture and shall be mounted on vibration isolation pads.

1. Transformers shall be provided with a drip-proof, rodent-proof, enclosure having a durable finish and a rustproof diagrammatic nameplate.
2. Wiring compartments shall have adequate space for terminating cables and shall be front connected for easy accessibility.
3. Where transformers are exposed to the weather, provide weather shields.

B. Core of the transformer shall be of high quality, cold-rolled, grain-oriented steel, annealed by manufacturer for low loss and exiting current.

1. Laminations shall be formed to eliminate burrs and annealed to reduce losses to a minimum.
2. Winding conductors shall be annealed and insulated by transformer manufacturer.
3. Transformer coils shall be of the continuous wound construction and shall be impregnated with non-hydroscopic thermosetting varnish.
4. All cores shall be constructed with low hysteresis and eddy current losses. Magnetic flux densities shall be kept well below the saturation point to prevent core overheating. Cores for transformers greater than 500kVA shall be clamped utilizing insulated bolts through the core laminations to ensure proper pressure throughout the length of the core. The completed core and coil shall be bolted to the base of the enclosure but isolated by means of rubber vibration-absorbing mounts. There shall be no metal-to-metal contact between the core and coil and the enclosure except for a flexible safety ground strap. Sound isolation systems requiring the complete removal of all fastening devices will not be acceptable.
5. The core of the transformer shall be visibly grounded to the enclosure by means of a flexible grounding conductor sized in accordance with applicable UL and NEC standards.
6. The transformer enclosures shall be ventilated and be fabricated of heavy gauge, sheet steel construction. The entire enclosure shall be finished utilizing a continuous process consisting of degreasing, cleaning and phosphatizing, followed by electrostatic deposition of polymer polyester powder coating and baking cycle to provide uniform coating of all edges and surfaces. The coating shall be listed by an NRTL for outdoor use.
7. Conductor surfaces shall be free from slivers, burrs, and other irregularities.

C. Primary voltage and connection and secondary voltage and connection: as shown on the schedules. All transformers shall be rated at 60 hertz.

1. Manufacturer shall submit the following test data under provisions of Section 01330 “Submittals”, and Section 01452, “Testing and Inspection Services”.

    a. Indicate loss data, efficiency at 25, 50, 75, and 100 percent rated load, and sound level in decibels.
    b. Percent regulation at 100 percent load, and 80 percent power factor.
    c. No load and full loses in watts.
    d. Impedance and rating.
    e. Manufacturer’s installation instructions. Indicate application conditions and limitations of use stipulated by product testing agency specified under Section 01452 - Testing Services. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

PART 3 EXECUTION

3.1 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.

3.2 INSTALLATION

A. Dry type transformers shall be installed by Contractor in accordance with manufacturer's instructions in rooms assigned for the installation of equipment.

B. Transformer enclosures and secondary neutral shall be securely grounded to a cold water pipe, 3/4" diameter by 10 feet long buried in direct contact with the earth, with a copper conductor sized according to NEC latest edition Article 250.

C. Dry type transformers shall be floor mounted or bracket mounted as shown on drawings. Transformers shall be bolted to floor if floor mounted and shall be bolted to steel angles if bracket mounted, or as shown on drawings. Provide a 3-inch-high concrete pad under floor mounted transformers. Oversize concrete pad so it will be 4 inches all around bigger than the transformer foot print.

D. Transformers shall be vibrationally isolated from the building structure by means of double neoprene pads, in addition to the vibration isolation built into the transformer. Neoprene shall be similar to Mason Industries Type W, 40 durometer minimum or sized for proper weight load.

E. Conduit connections to the equipment shall be made with flexible conduit, loosely installed.

F. Dry type transformers shall be installed with wiring compartment to the front to allow removal.

G. Maintain manufacturers recommended clearance from walls or surfaces to allow adequate ventilation, but in no case shall the transformers be installed less than 6 inches from any wall.

H. Provide grounding and bonding in accordance with Section 16450 “Grounding”.

I. Mount wall-mounted transformers using integral flanges or accessory brackets furnished by the manufacturer.

END OF SECTION

16470
PANELBOARDS

PART 1 GENERAL

1.1 SUMMARY

A. Provide a complete Distribution Panelboard system as indicated on the drawings, and as specified herein.

B. All materials shall be listed by an OSHA approved Nationally Recognized Testing Laboratory (NRTL).

C. Related Sections:

1. 09900 - Painting.
2. 16120 - Wire and Cable.
3. 16475 - Overcurrent Protective Devices.

1.2 SYSTEM DESCRIPTION

A. Panelboards used as service entrance equipment shall be NRTL labeled as service entrance equipment.

1.3 SUBMITTALS

A. Submit shop drawings, manufacturer's literature, and technical data before starting work.

B. All switchboards and panelboards submitted shall be designed and manufactured according to the latest revisions of the following specifications:

1. UL 50, UL 67, UL 89, Ul489, Ul 891, UL 1283, UL 1449
2. Nema AB-1, PB1, PB1.1, PB2, PB2.1 PB 2.2
3. NFPA 70
4. Federal Specifications: W-C-375B, W-P-115C

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Panelboards:

1. General Electric.
2. Siemens.
3. Square D.
4. Eaton Corp.

2.2 EQUIPMENT

A. Distribution and Power Panelboards:

1. Interior: Provide fully rated plated copper bus. Plating shall run the entire length of the bus bar. Solid neutral and ground bar shall be copper. Maximum rating: 1200 amp.
2. Main breaker shall be horizontally mounted. Main breakers shall have conspicuous marking labels.
3. Trims shall have door with keyed lock. All locks shall be keyed the same.
4. Provide directory holder and typed directory for all circuits.
5. Enclosure shall be galvanized galvaneal steel constructed in accordance with UL50 and NEMA 250. Box end walls shall be blank.
6. Short circuit current ratings shall be equal to or greater than available fault current at point of application. NRTL listed series ratings may be utilized, where not in violation of NEC 240.86. Provide documentation of NRTL listed series rating used.
7. Surge Protective Devices (SPD) shall be provided when specified in the design and associated electrical plans, with optional peak surge current of 260kA.
8. Distribution panels for use at 120/208 volts shall ne NRTL listed with minimum integrated assembly rating of 22K AIC.
9. Distribution panelboards, 400 amperes and over, shall be provided with molded case circuit breakers tested and labeled according to UL 489.

B. Lighting, Receptacle and Power Panelboards

1. Interior: Provide fully rated plated copper bus. Plating shall run the entire length of the bus bar. Solid neutral and ground bar to be copper. Maximum rating: 600amp.
2. Main breaker shall be vertically or horizontally located and have conspicuous marking labels.
3. Trims shall have door with keyed lock. All locks to be keyed the same. Provide trims with concealed door hinges and trim screws for panels 600 amps or less.
4. Provide directory holder and typed directory for all circuits.
5. Enclosure shall be galvanized steel constructed in accordance with UL50. Box endwalls shall be blank.
6. Short circuit current ratings shall be equal to or greater than available fault current at point of application. NRTL listed series ratings may be utilized, where not in violation of NEC 240.86. Provide documentation of NRTL listed series rating used.
7. Provide SPD's when specified in the design and associated electrical plans, with optional peak surge current of 100kA.
8. Minimum rating of breakers shall be as follows:

    a. Lighting and power panels for use at 120/208 volts: 225 amp maximum with circuit breakers rated at 10K AIC symmetrical at 240 volts.
    b. Lighting and power panels for use at 480/277 volts: 225 amp maximum with circuit breakers rated at 14K AIC symmetrical at 480 volts.

9. Interiors shall be factory assembled and designed to allow switching and protective devices to be replaced without disturbing adjacent units, without removing the main bus connectors, and allowing circuits to change without machining, drilling or tapping.
10. Branch circuits shall be arranged using double row construction unless narrow column panels are indicated. A nameplate shall be provided listing panel type and ratings. Circuit breakers shall be bolt-on type.
11. Unless otherwise noted, full size insulated neutral bars shall be included. Bus bar taps for panels with single pole branches shall be arranged for sequence phasing of the branch circuit devices. Neutral bussing shall have a suitable lug for each outgoing feeder requiring a neutral connection. A ground bus shall be provided in all panels.

C. Boxes and Trims shall meet the following criteria:

1. Boxes shall be at least 20 inches wide made from code gage galvanized sheet steel.

    a. Provide minimum gutter space according to NEC requirements.
    b. Where feeder cables supplying the mains of a panel are carried through its box to supply other electrical equipment, the box shall be sized to include the additional required wiring space.
    c. At least 4 interior mounting studs with adjustable nuts shall be provided.

2. Switching device handles shall be accessible.

    a. Doors and panelboard trims shall not uncover any live parts.
    b. Doors shall have flush chrome plated handle with cylinder lock and catch, except doors over 48 inches in height shall have auxiliary fasteners top and bottom of door in addition to the flush type cylinder lock and catch.
    c. Panelboard switching devices with individual dead front doors shall be acceptable instead of standard door in trim design.
    d. Panelboard trim clamps shall be of the indicating type.

3. Exterior and interior steel surfaces of the trim shall be properly cleaned, primed with rust inhibiting phosphatic coating, and finished with manufacturer's standard gray paint.

    a. Trims for flush panels shall overlap the box for at least 3/4" all around.
    b. Surface trims shall have the same width and height as the box.
    c. Trims shall be mountable by a screwdriver without the need for special tools.
    d. After installation, trim clamps shall not be accessible when the panel door is closed and locked.

4. Panelboards exposed to the weather shall have NEMA type 3R raintight enclosure or NEMA 4X in corrosive environments.

D. Electrical Components:

1. Main bus bars shall be fully rated copper bus bars, with plating shall running the entire length of the bus bar and shall be sized according to NRTL standards to limit the temperature rise on any current carrying part to a maximum of 50 degrees C. above an ambient of 40 degrees C. maximum. Provide main circuit breakers, main lugs, or sub-feed lugs as required.
2. Each panelboard shall incorporate breakers as shown with AIC or higher, at the application voltage, than the available fault at its location along the electrical distribution system, as determined by the short circuit study. Minimum rating of breakers shall be:

    a. Lighting and power panels for use at 120/208 volts: 225 amp maximum with circuit breakers rated at 10K AIC symmetrical at 240 volts.
    b. Lighting and power panels for use at 480/277 volts: 225 amp maximum with circuit breakers rated at 14K AIC symmetrical at 480 volts.
    c. Distribution panels for use at 120/208 volts: UL listed with minimum integrated assembly rating of 22K AIC.

3. Panels tested and listed according to UL 67 and bearing an integrated short circuit rating shall be determined by the short circuit study on the electrical system with 10,000 AIC minimum.

