3.5 ADJUSTING

A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.6 PAINTING

A. Touching Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05 mm).

B. Touching Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 9 Section "Painting."

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 15060

SECTION 15081 – DUCT INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes semi-rigid and flexible duct, plenum, and breeching insulation; insulating cements; field-applied jackets; accessories and attachments; and sealing compounds.

B. Related Sections include the following:

1. Division 15 Section "Pipe Insulation" for insulation for piping systems.

2. Division 15 Section "Metal Ducts" for duct liner.

1.03 SUBMITTALS

A. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any), for each type of product indicated.

B. Shop Drawings: Show fabrication and installation details for the following:

1. Removable insulation sections at access panels.

2. Application of field-applied jackets.

3. Applications at linkages for control devices.

C. Samples: For each type of insulation and field-applied jacket. Identify each Sample, describing product and intended use. Submit 12-inch- (300-mm-) square sections of each sample material.

1. Manufacturer's Color Charts: Show the full range of colors available for each type of field-applied finish material indicated.

D. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets with requirements indicated. Include dates of tests.

E. Installer Certificates: Signed by the Contractor certifying that installers comply with requirements.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the U.S. Department of Labor, Bureau of Apprenticeship and Training.

B. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.

2. Insulation Installed Outdoors: Flame-spread rating of 75 or less, and smoke-developed rating of 150 or less.

C. Mockups: Before installing insulation, build mockups for each type of insulation and finish listed below to demonstrate quality of insulation application and finishes. Build mockups according to the following requirements, using materials indicated for the completed Work:

1. Include the following mockups:

a. One 10-foot (3-m) section of rectangular straight duct.

b. One 90-degree square elbow and one 90-degree radius elbow.

c. One branch takeoff.

d. One transition fitting.

e. Four support hangers.

2. Build mockups with cutaway sections to allow observation of application details for insulation materials, mastics, attachments, and jackets.

3. Build mockups in the location indicated or, if not indicated, as directed by Architect.

4. Notify Architect seven days in advance of dates and times when mockups will be constructed.

5. Obtain Architect's approval of mockups before starting insulation application.

6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

7. Demolish and remove mockups when directed.

8. Approved mockups may become part of the completed Work if undisturbed at date of Architect's Final Certificate.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Ship insulation materials in containers marked by manufacturer with appropriate ASTM specification designation, type and grade, and maximum use temperature.

1.06 COORDINATION

A. Coordinate clearance requirements with duct Installer for insulation application.

1.07 SCHEDULING

A. Schedule insulation application after testing duct systems. Insulation application may begin on segments of ducts that have satisfactory test results.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Mineral-Fiber Insulation:

a. CertainTeed Manson.

b. Knauf FiberGlass GmbH.

c. Owens-Corning Fiberglas Corp.

d. Schuller International, Inc.

2. Flexible Elastomeric Thermal Insulation:

a. Armstrong World Industries, Inc.

b. Rubatex Corp.

3. Closed-Cell Phenolic-Foam Insulation:

a. Kooltherm Insulation Products, Ltd.

4. Calcium Silicate Insulation:

a. Owens-Corning Fiberglas Corp.

b. Pabco.

c. Schuller International, Inc.

2.02 INSULATION MATERIALS

A. Mineral-Fiber Board Thermal Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IB, without facing and with all-service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film.

B. Mineral-Fiber Blanket Thermal Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II, without facing and with all-service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film.

C. Flexible Elastomeric Thermal Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type II for sheet materials.

1. Adhesive: As recommended by insulation material manufacturer.

2. Ultraviolet-Protective Coating: As recommended by insulation manufacturer.

D. Closed-Cell Phenolic-Foam Insulation: Block insulation of rigid, expanded, closed-cell structure. Comply with ASTM C 1126, Type II, Grade 1.

E. Calcium Silicate Insulation: Flat-, curved-, and grooved-block sections of noncombustible, inorganic, hydrous calcium silicate with a nonasbestos fibrous reinforcement. Comply with ASTM C 533, Type I.

2.03 FIELD-APPLIED JACKETS

A. General: ASTM C 921, Type 1, unless otherwise indicated.

B. Foil and Paper Jacket: Laminated, glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil.

C. PVC Jacket: High-impact, ultraviolet-resistant PVC; 20 mils (0.5 mm) thick; roll stock ready for shop or field cutting and forming.

1. Adhesive: As recommended by insulation material manufacturer.

2. PVC Jacket Color: White or gray.

D. Aluminum Jacket: Deep corrugated sheets manufactured from aluminum alloy complying with ASTM B 209 (ASTM B 209M), and having an integrally bonded moisture barrier over entire surface in contact with insulation. Metal thickness and corrugation dimensions are scheduled at the end of this Section.

1. Finish: Smooth finish.

2. Finish: Cross-crimp corrugated finish.

3. Finish: Stucco-embossed finish.

4. Finish: Factory-painted finish.

5. Moisture Barrier: 1-mil- (0.025-mm-) thick, heat-bonded polyethylene and kraft paper.

E. Stainless-Steel Jacket: Deep corrugated sheets of stainless steel complying with ASTM A 666, Type 304 or 316; 0.10 inch (2.5 mm) thick; and roll stock ready for shop or field cutting and forming to indicated sizes.