4. Any 2 single pole circuit breakers shall be replaceable by 1 two-pole circuit breaker and any 3 single-pole breakers shall be replaceable by 1 three-pole circuit breaker.
5. Where new circuit breakers are specified to be installed within existing panelboards, they shall be compatible in terms of manufacture, type, and AIC.
6. Breakers 100 ampere through 400 ampere frame sizes shall be thermal-magnetic trip with inverse time current characteristics, unless otherwise noted.
7. Provide ground fault circuit interrupter circuit breakers where indicated.
8. Emergency Panelboards Identification: Paint door red and stencil in 1 inch high yellow letters "EMERGENCY PANEL" in addition to appropriate individual panel identification as shown on drawings.

PART 3 EXECUTION

3.1 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.

3.2 INSTALLATION

A. Panelboards shall be installed where indicated and with top of cabinet 6'-6" above floor and shall be rigidly and securely attached to building construction and shall not depend upon conduit for support. Allow at least 1/2" air space behind wall mounted panelboards.

B. Install panelboards according to manufacturer's recommended data. Maintain clearances required by the National Electrical Code, with particular attention to working space around panelboards. Maintain clear space above panelboards, coordinate with other trades to avoid placement of panelboards below piping, ductwork, or other foreign appurtenances. Relocate panels at no additional cost should such interferences occur.

C. Supply panelboards with phenolic nameplate 1 inch x 3 inch on exterior of panels and engraved with panel designation and voltage rating. Lighting and power panelboards shall be provided with a clear plastic enclosed typewritten directory inside. Circuit identification shall include load type (lighting, receptacles, etc.) and rooms served.

D. Where flush type panelboards are indicated, provide one 3/4" empty conduit terminated in accessible ceiling above for each 3 spare circuit breakers provided in the panelboard.

E. Install circuit breakers in existing panelboards according to manufacturer's recommendation. Verify tightness of connections including mains. Identify new circuits on the panel directory. If none exists, provide one.

F. Clean and touch up panelboard as required at completion of the project.

G. Support surface mounted panelboards for other than masonry walls, from floor slab secured "Kindorf" or "Unistrut" channels. Mount those installed on masonry walls to back boards secured to walls, and according to manufacturer’s recommendations and applicable codes and regulations. Contractor shall coordinate manufacturer’s actual panelboard dimensions with room clearances to conform with NEC requirements.

END OF SECTION

16475
OVERCURRENT PROTECTIVE DEVICES

PART 1 GENERAL

1.1 SUMMARY

A. Provide a complete system of overcurrent protective devises as indicated on the drawings, and as specified herein.

1.2 Related Sections:

1. 16440 - Disconnect Switches.
2. 16470 - Panelboards.

1.3 SYSTEM DESCRIPTION

A. Performance Requirements: Materials shall be listed by an OSHA approved Nationally Recognized Testing Laboratory (NRTL).

1.4 SUBMITTALS

A. Submit properly identified manufacturer's literature, product data, and technical data before starting work.

1.5 QUALITY ASSURANCE

A. NEMA AB 1 1993 – (National Electrical Manufacturers Association) Molded Case Circuit Breakers and Molded Case Switches.

B. UL 489 – (Underwriters Laboratories Inc.) Molded Case Circuit Breaker Enclosures.

C. UL943 – Standard for Ground Fault Circuit Interrupters.

D. CSA C22.2 No. 5.1 – M91 – (Canadian Standard Association) Molded Case Circuit Breakers.

E. Federal Specification W- C – 375b/GEN – Circuit Breakers, Molded Case; Branch Circuit and Services.

F. National Fire Protection Association NFPA – 70 (National Electric Code).

G. Fuses shall comply with NEMA FUI and ANSI C33.42.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Circuit Breakers:

1. GE.
2. Siemens.
3. Square D.

4. Eaton Corp.

B. Fuses:

1. Bussman Manufacturing.
2. Gould-Shawmut Company.
3. CEFCO.
4. Littelfuse, Inc.

2.2 EQUIPMENT

A. Circuit Breakers:

1. Conform to Federal Specification W-C-375a and NEMA Standard AB-1, unless indicated otherwise.
2. Lugs and terminals: UL approved for copper-aluminum.
3. Accessories: 120 volt.
4. Each circuit breaker shall be provided with a trip unit for each pole with elements providing inverse time delay under overload conditions and instantaneous magnetic trip for short circuit protection, unless indicated as non-automatic. Trip elements shall operate a common trip bar to open all elements.
5. All circuit breakers shall be bolt-on type, consisting of the number of poles and ampere ratings as noted on the drawings.
6. Two and three pole breakers shall be of the common trip type.
7. Circuit breakers shall be a circuit interrupting device operating both manually for normal switching functions and automatically under overload and short circuit conditions, while providing circuit and self-protection when applied in its ratings. Provide at voltage, phase, and amps indicated, with symmetrical amperes interrupting rating to be equal or larger than that shown on drawings. Control and signaling function may be incorporated by use of accessories.
8. Operating mechanism shall be entirely trip-free so contacts cannot be held close against an abnormal over-current or short circuit condition.
9. Operating handle of circuit breaker shall open and close all poles of a multi-pole breaker simultaneously. Circuit breakers shall meet applicable NEMA AB-1 and have UL label.
10. Ampere rating shall be clearly visible. Contacts shall be of non-welding silver alloy. Circuit breakers to be used in switchboards, lighting and power panelboards, distribution panelboards and individually enclosed shall be 1, 2, or 3 poles as indicated on drawings.

B. Molded Case Circuit Breakers Characteristics - General:

1. Circuit Breakers shall be constructed using glass reinforced insulating material. Current carrying components shall be completely isolated from the handle and the accessory mounting area.
2. Circuit breakers shall have an over center, trip free, toggle operating mechanism which will provide quick – make, quick – break contact action.
3. The circuit breaker handle shall reside in a tripped position between on and off to provide local trip indication. Circuit breaker escutcheon shall be clearly marked on and off in addition to providing International I/O markings.
4. The maximum ampere as established by a NRTL, or other certification standards, with applicable voltage systems and corresponding interrupting ratings, shall be clearly marked on face of circuit breaker.

5. Circuit breakers shall be factory sealed with a hologram quality mark and shall have date code on face of circuit breaker.
6. Circuit breaker combinations for series connected interrupting ratings shall be listed by a NRTL as a recognized component combination. Any series rated combination used shall be marked on the end use equipment along with the statement “Caution – Series Rated System _____A Available. Identical Replacement Component Required.”
7. Circuit breakers shall be equipped with NRTL listed electrical accessories as noted on the electrical drawings. Circuit breaker handle accessories shall provide provisions for locking handle in the On and Off position.
8. Circuit breakers shall be NRTL listed for reverse connection without restrictive line and load markings and be suitable for mounting in any position.
9. Molded case circuit breakers shall be bolt-on type, mounted in lighting and power panelboards and individually enclosed units.
10. Molded case circuit breakers shall be quick-make, quick-break action.
11. Molded case circuit breakers for panelboards shall have a short circuit current rating based on the coordination and short circuit study or the following minimum symmetrical ampere interrupting capacities (RMS):

    a. 120 volts: 10,000 SAIC power panelboards (miminum).
    b. 277 volts: 14,000 SAIC lighting panelboards (minimum).
    c. 277/480 volts: Up to 50,000 SAIC distribution panelboards, or as shown on drawings.

12. Each molded case circuit breaker shall have a thermal magnetic trip device, with common tripping for all poles, and with trip ratings as shown on drawings.

C. Electronic Trip Circuit Breakers With Standard Function Trip System 2000 amp maximum

1. Circuit breaker trip system shall be a micro compressor – based true rms sensing design with sensing accuracy through the thirteenth (13^{th}) harmonic. Sensor ampere ratings shall be as indicated on the associated electrical drawings.
2. The integral trip system shall be independent of any external power source and shall contain no less than industrial grade electronic components.
3. The ampere rating of the circuit breaker shall be determined by the combination of an interchangeable rating plug, the sensor size and the long time pickup adjustment on the circuit breaker. The sensor size, rating plug and the adjustment positions shall be clearly marked on the face of the circuit breaker. Circuit breakers shall be listed by a NRTL to carry 80% or 100% (if working as a service entrance main breaker) of their ampere rating continuously as specified or designed on the associated electrical drawings.
4. The following time/ current response adjustments shall be provided. Each adjustment shall have discrete settings and shall be independent of all other adjustments.

    a. Long Time Pickup Instantaneous Pickup
    b. Long Time Delay (Ground Fault Pickup)
    c. Short Time Pickup (Ground Fault Delay (I2t OUT only))
    d. Short Time Delay
    e. Ground Fault Pickup {Service Entrance Main if required or designed.}
    f. Ground Fault Pickup {Service Entrance Main if required or designed.}

5. A means to seal the trip unit adjustments in accordance with NEC Section 240-6(b) shall be provided.

6. Local visual trip indication for overload, short circuit and ground fault trip occurrences shall be provided.
7. Long Time Pickup indication to signal when loading approaches or exceeds the adjusted ampere rating of the circuit breaker shall be provided.
8. Circuit breaker trip system shall be equipped with an externally accessible test port for use with a Universal Test Set. Disassembly of the circuit breaker shall not be required for testing. Test set shall be capable of verifying the operation of all trip functions with or without tripping the circuit breaker.

D. Fuses:

1. Provide rejection fuses for fusible equipment regardless of which trade has furnished such equipment.
2. The time-current characteristic and ratings shall assure positive selective coordination.
3. All fuses: current limiting and have an interrupting capacity of at least 200,000 amperes RMS symmetrical.
4. The time-current characteristics and ratings shall be set in such a way that positive selective coordination is assured.
5. Coordination and current limitation for the protection of each part of the electrical system must be designed around the type and class and manufacturer selected for that type and class.
6. Fuses, 601 amperes and larger, shall comply with UL Class L standard and be Shawmut Form 480 "Amp-Trap" or Bussman "Hi Cap".
7. Fuses, 600 amperes and lower, where applied to general feeder and branch circuit protection, shall comply with UL Class RKl standards and be Shawmut dual element "Amp- Trap" or Bussman "Low Peak" Limitron.
8. Dual element fuses shall have low resistance and relatively low operating temperatures. Fuses shall be provided with thermal protection against damage from poor contact. Fuse shall open when temperature at thermal cutout reaches 280 degrees F., preventing damage to clips and switches before fuse opens. They shall combine high interrupting capacity (200,000 ampere RMS symmetrical) with time delay, holding 500 percent load for a minimum of 10 seconds.
9. Individual motor circuit fuses shall be sized at approximately 150 percent of motor full load current. Fuses, below 600 amperes shall comply with UL Class RK1, time delay, dual element standardsand be Gould-Shawmut "Amp-Trap" or Bussman Type LPN-RK. Fuses 601 amperes and larger, shall comply with UL Class L standards and be Gould-Shawmut Form 480 "Amp-Trap" or Bussman Type KRP-C.
10. Provide 10 percent spares (minimum of three) of each size and type of fuses furnished. Spare fuses shall be placed in a wall-mounted cabinet located in the main electric room.

PART 3 EXECUTION

3.1 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.

3.2 INSTALLATION

A. Install all circuit breakers and fuses where indicated on drawings, where required by NEC or other applicable codes and regulations, and in accordance to manufacturer's

recommendations and accepted submittals. Special attention shall be given to air conditioning equipment.

B. Two and three pole breakers must be true two and three pole breakers.

   1. Do not combine single pole breakers with common handle connection to meet multiple pole breaker requirements.

C. Label circuit breaker enclosures with 1-inch high stenciled letters showing equipment served.

D. Circuit breaker pick-up level and time delay settings shall be adjusted to values indicated on the coordination study.

END OF SECTION

16511
LIGHTING FIXTURES AND LAMPS

PART 1 GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, equipment and services necessary to complete the lighting fixture installation work, and as indicated on the drawings and as specified herein.

B. All materials shall be listed by an OSHA approved National Recognized Testing Laboratory (NRTL).

C. Related Sections:

1. 09200 - Metal Studs, Lath, Suspension Ceiling, Plaster, and Stucco.
2. 16112 - Raceways and Conduits.
3. 16120 - Wire and Cable.

1.2 SYSTEM DESCRIPTION

A. Explosion-proof, shielded, and vapor tight and wet location fixtures shall bear a NRTL label appropriate for the type of application.

1.3 SUBMITTALS

A. Submit, shop drawings, manufacturer's literature and technical product data as required.

B. Shop drawings shall include but not be limited to:

1. Manufacturer's dimensioned scale drawings showing in complete detail the fabrication of all luminaires including finished, metal thickness, fabrication methods, support method, ballasts, sockets type of shielding, reflectors, provisions for re-lamping and all other information to show compliance with the Contract Documents.
2. Submit shop drawings and samples as requested of luminaires for approval before fabrication. Luminaire details may vary slightly from those shown on drawings provided the changes do not adversely affect size of installation, durability of luminaire, luminaire performance or appearance. Submitted samples may be subjected to photometric testing at an independent testing laboratory, refer to Section 01330, “Submittals”.

C. Furnish certified photometric data for every fixture specified.

D. Upon request, a sample of each fixture proposed for every use and specified unit shall be submitted to the A/E for review.

E. Lighting calculations shall comply with Florida Building Code (FBC) and IES minimum foot-candle level when required.

1.4 QUALITY ASSURANCE

A. Materials, equipment and appurtenances as well as workmanship provided under this section shall conform to the highest commercial standard and as specified and as indicated on drawings. Luminaire parts and components not specifically identified or indicated: made of materials most appropriate for their use or function and as such resistant to corrosion, thermal, and mechanical stresses encountered in the normal application and functioning of the luminaires.

B. All cast parts, including die-cast members: of uniform quality, free from blow holes, pores, hard spots, shrinkage defects, cracks or other imperfections that affect strength and appearance, or are indicative of inferior metals or alloys. Exterior surfaces, which do not otherwise receive a finishing coating: machined, sanded or similarly treated areas, such as extruded metal parts. All such finished castings: given a minimum of one coat of baked-on clear methacrylate lacquer unless a painted finish is specified.

C. Comply with Florida Building Code (FBC).

D. Luminaries and components shall be built under provisions of the N.E.C.

PART 2 PRODUCTS

2.1 EQUIPMENT

A. Fixtures in student occupied areas and where food is prepared or consumed, shall be provided with solid lenses. Exposed lamps of any type are not allowed in these areas.

B. Surface mounted fixtures in student areas or outdoors shall be vandal resistant, with 10-year lens warranty. Fixture bases shall be metal and fastened to mounting locations with metal components.

C. Exterior fixture shall be of aluminum or plastic construction.

D. Lighting Fixtures:

1. Provide lighting fixtures as indicated on the drawings and as specified.
2. The schedule and details of lighting fixtures, appearing on the drawings, indicate the type, construction, appearance, quality and performance of the fixtures required.

    a. Any proposed deviation from the fixtures specified requires the proposed substitute product be listed in the latest FPL Commercial/Industrial Lighting Approved Products.
    b. Any proposed deviation from the fixtures specified shall equal or be superior to the item specified under these headings.
    c. Proposed substitute lighting fixtures will be judged on overall quality on construction.
    d. Provide 120V working sample of proposed substitution with cord, plug, and lamp.
    e. The fixture manufacturers products scheduled are considered acceptable, based on the equivalency of individual units as determined by the A/E.

3. Materials used in the manufacture of fixtures shall be new and the best of their respective kind, and shall be formed and assembled in a neat, accurate, and professional manner.

    a. Sheet metal shall be of sufficient thickness or shall be ribbed, flanged, or otherwise reinforced so that lighting fixtures and their component parts will withstand the stresses of normal handling and installation and service without undue distortion of shape.
    b. Plastering or other installation procedures shall not be relied on to reinforce lighting fixtures or their component parts.
    c. Fixture bases shall be metal and fastened to mounting location with metal components.

4. Fixtures shall be complete with canopies, suspensions of proper lengths, hickeys, casing, sockets, holders, reflectors, hardware, and shall be completely wired and assembled. Each troffers shall have 2 earthquake clips minimum, positive enclosed spring loaded catches, and safety hinges.
5. Furnish suitable plaster rings or plaster stops for fixtures set in plaster ceilings. Consult the "Finish Schedules" on drawings for locations and extent of plaster ceilings. Coordinate the mounting methods of recessed fluorescent lighting fixtures with ceiling suspension system and ceiling trades.

6. Lamp Holders

    a. Fluorescent Lampholders shall be General Electric or Leviton.
    b. Silicone-fiberglass insulated wire rated at 150 degrees or 200 degrees C. or Teflon-fiberglass insulated wire rated at 250 degrees C. shall be provided as required with recessed HID fixtures for connection of fixtures to adjacent boxes.
    c. Medium and mogul screw base lampholders shall have porcelain bodies.
    d. Screw-shell sockets shall be nickel plated and shall have spring contacts wherever possible
    e. Lamp sockets: Rigidly and securely attached to luminaire enclosure or husk.

        1) Metallic vapor lamp sockets: Of heavy-duty heat-resistant porcelain type.
        2) Plastic or metal sheet sockets: Do not use unless specified.
        3) Fluorescent lamp sockets operating with an open circuit voltage in excess of 300 volts: Of the safety type and open the supply circuit when the lamp is removed from the sockets.

    f. Provide a positive device to assure proper axial alignment of lamps with asymmetric distribution when re-lamping.

        1) This device may be preset or adjustable as required by the specifications.
        2) Axial and angular lamp adjustments shall have provision for locking in adjusted position by hex head or hex socket bolts or nuts with special toothed washers that resist turning in both directions.

    g. Fluorescent ballasts and lamp holders shall be readily and simply replaceable without demounting the fixture.

        1) Bottom and one side of ballast shall be in full contact with metallic fixture surfaces for maximum heat conductance.

2) Exposed lamp fluorescent sockets shall be telescoping type or be provided with lamp support brackets.

h. Exposed bare lamps fixtures shall be protected with wire guards. For HID lamps, consult with respective manufacturer for requirements of enclosure made of suitable material capable of withstanding the glass lamp particles if the outer jacket of the lamp bursts or shatters.

E. REFLECTORS

1. HID reflectors shall be fabricated from minimum 0.050 Alcoa #12 reflector sheet or accepted equivalent, free from forming lines and other visible imperfections.

   a. Black anodized finish shall be minimum 0.001 thick guaranteed against fading and discoloration.
   b. Plain anodized finish used indoors shall be Alcoa MI Alzak or accepted equivalent.
   c. Plain anodized finish used outdoors shall be Alcoa SI Alzak with fixture protected with glass cover or other means.

2. Fluorescent Specular Reflectors: Specular reflectance shall be 86 percent minimum.

   a. Concealed fluorescent specular reflectors shall be Alcoa MI Alzak finish or accepted equivalent.
   b. Visible reflectors shall be Alcoa reflector sheet type 1 or accepted equivalent.

3. Reflectors and reflecting cones or baffles: fabricated from #12 aluminum reflector sheets, 0.57: (15 gage) or heavier, all absolutely free of any tooling marks including spinning lines, and free of any marks or indentations caused by riveting or other assembly techniques. No rivets, springs or other hardware will be visible after installation.
4. Reflectors and baffles: of first quality polished, buffed and anodized finish, "Alzak", and of specular finish color as selected by the A/E. Reflector and baffles: modified elliptical contour and produce no apparent brightness from nadir to 40 degrees above nadir, nor the lamp image nor any part of the lamp be visible from nadir to 40 degrees above nadir.
5. Submit samples of colored aluminum finished (black, brass, bronze, etc.) for approval before fabrication.

F. LENSES

1. LED:

   a. Shall be Reduction of Hazardous Substance (RoHS) compliant, and shall comply with FCC 47 CFR Part 15, IES LM-79 & 80.
   b. Minimum CRI of 80 with a color temperature of 3000-3500ºK for interior fixtures and 4000-4500ºK for exterior fixtures, unless otherwise noted in the Contract Documents.
   c. Minimum rated life of 60,000 hours at 25ºC ambient temperature.
   d. LED driver shall have a THD of <20% and a power factor of 0.95 or higher with integral short circuit, open circuit and overload protection.
   e. LED driver and LED module shall be accessible and replaceable from below.

f. LED lighting fixtures shall be assembled in the USA with minimum 80% materials content from the USA.
g. All LED fixtures located within instructional spaces shall have factory installed dimmable control modules built right into the fixture.
h. LED fixtures shall be provided with a minimum 10-year warranty on entire fixture (all components).
i. Approved LED fixtures:

1) Size: 2'-0" x 2'-0": Model #ZR22 by Cree or other A/E approved equivalent by Lithonia or Kenall.
2) Size 2'-0" x 4'-0": Model #ZR24 by Cree or other A/E approved equivalent by Lithonia or Kenall.
3) At makeup mirrors in Stage dressing rooms: Provide linear-style LED fixtures mounted the full length along the left, top and right edges of the makeup mirror. LED fixtures shall be dimmable and shall be controlled by a wall-mounted LED dimmer switch. LED fixtures shall as indicated in the Contract Documents and shall meet the following minimum requirements:

a) Input Voltage: 120V.
b) UL Listed.
c) Minimum 90 CRI.
d) Each fixture shall have a tampered proof, low-glare white-frosted diffuser.
e) Manufacturer: Model FMVTRL by Lithonia, or other A/E approved equivalent by Cree or Kenall.

4) Other LED fixtures of size and type as indicated in Contract Documents: Fixtures shall be as manufactured by Cree, Lithonia or Kenall, and as approved by A/E.

2.2 MARKING OF LUMINAIRES

A. Mark luminaires designed for voltages other than 110-125 volts circuits.

2.3 LUMINAIRE TRIMS

A. Luminaires shall have finish trim designed for the following types of ceiling systems:

1. LED Luminaires:

	Ceiling Type	Trim Type
a.	Plaster	F - Flanged with Plaster Frame
b.	Metal pan	M - Modular - Fit-In
c.	Mineral Tile	F - Flanged
d.	Drywall	F - Flanged
e.	Lay-In	G - Grid

B. Each trim detail shall be as shown on the drawings, which are indicative of appearance and dimensional requirements. The manufacturer's trim finish and dimensions: subject to the approval of the A/E. Flush mounted ceiling trims for rectangular or square recessed luminaires shall include mitered corners continuously welded and smoothed before shop finish is applied. No lapping of trim metal is permitted.

C. Trim of luminaires installed in metal shall match the color of that deck.

2.4 EXIT LIGHTS

A. LED lamps shall have 6-inch red letters on white background.

B. Field convertible mounting-end, back or top.

C. Field convertible directional arrows.

D. Each LED exit light shall have a total connected load of less than 2 watts.

2.5 LIGHTING CONTACTOR

A. Electrically operated, mechanically held, double break silver alloy contacts. Fully rated for tungsten lamp loads, when used as a back-up for HID luminaires, fluorescent lamp loads and general use loads. Interrupting capacity: 300 percent of rated current. NEMA I enclosure except otherwise specified.

B. As manufactured by: Asco-920RC, Square 'D' - Class 8903, General Electric - CR160MB, Westinghouse A202.

2.6 MODULAR RELAY PANEL

A. Comply with UL 508 and UL 916; factory assembled with modular single pole relays, power supplies, and accessory components required for specified performance.

1. Cabinet: Steel with hinged, locking door.

a. Barriers separate low-voltage and line-voltage components
b. Directory: Mounted on back of door. Identifies each relay as to load groups controlled and each programmed pilot device if any.
c. Control Power Supply: Transformer and full-wave rectifier with filtered dc output.

2. Single-Pole Relays: Mechanically held unless otherwise indicated; split-coil, momentary-pulsed type.

a. Low-Voltage Leads: Plug connector to the connector strip in cabinet and pilot light power where indicated.
b. Rated capacity (Mounted in Relay Panel): 20A, 125V AC for tungsten filaments; 20A, 277V AC for ballasts.
c. Endurance: 50,000 cycles at rated capacity.
d. Mounting: Provision for easy removal and installation in relay cabinet.

B. Motion sensors shall be installed following manufacturer’s recommendations.

C. Motion sensors and their power packs must be of the same manufacturer.

D. Motion sensor failure shall leave lights on.

E. Motion sensors shall be provided with a 5-year warranty.

2.7 TIME SWITCHES

A. Electronic Time Switches: Electronic, solid-state programmable units with alphanumeric display; complying with UL 917.

1. Circuitry: Allow connection of a photoelectric relay as a substitute for on-off function of a program.
2. Astronomic Time Clock capability.
3. Battery Backup: For schedules and time clock.

B. Electromechanical-Dial time switches:

1. Circuitry: Allow connection of a photoelectric relay as a substitute for on-off function of a program.
2. Astronomic time dial.
3. Wound-spring reserve carryover mechanism to keep time during power failures, minimum of 16 hours.

C. Description: Solid state, with dry contacts to operate connected load, relay, or contactor coils; complying with UL 773.

1. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range.
2. Time Delay: 30-second minimum, to prevent false operation.
3. Lightning Arrester: Air-gap type.
4. Mounting: Twist lock complying with IEEE C136.10, with base.
5. Light-Level Monitoring Range: 1000 to 10,000 fc, with an adjustment for turn-on and turn-off levels within that range.
6. Time Delay: Adjustable from 5 to 300 seconds to prevent cycling, with dead-band adjustment.
7. Indicator: Two LEDs to indicate the beginning of on-off cycles.

PART 3 EXECUTION

3.1 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.

3.2 INSTALLATION

A. Install fixtures according to manufacturer's recommendations.

B. Install "Lay-In" type fixtures with 6 foot lengths of flexible conduit to enable fixture relocation with minimum inconvenience. Fixture to be securely fastened to ceiling frame members by mechanical means as per the NEC.

C. Luminaire locations as indicated on the drawings are generalized and approximate. Carefully verify future locations with architectural floor plans, reflected ceiling plans and other reference data prior to installation. Check for adequacy of headroom and non-interference with other equipment, such as ducts, pipes or openings

D. Upon completion of the installation, the luminaires and lighting equipment must be in first class operating order and free from defects in condition and finish. At time of final inspection, all luminaires and equipment shall be fully lamped, and be complete with required lenses of diffusers, reflectors, side panels, louvers or other components necessary for the functioning of the luminaires. Luminaires and equipment shall be clean and free from dust, plaster or paint spots. Any reflectors, lenses, diffusers, side panels or other parts damaged prior to the final inspection shall be replaced by the Contractor.

E. The housings of recessed luminaires shall be adequately protected during installation by internal blocking or framing to prevent distortion of sides or dislocation of threaded lugs which, upon completion, shall be in perfect alignment and match the corresponding holes in frames or rims. Holding screws shall be inserted freely without forcing and remain easily removable for servicing. Threads intended to receive holding screws shall be chased after plating and finished to ensure easy installation and removal of knurled headed screws.

F. Housings shall be rigidly installed and adjusted to neat flush fit with the ceiling or other finished mounting surface. No light leaks will be permitted at the ceiling line or from any visible part or joints of the luminaires.

G. Housings installed directly in concrete shall be fabricated of hot dip galvanized steel or cast aluminum. Where cast aluminum housings are used, provide two coats of asphaltum paint prior to installation.

H. Provide 1/8 inch thick x 2 inch diameter solid neoprene grommets at every mounting point for all luminaires surface mounted to concrete structure to prevent direct contact of housing to concrete.

I. Adjust all directional luminaires to obtain the most uniform distribution. Orient all similar luminaires consistently. Coordinate luminaires with speakers, air grilles, pipes and ductwork.

J. Luminaire bottoms, edges and ends of rows shall be even. Rows shall be straight, aligned and equally spaced in distinct areas. Clean all luminaires of debris and fingerprints and adjust trim to fit surface snug.

K. Provide all necessary hangers and mounting accessories for a complete installation.

L. Locate the fluorescent luminaires in the equipment rooms to best illuminate the equipment installed. Use chains or rods to support below ducts and pipes as required. Install after pipes and ducts are in.

M. Test all luminaires, switches and controls for operation. Replace all lamp burnout's if their estimated operating period is less than 80 percent rated lamp life prior to final acceptance.

3.3 Exit lights:

A. Install wall or ceiling mounted as shown on drawings.

B. Provide directional arrows required to show correct path to exit.

C. Install exit lights at a location and height to ensure a clear line of sight from the egress passageway.

D. Relocate exit lights that are not readily visible at no additional cost to the City of Miami.

E. Internally illuminated exit signs shall have LED light source on normal power.

3.4 SUPPORTS

A. Fixture Supports:
   1. Support each fixture securely.
   2. Each recessed fluorescent troffer shall be lay-in supported by ceiling suspension system at each corner. Provide at least 2 earthquake clips.
   3. Where pendant fixtures are mounted in continuous rows, the number of hangers shall equal the number of 4-foot lengths, plus 1.
   4. Do not support fixtures to plaster or gypsum board ceilings.
   5. Furnish and install steel members and supports to fasten and suspend fixtures.

B. Install lighting fixtures on ceilings or walls of mechanical and electrical equipment rooms after piping, ductwork, and equipment are installed therein.
   1. Exact location and switching for such fixtures will be determined at the job site during the work.
   2. Fixtures shall be located to give maximum illumination to items of equipment requiring servicing and moving machinery.
   3. Any lighting fixtures blocked, inaccessible or improperly located shall be relocated at no extra cost.
   4. Where fan rooms are used as an air plenum, provide suitable gasketed vapor-tight lighting fixtures.

C. Plaster frames for lighting fixtures shall be furnished under this Section and installed by others under this Contract. Frames shall be finished matte white baked enamel unless otherwise noted.

D. Recessed luminaires shall be provided complete with mounting devices and accessories and constructed and mounted as to permit access to wiring.

E. Attachment devices shall be fabricated of formed, rolled or cast metal shapes with the requisite rigidity and strength to maintain continuous alignment of the installed luminaires.

F. Contractor shall be responsible for necessary adjustments in ceiling required to install luminaires.

G. Contractor shall verify all ceiling conditions from the architectural plans and provide appropriate mounting details for each luminaires.

H. Reflectors shall be attached to housing by means of a length of chain, which will prevent reflector from falling. Ensure that no part of chain is visible after installation when viewed from any angle below 45 degrees from the horizontal.

I. Pendant or surface mounted luminaires shall be provided with required mounting devices and accessories, including hickeys, stud-extensions, ball-aligners, canopies and stems. Coordinate locations of luminaires in mechanical areas. Mounting stems of pendant luminaires shall be of the correct length to uniformly maintain the luminaire heights shown on the drawings or established in the field.

3.5 ADJUSTMENTS

A. After the installation of luminaires is completed, adjust luminaires after dark under the supervision of the A/E at no additional cost to the City of Miami.

B. Upon the completion of the installation of all luminaires, turn on for a continuous period of 48 hours and during that time, replace any burned-out lamps, defective ballasts or fuses, etc.

END OF SECTION

16530
EXTERIOR LIGHTING

PART 1 GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, equipment and services necessary to complete the lighting fixture installation work, and as indicated on the drawings, and as specified herein.

B. All materials shall be listed and labeled by an OSHA approved Nationally Recognized Testing Laboratory (NRTL).

1.2 RELATED SECTIONS:

1. 16112 - Raceways and Conduits.
2. 16120 - Wire and Cable.

1.3 SYSTEM DESCRIPTION

A. Wet location fixtures shall bear an NRTL label appropriate for that type of application.

1.4 SUBMITTALS

A. Shop drawings include but not be limited to:

1. Manufacturer's dimensioned scale drawings showing in complete detail the fabrication of all luminaires including finished, metal thickness, fabrication methods, support method, ballasts, sockets type of shielding, reflectors, provisions for relamping and all other information to show compliance with the Contract Documents.
2. Submit shop drawings and samples as requested of luminaires for approval before fabrication. Luminaire details may vary slightly from those shown on drawings provided the changes do not adversely affect size of installation, durability of luminaire, luminaire performance or appearance. Submitted samples may be subjected to photometric testing at an independent testing laboratory, refer to Section 01330, “Submittals”.

B. Certified photometric data for exterior lighting fixtures and a point by point illumination plan for entire site at same scale as Construction Documents

C. Wind load certification, by a Florida registered structural engineer, for exterior lighting poles.

D. Upon request, a sample of each fixture proposed for every use and specified unit shall be submitted to the A/E for review.

1.5 QUALITY ASSURANCE

A. Materials, equipment and appurtenances as well as workmanship provided under this section shall conform to the highest commercial standard and as specified and as indicated on drawings. Luminaire parts and components not specifically identified or indicated shall be fabricated from materials most appropriate for their use or function and

as such resistant to corrosion, thermal, and mechanical stresses encountered in the normal application and functioning of the luminaires.

B. All cast parts, including die-cast members shall be of uniform quality, free from blow holes, pores, hard spots, shrinkage defects, cracks or other imperfections that affect strength and appearance, or are indicative of inferior metals or alloys. Exterior surfaces, which do not otherwise receive a finishing coating, shall be machined, sanded or similarly treated areas, such as extruded metal parts. All such finished castings: given a minimum of one coat of baked-on clear methacrylate lacquer unless a painted finish is specified.

C. Comply with Florida Building Code (FBC).

D. Luminaries and components shall be built under provisions of the N.E.C.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Exterior mounted lighting fixtures shall be vandal-proof types as shown on plans or accepted equivalent.

2.2 EQUIPMENT

A. Exterior Lighting Fixtures:

1. Exterior fixtures shall be vandal-proof.
2. Provide required exterior lighting fixtures and components with NEMA LE2 lighting systems noise ratings.
3. Exterior lighting fixtures shall be furnished as indicated on drawings and fixture schedule. Fixtures shall be complete with necessary wiring, lamps, reflectors, glassware, and mounting accessories.
4. Components of the same type, size, rating, functional characteristic, and make of similar exterior lighting fixtures shall be interchangeable.
5. Fixture bases shall be metal and fastened to mounting locations with metal components.
6. Exterior fixtures shall be of aluminum or plastic construction.

B. Lamps:

1. Provide lamps for exterior lighting fixtures. Lamps shall be as indicated on the lighting fixture schedule.
2. LED:

a. Shall be Reduction of Hazardous Substance (RoHS) compliant, and shall comply with FCC 47 CFR Part 15, IES LM-79 & 80.
b. Minimum CRI of 80 with a color temperature of 3500º K.
c. Minimum rated life of 50,000 hours at 25ºC ambient temperature.
d. LED driver shall have a THD of <20% and a power factor of 0.95 or higher with integral short circuit, open circuit and overload protection.
e. LED driver and LED module shall be accessible and replaceable from below.

PART 3 EXECUTION

3.1 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.

3.2 INSTALLATION

A. Exterior Lighting Fixtures: Exterior lighting fixtures shall be installed according to manufacturer's instructions and according to details as shown on electrical drawings. Fixtures in student areas shall not be mounted below 7'-6" above the floor.

3.3 Exterior lighting shall be controlled using a combination of photocell control with the programmable timed lighting control system.

END OF SECTION

16630
BATTERY POWERED EMERGENCY LED LIGHTING UNITS

GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, equipment and services necessary to complete the Battery Powered Emergency Incandescent Lighting Units work, as indicated on the drawings, and as specified herein.

B. All Materials shall be listed by an OSHA approved Nationally Recognized Testing Laboratory (NRTL).

C. RELATED SECTIONS:

1. 16511 - Lighting Fixtures and Lamps.

1.2 SUBMITTALS

A. Submit identified manufacturer's literature and technical data including printed installation instructions and recommendations.

1.3 WARRANTY

A. Three-year unconditional guarantee, 5 year pro-rata against defective parts and improper construction under normal operating conditions.

PART 2 PRODUCTS

2.1 MANUFACTURERS/PRODUCTS

A. Battery Powered Emergency Lighting Units:

1. Dual-Lite, Model LZ Series with 3 watts LED lamps.
2. Lightalarms Electronics Corp., LCA1250 Series with 4 watts LED lamps.
3. Lithonia ELM-2 LED.

2.2 EQUIPMENT

A. Unit equipment shall consist of the following:

1. Battery: Three-cell, 6-volt, maintenance free, rechargeable, sealed lead calcium or nickel-cadmium battery having a minimum of 5-year life rating and operating capacity to power the connected lamps for 1-1/2 hours to 87.5 percent of initial nominal voltage of 1.75 volts per cell.
2. Case: House battery in a compact injection molded UL 94V-O flame rated thermoplastic cabinet with front section hinged for easy access to battery, battery charger, fuses, and wiring compartment and with provisions for wall mounting. Provide access hole to test switch.
3. Charger: Solid state, multi-rate, fully automatic with sensing device to determine charging rate and to charge battery to 100 percent of battery capacity within 12 hours

following a full rated load discharge to 87.5 percent nominal voltage to 1.75 volts per cell.

4. Transfer Relay: Solid state transfer relay for immediate transfer.
5. Head Lamps: LED.
6. Input Voltage: Dual voltage operation 120/277 volts, 60 cycle input voltage.
7. Accessories:

    a. Test Switch: Locate at one side of the housing.
    b. Charge Monitoring Light: Locate at one side of the housing.
    c. AC Pilot light.
    d. Cell vents as required by NEC 480-9.
    e. Vandal resistant shields as indicated on drawings.

PART 3 EXECUTION

3.1 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 appropriate manner.

3.2 INSTALLATION

A. Install according to manufacturer's recommendation and with applicable codes and regulations.

B. Securely mount unit equipment on the wall on brackets, 2 feet below ceiling or 7'-6" above finished floor, whichever is higher, exact location to be determined in the field.

C. Electrical connections to either a unit equipment or emergency lighting unit shall be permanent and connected to the circuit supplying power to other lights in that particular area, ahead of any switch controlling those lights.

END OF SECTION

16670
LIGHTNING PROTECTION SYSTEM

PART 1 GENERAL

1.1 WORK INCLUDED

A. Section includes a complete and certified direct lightning protection system including necessary equipment, materials and accessories.

B. All materials shall be listed by an OSHA approved Nationally Recognized Testing Laboratory (NRTL). After completion, system shall bear a master label certificate.

C. RELATED SECTIONS:

1. 07500 - Roof Assembly.
2. 16112 - Raceways and Conduits.
3. 16120 - Wire and Cable.

1.2 REFERENCE STANDARDS

A. National Fire Protection Association (NFPA) 78 - Lightning Protection Code.

B. Underwriters Laboratories (UL) Master Label Code 96A Standards for Lightning Protection Systems.

1.3 SUBMITTALS: Submit properly identified product data for review on materials and connections, fastenings, and method of installation. Submit layout of system indicating components and connections.

1.4 QUALITY ASSURANCE

A. Lightning protection system shall be the standard product of manufacturer regularly engaged in the production of lightning protection systems and manufacturer's latest approved design. The equipment manufacturer shall also be and NRTL listed and approved manufacturer.

B. After completion of the work, system shall bear a master label certificate from an OSHA approved NRTL.

1.5 SEQUENCING AND SCHEDULING

A. Work with other trades to ensure a correct, neat, and unobtrusive installation. Provide a sound bond to the main water service and assure interconnection with telephone, electrical and other building ground systems. Install surge protective device on the power service.

PART 2 PRODUCTS

2.1 MATERIAL

A. Copper, aluminum or bronze components as described, NRTL listed and labeled, and of the size, weight, and construction for use according to NRTL, code requirements and per manufacturer recommendations.

B. Conductors:

1. Downlead conductors to ground: Copper of 32 strands 17 gage minimum, 65,500 circular mils or aluminum 28 strands 14 gage 115,000 circular mils for Class 1 structures.
2. Main roof conductors: Copper of 29 strands 17 gage minimum, 59,500 circular mils or aluminum of 24 strands 14 gage 98,600 circular mils for Class 1 structures.
3. Bonding devices, cable splicers, and miscellaneous connectors on the roof:

    a. Cast bronze or aluminum with bolt pressure connections to cable.
    b. Cast or stamped crimp fittings are not acceptable.
    c. Straps and adhesive cable straps may be stamped.

C. Air Terminal:

1. Air Terminal Installed at Flat Roofs and at Parapet Tops: Solid, round copper rod, 3/8" minimum diameter with nickel plated pointed tip, or solid, round aluminum rod, 1/2” minimum diameter with pointed tip. Rods shall project 10 inches minimum above the object to be protected.
2. Air Terminal Bases: Cast bronze with bolt pressure cable connections and securely mounted with stainless steel screws or bolts. Bases on built-up roof shall be secured with a proper adhesive and shall have a minimum surface contact area of 18.5 square inches.

D. Ground Rods: Copper-clad steel, minimum of 5/8" diameter and 10 feet long. Connect to the system with a 2 bolt cast bronze clamp, having a minimum length of 1-1/2" and employing stainless steel cap screws.

E. Cable Fasteners: Substantial in construction, compatible electrically with the conductor and mounting surface and space according to Code and NRTL requirements.

F. Make connections to metallic building parts and machinery with bonding plates of cast bronze with bolt tension cable clamps or by other accepted equivalent.

PART 1 EXECUTION

1.1 INSTALLATION

A. Lightning protection system shall be installed according to NFPA Publication No. 780, UL Publication 96A, LPI Publication No. 175, as specified, as shown on drawings, and according to accepted Shop Drawings.

B. Lightning protection system shall be an LPI Certified Lightning Protection System and shall be provided with a UL or NRTL Master Label.

C. Contract drawings indicate extent and general arrangement of lightning protection system. If any departure from contract drawings is deemed necessary by Contractor, details of such departures and reasons, shall be submitted as soon as practicable to the A/E for acceptance. No such departures shall be made without prior written acceptance of the A/E.

D. Connections made in lightning protection system shall be electrically continuous to ground rods.

E. Metal on roof, including plumbing vents, roof drains, fan housings, steel frames, flashings, roof hatch, skylights, electrical conduit, etc., shall be bonded to lightning protection system.

F. Air Terminal Locations: On ridged and flat roofs, provide air terminals at locations indicated with fasteners according to system manufacturer instructions.

G. Conductor Locations: Conductors shall be installed at locations indicated with fasteners spaced a maximum of 3 feet apart.

H. Raceways Locations: Raceways shall be continuous and concealed, and any metal raceways shall be bonded at both ends. Radius for elbows and bends shall not be less than 8 inches. Coordinate roof penetrations with applicable Sections of the Specifications.

I. Ground Rod Locations: Ground rods shall be installed at locations indicated on the drawings with top of rods a minimum of 12 inches below finished grade.

J. Installation of an aluminum lightning protection system shall comply NFPA-780 paragraph 4.5.

K. Upon completion of the installation, provide a UL or other OSHA approved NRTL Master Label to the A/E for City of Miami records. Submit copies of record shop drawings with the Master Label Application form.

END OF SECTION

16709
SURGE PROTECTIVE DEVICES

PART 1 GENERAL

1.1 WORK INCLUDED

A. Section Includes Surge Protective Devices (SPDs) for the protection of AC electrical circuits and electronic equipment from the effects of lightning induced transients, other externally generated transients, and internally generated transients.

B. All materials shall be listed by an OSHA approved Nationally Recognized Testing Laboratory (NRTL).

1.2 REFERENCE STANDARDS:

A. ANSI/IEEE:

1. C62.33IEEE - Standard Test Specifications for Varistor Surge-Protective Devices.
2. C62.41IEEE - Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.
3. C62.45-87 IEEE - Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage AC Power Circuits.
4. 142 IEEE - Recommended Practice for Grounding of Industrial and Commercial Power Systems (IEEE Green Book).

B. Underwriters Laboratories (UL):

1. UL 1449 Standard for Safety, Transient Voltage Surge Suppressors (3rd Edition).
2. UL 1283 Electromagnetic Interference Filters.

C. National Fire Protection Association (NFPA):

1. NFPA 70 National Electrical Code (NEC).
2. NFPA 75 Standard for the Fire Protection of Information Technology Equipment.
3. NFPA 780 Lightning Protection Standards.

1.3 QUALITY ASSURANCE

A. The manufacturer shall submit a written statement indicating that a factory authorized representative inspected the installation. The installing contractor shall submit a checkout memorandum to the manufacturer indicating the date the equipment was placed into service and the actual method of installation. Submit three copies of each to the A/E.

B. All SPDs for service entrance, distribution, and branch circuit protection within the facility shall be provided by a single manufacturer.

1.4 WARRANTY

A. The SPD and supporting components shall be guaranteed by the manufacturer to be free of defects in material and workmanship for a period of 5 years from the date of substantial completion of service and activation of the system to which the SPD is attached.

B. An SPD that shows evidence of failure or incorrect operation during the warranty period shall be repaired or replaced, including labor and materials, at no expense to The City. Since "Acts of Nature" or similar statements typically include the threat of lightning to which the SPD shall be exposed, any such clause limiting warranty responsibility in the general conditions of this specification shall not apply to this warranty. The warranty shall cover the entire device, not just the modules.

C. The installation of SPDs in or on electrical distribution equipment shall in no way compromise or violate equipment listing, labeling, or warranty of the distribution equipment.

1.5 SUBMITTALS

A. Submittals shall include, but not be limited to, the following information:

1. Data for each SPD type indicating conductor sizes, conductor types, connection configuration and lead lengths.
2. Manufacturer’s certified test data indicating the ability of each SPD to meet or exceed requirements of this specification.
3. Drawings, with dimensions, indicating SPD mounting arrangement and lead length configuration, and mounting arrangement of any optional remote diagnostic equipment and assemblies.
4. List and detail protection systems such as fuses, disconnecting means and protective materials.
5. SPD wiring, bonding and grounding connections shall be indicated on the wiring diagrams for each system. Include installation details demonstrating mechanical and electrical connections to equipment to be protected.
6. If requested, a sample of each SPD type shall be submitted for use in testing and evaluation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Transient Voltage Surge Suppression:

1. Advanced Protection Technologies.
2. EDCO-Emerson Network Power.
3. HubbellSurge Protection Devices.
4. LEA International by Power Logics.
5. Siemens.
6. Eaton Corp.

2.2 PERFORMANCE

A. General:

1. SPDs shall be listed according to UL – Third Edition 1449 Standard for Safety, Transient Voltage Surge Suppressors, and UL 1283, Electromagnetic Interference Filters.
2. Services entrance equipment SPD’s shall be labeled as Type 1 with 10 modes of protection: 3-modes (Line-to-line) 3-modes (Line-to-Ground), 3-modes (Line-toNeutral), and 1-mode (Neutral-to-Ground) for a 3-phase, 4-Wire plus ground voltage system. (Line-to-Neutral-to-Ground is not an acceptable substitute for Line-toGround).

3. Distribution and panelboard SPD's shall be labeled Type 1 with 7 modes of protection: 3 modes (line-to-ground), 3 modes (line-to-neutral), and 1 mode (neutralto-ground) for a 3-phase, 4 wire plus ground voltage system. (Line-to-Neutral-toGround is not an acceptable substitute for Line-to-Ground).
4. Provide an SPD at the panelboard powering the security camera head-end equipment.
5. The UL 1449 Clamping Voltage for the following configurations shall not exceed the following: VOLTAGE CONFIGURATION L-G L-N N-G L-L 120/208V 700V 700V 700V 1200V 277/480V 1200V 1200V 1200V 1800V
6. The unit shall be UL 1283 listed as an electromagnetic interference filter. Standardized insertion loss data shall be obtained using MIL-STD E220A 50W insertion loss methodology. Minimum insertion loss shall be as follows: FREQUENCY[MHz] INSERTION LOSS[dB] 0.1 34 1.0 51 10.0 54 100.0 48
7. SPDs shall use a separate path to building ground, the equipment safety ground is not to be used as a transient ground path.
8. SPDs shall be constructed using metal oxide varistors (MOV) based modules. Each SPD shall have a response time of less than one nanosecond with 6 inches or less of connected lead length for any individual protection mode.
9. Each MOV contained within a current diversion module shall be individually fused (component level safety fusing). For the assurance of safety purposes, this feature shall be a standard design feature and not an optional feature of the product. The individual component level fusing shall allow a reduction of protection rather than an automatic complete loss of protection.
10. The maximum continuous operating voltage (MCOV) of all components shall not be less than 125 percent for a 120/208 volt system with MCOV of 150 volts and 115 percent for 277/480 volt, systems with MCOR of 320 volts.
11. The minimum surge current capacity (single pulse rated) per phase shall be:
    a. Service Entrance: 300 KA
    b. Distribution Panelboard: 200 KA
    c. Lighting and Power Panelboard: 100KA
12. SPD's shall include visual LED diagnostics indicators, and audible alarm with silence.

PART 3 EXECUTION

3.1 INSTALLATION

A. The contractor shall install the parallel SPD with short and straight conductors, not to exceed 18 inches long.

B. Service entrance SPD's shall have a 60 amp, 3-pole circuit breaker protection and distribution and lighting/power panelboards shall have a 30 amp, 3-pole circuit breaker protection. Connect SPDs with #6AWG wire gauge minimum.

C. The contractor shall follow the SPD manufacturer's recommended installation practice as found in the equipment installation manual.

D. The installation shall apply to all applicable codes.

END OF SECTION

16721
FIRE ALARM DETECTION SYSTEM

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Complete, operable, tested and certified, addressable or non-addressable (zoned), non-coded, electrically supervised fire alarm detection system including necessary controls and accessories.

B. Related Sections:

1. 08710 - Finish Hardware.
2. 13845 - Intrusion Detection System.
3. 15300 - Fire Protection.
4. 15515 - Valves and Specialties.
5. 16112 - Raceways and Conduits.
6. 16120 - Wire and Cable.
7. 16131 - Outlet, Pull, and Junction Boxes.

1.02 REFERENCES

A. Florida Building Code – Latest Edition

B. The American with Disabilities Act (ADA.

C. Florida Accessibility Code for Building Construction, October 1997 edition.

D. American National Standards Institute, Inc. (ANSI) A117.1, Building and Facilities - Providing Accessibility and Usability for Physically Handicapped People.

E. Department of Insurance, Division of State Fire Marshall (SFM), Uniform Fire Safety Rules and Standards, Chapter 4A48, Fire Alarm Systems, latest edition.

F. National Fire Protection Association, Inc. (NFPA):

1. NFPA 70 National Electrical Code (NEC), 1996 edition.
2. NFPA 72 National Fire Alarm Code, 1993 edition.
3. NFPA 90A Installation of Air-conditioning and Ventilating Systems, 1993 edition.
4. NFPA 92A Smoke Control Systems, 1993 edition.

G. Underwriters Laboratories (UL), latest edition.

1. UL 38 Manually Activated Signaling boxes for Use with Fire Protective Signaling Systems.
2. UL 228 Door Closers-Holders, With or Without, Interior Smoke Detectors.
3. UL 268 Smoke Detectors for Fire Protective Signaling Systems.
4. UL 268 A Smoke detectors for Duct Application.
5. UL 346 Water Flow Indicators for Fire Protective Signaling Systems.
6. UL 464 Audible Signal Appliances.
7. UL 497 B Protectors for Data Communication and Fire Alarm Circuits.
8. UL 521 Heat Detectors for Fire Protective Signaling Systems.
9. UL 864 Control Units for Fire Protective Signaling Systems.

10. UL 1424 Cables for Power Limited Fire Protective Signaling Circuits.
11. UL 1481 Power Supplies for Fire Protective Signaling Systems.
12. UL 1635 Digital Alarm Communication Systems Units.
13. UL 1971 Signaling Devices for the Hearing Impaired.

1.03 SYSTEM DESCRIPTION

A. Design addressable and non-addressable systems to meet the requirements of NFPA 70 (NEC), NFPA 72, accessibility codes, and UL.

1.04 SUBMITTALS

A. Before starting the work, the manufacturers authorized representative shall submit one of the following:

1. A signed document committing the manufacturer to provide the City with all the special tools, hardware, software, any proprietary items or products, and instruction or training programs necessary to service and maintain the system installed under this contract.
2. A signed document stipulating that service and maintenance of the system installed under this contract does not require special tools, hardware, software, any proprietary items or products, or instruction or training programs.
3. Passcodes for maintenance and programming of the installed fire alarm system.

B. Before starting the work, submit shop drawings and product data on all equipment including the following:

1. Dimensioned outline drawings and technical data sheets for all equipment.
2. Riser diagrams indicating wiring and conduits.
3. Indicate cabinet elevations with each item on the face of the cabinet identified.
4. Functional description of the complete fire alarm system and subsystem.
5. Fuel shut-off system.
6. Operation and maintenance manuals.
7. Parts list.
8. Name, address, and telephone numbers of local supplier and local factory trained Technical Representative (TR). Provide 3 copies of TR's certificate verifying factory training on the submitted system.
9. Delineate the fire zones and the device identifications for the entire project.

C. Operating Instructions: Furnish 3 sets of detailed written operating instructions.

D. Quality Control Submittals:

1. Submit a signed NFPA 72-1993 CERTIFICATE OF COMPLETION.

E. Substantial Completion Submittal Requirements:

1. Provide 3 complete sets of operating and maintenance instructions, literature, and information concerning equipment, indexed and bound in accepted loose leaf binders.
2. Furnish 3 sets of Record Drawings to the A/E indicating accurate plan layout, conduit runs, and wiring diagrams as actually installed. One of the 3 sets shall be in reproducible sepia.
3. Provide and maintain 3 sets of record drawings for the complete system. Show connections, numbering system of every device including wiring and cabling

identification, raceways, and junction and terminal cabinets. Typical wiring diagrams are not allowed.

1.05 QUALITY ASSURANCE

A. The equipment manufacturer shall have a local branch office or authorized distributor staffed with factory trained, full-time employees capable of performing installation, testing, inspection, repair, and maintenance services for the life of the fire alarm detection system.

B. Any equipment, device, system component, or part provided or installed by contractor containing or using date processing shall be Year 2000 (Y2K) compliant. Before substantial completion, contractor shall provide a manufacturers statement of Year 2000 compliance and manufacturers and contractors warranty against date related failures.

C. Fire alarm system, devices, and wiring installation shall be by the certifying company, either the original equipment manufacturer or the factory distributer for the brand of equipment used. Furnish wiring diagrams and wire runs for the raceway system installed by the licensed electrical contractor, under Division 16.

D. Installer Qualifications:

1. The installing contractor for the Fire Alarm Detection System shall be properly licensed by the State of Florida Department of Business and Professional Regulation under Section 489, Part II of the Florida Statue as an EC-Unlimited electrical contractor or an EF-Alarm contractor I. The installing contractor shall possess a valid occupational license, and a current certificate of insurance.
2. The installing contractor shall ensure that a qualified representative of the fire alarm detection system manufacturer monitors and coordinates the installation and is present at the Acceptance Inspection to test and instruct the City as to the use of the system.
3. Employees installing the fire alarm detection system shall possess, or be directly supervised by a person with a Certificate of Competency as an Electrical Master, Electrical Journeyman, Master Speciality or Journeyman Speciality in the fire alarm trade as issued by the Miami-Dade County Construction Trades Qualifying the City, Division B or the equivalent construction trades qualifying licensing the City's of Broward, Collier, Monroe, or Palm Beach counties.
    a. Provide a minimum of 1 Electrical Master, Electrical Journeyman, Master Speciality or Journeyman Speciality in the fire alarm trade for every 3 apprentices performing the installation of the fire alarm detection system.

E. Fire Alarm Detection System:

1. Listed and labeled by Underwriters Laboratories.
2. Listed and labeled for commercial use. Residential devices are not allowed.

F. Components, Parts, and Assemblies: Furnished by the same manufacturer and compatible throughout the system, one-to the-other, without exception.

1.06 WARRANTY

A. Components, parts, raceways, wiring, and assemblies furnished and installed by the manufacturer's representative or distributer shall be warranted for 1 year after substantial completion, in writing, against defects in labor and materials.

1. Written Warranty:
    a. Extend the requirements of General Conditions, to include a signed manufacturer's 1-year written warranty against defects in materials and labor quality.
    b. Provide 5 notarized copies signed by authorized manufacturer's representative, giving details of warranty being provided, listing components included and not included in the warranty, number of hours per days for warranted service, and billable rates for services not covered by warranty.
    c. Provide 5 original copies of:
        1) A notarized and properly completed NFPA 72-1993 CERTIFICATE OF COMPLETION form signed by the EF or EC license holder. License holder shall be employed by the manufacturer and/or Contractor.
        2) Valid electrical license of the installing contractor.

B. Warranty service shall be performed by a certified factory trained and approved fire alarm technician of the equipment manufacturer's representative or distributer.

1. The Contractor shall respond to routine warranty service requests by completing repairs within 24 hours of service request.
2. 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, the following:
    a. Total system failure.
    b. Inability to acknowledge, silence, or reset audibles or panel troubles.
    c. Failure of air-conditioning to reset after an alarm.
    d. Loss of battery power
    e. Damage caused to system due to transients and power surges.
    f. Complete zone or loop failure.
    G+. Fire at facility.

3. If problem is not correctable within specified time frames, the Contractor shall provide in writing an expected completion date.

C. Inspections at End of Warranty:

1. At the end of the 1-year general warranty period, the City will decide if the warranty items cited during the course of the warranty period have been completed to the satisfaction of the City.
2. Meet on-site with DB and the City to establish the end of the 1-year warranty period and address unresolved warranty items.

D. Equipment and systems shall be warranted by the Contractor for 1 year following acceptance. The warranty shall include parts, labor, prompt field service, pickup, and delivery.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Alarm Detection System:
1. Edwards Systems Technology.
2. Faraday.

3. Fire Control Instruments.
4. Notifier.
5. Cerberus Pyrotronics.
6. Simplex.

B. Lightning Protection and Transient Voltage and Surge Suppression:
1. Atlantic Scientific.
2. Diversified Technology Group (DITEK).
3. EDCO.
4. Transtector, Hayden Lake, ID.

C. Fire Alarm Cables for Wet Locations: Aquaseal by West Penn or accepted equivalent.

D. UL Protective Covers: Safety Technology International (STI), Waterford, MI as follows or accepted equivalent.

2.02 COMPONENTS

A. System Types:

1. Provide a single standalone or a multiple panel network type system for the entire facility. The system shall be a 24-Volts Direct Current (VDC), fully analog addressable using multiple Signaling Line Circuits (SLC) Style 4 (Class B) and multiple Style Y (Class B) Notification Appliance Circuits (NAC), wired in exclusive conduits, electrically supervised and power limited.

B. Addressable Systems:

1. The fire alarm detection system shall consist of a UL 864 listed intelligent microprocessor based main control panel, printer, automatic detection devices, manual stations, and notification appliance devices wired according to the schedule on the Drawings and function as specified.
a. Equipment shall allow a one-person walk-through test of either the complete system or each individual SLC while maintaining full functionality of SCL not being tested. If no test activity occurs for a specified period, as determined by the manufacturer, the system shall automatically return to the normal operating mode.
b. System shall be capable of being programmed in the field, by a laptop computer. Store programmed information in non-volatile memory. System programming shall be password protected by fire alarm detection manufacturer and include full upload and download capability.
c. System shall be capable of monitoring intelligent/analog and non-addressable ionization, manual stations, thermal and photoelectric detection devices, and interface modules for water flow and tamper switches.
d. As a minimum, the panel shall have behind a locked door the following switches:
1) Audible silence.
2) Trouble silence.
3) Supervisory silence.
4) Panel reset.
5) Occupancy recall.

e. System shall have a real time history log, stored in non-volatile memory, capable of containing a minimum of 400 events.
f. The input AC power to the fire alarm detection system shall be from a dedicated branch circuit of the facility emergency backup system. AC breaker shall be marked "WARNING - AC POWER TO FIRE ALARM DETECTION SYSTEM - DO NOT TURN OFF OR DISCONNECT".
g. Provide 1 dry form C relay contacts for central monitoring for each of the following:
1) System alarm.
2) System trouble.
3) Sprinkler supervisory.
h. Provide battery backup capable of operating the fire alarm system under maximum normal load for 24 hours and then operating in the alarm mode for 5 minutes after loss of input power. Include remote power supplies.

2. Intelligent/analog and non addressable ionization, photoelectric and thermal detectors shall be capable of being intermixed on the same control panel. Detection devices shall contain an integral alarm LED. Intelligent/analog detectors shall be individually identifiable from the control panel.
a. The intelligent/analog type smoke detector shall be UL 268 listed.
b. The intelligent/analog detector type thermal detector shall be UL 521 listed.
c. The intelligent/analog detector sensitivity shall be individually adjustable from the control panel. It shall also be possible to accurately measure the intelligent/analog detector's sensitivity from the control panel.

3. The intelligent monitoring module shall incorporate a custom microprocessor based integrated circuit, supervised and uniquely identifiable by the control panel. The intelligent interface module shall be used to uniquely identify water flow switches, tamper switches, OS & Y valves, kitchen alarm panels, and power to the building sound system.

4. The intelligent manual fire station shall be non-coded, single action, and operate on any SLC. The intelligent manual fire station shall be individually annunciated on the control panel.
a. Intelligent Manual Fire Station: UL 38 listed.
b. Manual Stations: Mount semi-flush where possible.
c. If it is not possible to mount a semi-flush station, the supplier shall provide the proper manufacturer's surface mounted box.
d. Protect each manual pull station with a UL listed transparent protective cover.
e. Provide 10 keys or wrenches to the City.

5. The air duct detector shall operate on a crosssectional air sampling principal to overcome stratification and the skin effect. The air duct detector shall consist of a standard intelligent/analog ionization detector mounted in an air duct sampling assembly and sampling tube that protrudes across the duct of the ventilating system. The air duct detector shall retain the features of the (intelligent/analog or non-addressable) ionization detector, and be installed in the ventilating duct as indicated in the devices if both are required.
a. Intelligent/analog air duct detector shall be UL 268A listed.
b. When used for air handling control, the relay within the base of the duct detector shall be capable of operating from general alarm.

6. Horns: Polarized 24VDC type with capability of alarm audibility and occupancy recall.

a. UL 464 listed.
b. Operate march time beat during alarm condition.
c. Locate horns at heights according to NFPA 72 6-3.7. and ADA.
d. Protect each horn less than 7'-6" above finished floor (AFF) or at unsecured or unsupervised occupied locations with a UL listed transparent protective cover.
e. Audio shall be used for alarm audibility and occupancy recall. The recall signal shall be separate and distinct from any other signal.
f. Provide horns of the same type and sound throughout the facility.

7. Horn/Strobes: Polarized 24VDC type and meeting ADA requirements. The audio portion shall be used for alarm audibility and occupancy recall. The recall signal shall be separate and distinct from any other signal. Each unit shall have separate terminals associated with the horns and the strobes so the strobes may remain on during the alarm condition.

a. Horn/Strobes: UL 464 and UL 1971 listed respectively.
b. Horns: Operate march time beat during alarm condition.
c. Provide horns of the same type and sound throughout the facility.
d. Locate horns/strobes at heights according to NFPA 72 6-4.4 and ADA.

8. Strobes: Polarized 24VDC type meeting ADA requirements. The strobes shall remain on during any alarm condition and until the system is reset.

a. Strobes: UL 1971 listed.
b. Install at heights according to NFPA 72 6-4.4.
c. Protect each strobe with a UL listed transparent protective cover.

9. Protective Covers: Provide and install clear polycarbonate covers for initiating or annunciating devices at less than 7'-6" AFF or at unsecured or unsupervised occupied locations. Provide spacers as required for surface mounted units. By Safety Technology International, Waterford, MI or accepted equivalent.

a. For flush mounted pull stations:
    1) STI 1200 for indoor locations.
    2) STI 1250 for outdoor locations (weather resistant).

b. For surface mounted pull stations:
    1) STI 1230 for indoor locations.
    2) STI 3150 for outdoor locations (weather resistant).

c. For flush mounted horns and horn/strobe combinations less than 7'-6" AFF or at unsecured or unsupervised occupied locations:

    1) STI 1210 for indoor locations.

    2) STI 1210 with STI 3002 weather resisistant gaskets for outdoor locations (weather resistant).

d. For surface mounted horns and horn/strobe combinations less than 7'-6" AFF or at unsecured or unsupervised occupied locations:

    1) STI 1223 for indoor locations.

2) STI 1223 with STI 3002 weather resistant gaskets for outdoor locations (weather resistant).

e. For flush mounted strobes:

1) STI 1221 for indoor locations.
2) STI 1221 with STI 3002 weather resistant gaskets for outdoor locations (weather resistant).

f. For surface mounted strobes:

1) STI 1221 with STI 3100 conduit spacer for indoor locations.
2) STI 1221 with STI 3100 conduit spacer and STI 3002 weather resistant gaskets for outdoor locations (weather resistant).

g. For flush mounted smoke detectors less than 8'-6" AFF:

1) STI 9601.
2) STI 9604.
3) STI 9609.

h. For surface mounted smoke detectors less than 8'-6" AFF:

1) STI 9602.
2) STI 9605.
3) STI 9610.

i. Fasteners for covers shall be tamperproof.

10. Door Holders: 24VDC powered. Door holders types are specified in Section 08710 - Finish Hardware. a. Door holders shall be UL 228 listed.

11. The Fire Alarm Detection System Annunciator shall be of an LCD or graphic LED type and display the exact origin of the alarmed device with a custom user defined message. Locate as shown on the Drawings. The annunciator shall duplicate the information available at the main panel.

a. Locate a floor plan with legible device addresses and room numbers within each room or an area zone map with device types and locations next to the fire alarm system annunciator panel by the designated intercom station receiving incoming calls.
b. Orient the map so when facing the mounting wall, the "YOU ARE HERE" arrow will point up.

12. Wiring shall be power limited and meet the intent of NFPA 70, article 760. The systems shall be wired Style 4(Class B) and Style Y (Class B).

a. Wiring shall be UL 1424 listed for indoor installations.

13. Fire Alarm Cables for Wet Locations: Cables shall be suitable for use in raceways and in wet locations, comply with NEC 70, articles 725 and 760.

a. Audible/Strobes:

1) Cable Description: 4 conductor non-shielded cable manufactured according to UL 1424 and NEC 70, articles 725 and 760 type Fire Power Limited (FPL).
2) AWG of Conductors: 14 solid bare copper.
3) Number of Conductors: Four.
4) Conductor Insulation: 0.010 tri-rated semirigid PVC rated for 105C.
5) Cable Jacket: 0.015 Red PVC.
6) Nominal Cable Diameter: 0.225 inches.
7) Applicable UL Designation: Type FPL, 75C.
8) Meet the low capacitance requirements for the manufacture of the fire alarm system being installed.

b. Initiating Circuits:

1) Cable description: 2 conductor shielded or nonshielded cable according to manufacturers requirements and UL 1424 and NEC, articles 725 and 760 - type fire power limited.
2) AWG of Conductors: 16 or 18 solid bare copper.
3) Number of Conductors: Two.
4) Conductor Insulation: 0.020 PVC rated for 105C.
5) Cable Shield: Overall aluminum backed polyester tape shield, aluminum facing outward, and 100 percent shield coverage.
6) Cable Drain: 20 AWG stranded tinned copper.
7) Cable Jacket: 0.015 Red PVC.
8) Nominal Cable Diameter: 0.225 inches.
9) Applicable UL Designation: Type FPL, 75C.
10) Meet the manufacturer's low capacitance requirements for the fire alarm system being installed.

14. Provide lightning protection and transient voltage and surge suppression for the input AC power and all load side circuits.

a. Lightning protection and transient voltage and surge suppression for load side circuits shall be UL 497B listed.

b. Furnish lightning/surge protection integral with panel. Provide additional surge protection at 120 VAC disconnect breaker.

c. Furnish and install additional transient suppression Isolated Loop Circuit Protector devices (ILCP) on fire alarm wiring, (including shield), extending beyond the main building by either aerial, underground, or other methods (walkways, bridges, or other aboveground connectors). The ILCP shall be located as close as practicable to the point the circuits leave or enter the building containing the fire alarm control panel.

1) The ILCP grounding conductor shall be a No.12 AWG minimum wire having a maximum length of 28 feet to be run in as straight a line as practicable and connected to the building grounding electrode system (unified ground) according to Article 800-31 of the National Electrical Code - 1996. The ILCP shall have a line to line response time of less than one nano second capable of accepting 2,000 amps (10 x 50uS pulse).

Line to earth response time shall be less than 25 nano seconds with maximum current of 2,000 amps (8 x 20uS pulse) to earth Shield to earth current shall be 5,000 amps maximum.

2) The ILCP shall be protected by a high dielectric insulating material and be of small enough size to mount in a standard 4-11/16" square by 2-1/8" deep electrical box. Spark gap devices or devices incorporated in or installed within the fire alarm control panel in lieu of the specified ILCP are not acceptable.

C. Sequence of Operation/Alarm Activation:

1. The system shall function as follows when an area or duct detector, manual station, or water flow switch operates:

a. Sound required audible in a march time mode and activate devices and strobes throughout the facility.
b. Display individual detector or zone number on alphanumeric display with user defined message.
c. Light an indicating LED on the device initiating the alarm. Smoke detectors and monitor modules only.
d. Shut down the HVAC system and operate selected dampers.
e. Activate the elevator capture if an elevator related device is activated.
f. Close all magnetically held fire doors.
g. There shall be no limit, other than maximum system capacity, as to the number of intelligent/analog devices that may be in alarm simultaneously.

2. When an alarm has been acknowledged and silenced, the audible devices shall cease to operate but the strobes shall remain on.

a. The block acknowledge feature of addressable system is not allowed and shall be disabled except for system start-up and maintenance.

3. After the alarm has been investigated, it shall be possible to press the recall button in the control panel to emit a steady sound throughout the facility as a recall signal.

a. It shall not be possible to activate the recall before the alarm signal is silenced.
b. The recall button shall be used as a signal to reoccupy the building after a fire and not be for any other purpose.

PART 3 EXECUTION

3.01 INSTALLATION

A. Mount control and other panels with sufficient clearance for observation and testing of the display and panel controls to comply with ADA and Florida Accessibility Code for Building Construction (January 1994 edition), Article 4.27 - Controls and Operating Mechanisms. Provide decal with telephone contact number for warranty work at the inside face of the panel door.

B. Clearly mark fire alarm junction boxes for easy identification according to established color codes as outlined in Section 16112 - Raceway and Conduit. Wiring shall be in conduit, EMT thin-wall or other approved methods, refer to Section 16112 - Raceway and Conduit. Use

flexible metal raceway for devices mounted in suspend ceiling panels. Conduit, mounting boxes, junction boxes, and panels shall be securely hung and fastened with appropriate fittings to insure positive grounding throughout the system.

C. No wiring other than that directly associated with fire alarm detection, alarm, or auxiliary fire protection functions shall be allowed in fire alarm conduits.

1. Avoid wiring splices to the extent possible and, if needed, splices shall be made only in junction boxes and be by NEC approved methods.
2. Transposing or changing color coding of wires is not allowed.
3. Conductors in conduit containing more than 1 wire shall be labeled on each end with "E-Z markers" or accepted equivalent.
4. Conductors in cabinets shall be carefully formed and harnessed so that each drop off directly opposite to its terminal.
5. Cabinet terminals shall be numbered and coded.
6. Provide clearly labeled controls, function switches, etc., on equipment panels.
7. In junction or pull boxes with splices, provide:
    a. Minimum dimension of junction or pull boxes according to NEC Articles 370-18a.1.a. and 370- 18a.2, the conductor size notwithstanding.
    b. Terminal strips.
8. Color Codes:

    a. Signaling Line Circuits: Red jacket with red and black conductors.
    b. Initiating Device Circuits: Red and black.
    c. Notification Appliance Circuit Horns: Brown and orange.
    d. Notification Appliance Circuit Strobes: White and yellow.
    e. Control Circuits for Door Holders and Relays: White and orange.

D. Check and test wiring to insure grounds, opens, or shorts are not present.

E. Manual Pull Stations: Where manual pull stations are indicated on the Drawings, install 4'-0" AFF, with a minimum of 3 inches of clear, flat, wall space all around the devices from door or window trim, wall outlets, wall openings, thermostats, cabinets, shelving, or any other adjacent obstruction. Provide protective covers.

F. Audible Alarms: Mount on walls at least 6 inches below the adjacent surface or at 7'-6" AFF to top of unit, whichever is lower unless otherwise directed by the A/E. Use combination horn/strobe, with protective coves, if proposed location of audible unit is less than 7'-6" AFF or at unsecured or unsupervised occupied locations.

G. Visual Alarms and Combination Horn/Strobes: Mount on walls 80 inches AFF or 6 inches below ceiling whichever is lower. Provide protective covers.

H. Conduit: Run concealed, unless written approval from the City has been received to do otherwise. Refer to Section 16112 - Raceway and Conduit. Exceptions:

1. Electrical/mechanical rooms.

3.02 FIELD QUALITY CONTROL

A. Tests and Reports: Perform electrical and mechanical tests required by NFPA 72 inspection and test form. Test and report costs shall be in the contract price. Submit a check out report in

triplicate, one copy of which will be registered with the equipment manufacturer. The report shall include, but not be limited to:

1. A complete list of equipment installed and wired.
2. Indication that equipment is properly installed and functions and conforms with these specifications.
3. Test of individual zones as applicable.
4. Test of all manual stations and detectors that can be reset.
5. Verification of line supervision of each initiating and indicating circuit.
6. Verification of the Class B operation of each initiating circuit as specified.
7. Verifying the operation of all alarm-initiated functions, including, but not limited to, smoke control, and elevator capture features if used.
8. Written report indicating all area smoke detector sensitivity readings.
9. Written report indicating all AHU duct smoke detector air velocity and sensitivity readings.
10. Technician's name and date.

3.03 DEMONSTRATION

A. Manufacturer's Training:

1. Provide factory level instructional training in the operation, maintenance and programming of the system for designated personnel from the City.
2. At end of training provide:
    a. Training certificates to each trainee.
    b. Installation/user manual to each trainee.

END OF SECTION