1. Moisture Barrier: 1-mil- (0.025-mm-) thick, heat-bonded polyethylene and kraft paper.

2. Moisture Barrier: 3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper.

3. Jacket Bands: Stainless steel, Type 304, 3/4 inch (19 mm) wide.

2.04 ACCESSORIES AND ATTACHMENTS

A. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, presized a minimum of 8 oz./sq. yd. (270 g/sq. m).

1. Tape Width: 4 inches (100 mm).

B. Bands: 3/4 inch (19 mm) wide, in one of the following materials compatible with jacket:

1. Stainless Steel: ASTM A 666, Type 304; 0.020 inch (0.5 mm) thick.

2. Galvanized Steel: 0.005 inch (0.13 mm) thick.

3. Aluminum: 0.007 inch (0.18 mm) thick.

4. Brass: 0.010 inch (0.25 mm) thick.

5. Nickel-Copper Alloy: 0.005 inch (0.13 mm) thick.

C. Wire: 0.080-inch (2.0-mm), nickel-copper alloy; 0.062-inch (1.6-mm), soft-annealed, stainless steel; or 0.062-inch (1.6-mm), soft-annealed, galvanized steel.

D. Weld-Attached Anchor Pins and Washers: Copper-coated steel pin for capacitor-discharge welding and galvanized speed washer. Pin length sufficient for insulation thickness indicated.

1. Welded Pin Holding Capacity: 100 lb (45 kg) for direct pull perpendicular to the attached surface.

E. Adhesive-Attached Anchor Pins and Speed Washers: Galvanized steel plate, pin, and washer manufactured for attachment to duct and plenum with adhesive. Pin length sufficient for insulation thickness indicated.

1. Adhesive: Recommended by the anchor pin manufacturer as appropriate for surface temperatures of ducts, plenums, and breechings; and to achieve a holding capacity of 100 lb (45 kg) for direct pull perpendicular to the adhered surface.

F. Self-Adhesive Anchor Pins and Speed Washers: Galvanized steel plate, pin, and washer manufactured for attachment to duct and plenum with adhesive. Pin length sufficient for insulation thickness indicated.

2.05 VAPOR RETARDERS

A. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.03 GENERAL APPLICATION REQUIREMENTS

A. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; and free of voids throughout the length of ducts and fittings.

B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each duct system.

C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Apply multiple layers of insulation with longitudinal and end seams staggered.

E. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.

F. Keep insulation materials dry during application and finishing.

G. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.

H. Apply insulation with the least number of joints practical.

I. Apply insulation over fittings and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated.

J. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic. Apply insulation continuously through hangers and around anchor attachments.

K. Insulation Terminations: For insulation application where vapor retarders are indicated, seal ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.

L. Apply insulation with integral jackets as follows:

1. Pull jacket tight and smooth.

2. Joints and Seams: Cover with tape and vapor retarder as recommended by insulation material manufacturer to maintain vapor seal.

3. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to duct flanges and fittings.

M. Cut insulation according to manufacturer's written instructions to prevent compressing insulation to less than 75 percent of its nominal thickness.

N. Install vapor-retarder mastic on ducts and plenums scheduled to receive vapor retarders.

1. Ducts with Vapor Retarders: Overlap insulation facing at seams and seal with vapor-retarder mastic and pressure-sensitive tape having same facing as insulation. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-retarder seal.

2. Ducts without Vapor Retarders: Overlap insulation facing at seams and secure with outward clinching staples and pressure-sensitive tape having same facing as insulation.

O. Roof Penetrations: Apply insulation for interior applications to a point even with top of roof flashing.

1. Seal penetrations with vapor-retarder mastic.

2. Apply insulation for exterior applications tightly joined to interior insulation ends.

3. Seal insulation to roof flashing with vapor-retarder mastic.

P. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions.

Q. Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire/smoke damper sleeves for fire-rated wall and partition penetrations.

R. Floor Penetrations: Terminate insulation at underside of floor assembly and at floor support at top of floor.

1. For insulation indicated to have vapor retarders, taper termination and seal insulation ends with vapor-retarder mastic.

3.04 MINERAL-FIBER INSULATION APPLICATION

A. Blanket Applications for Ducts and Plenums: Secure blanket insulation with adhesive and anchor pins and speed washers.

1. Apply adhesives according to manufacturer's recommended coverage rates per square foot, for 100 percent coverage of duct and plenum surfaces.

2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.

3. Install anchor pins and speed washers on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

   a. On duct sides with dimensions 18 inches (450 mm) and smaller, along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.

   b. On duct sides with dimensions larger than 18 inches (450 mm). Space 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from insulation joints. Apply additional pins and clips to hold insulation tightly against surface at cross bracing.

   c. Anchor pins may be omitted from top surface of horizontal, rectangular ducts and plenums.

   d. Do not overcompress insulation during installation.

4. Impale insulation over anchors and attach speed washers.

5. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

6. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from one edge and one end of insulation segment. Secure laps to adjacent insulation segment with 1/2-inch (13-mm) staples, 1 inch (25 mm) o.c., and cover with pressure-sensitive tape having same facing as insulation.

7. Overlap unfaced blankets a minimum of 2 inches (50 mm) on longitudinal seams and end joints. Secure with steel band at end joints and spaced a maximum of 18 inches (450 mm) o.c.

8. Apply insulation on rectangular duct elbows and transitions with a full insulation segment for each surface. Apply insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.

9. Insulate duct stiffeners, hangers, and flanges that protrude beyond the insulation surface with 6-inch- (150-mm-) wide strips of the same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with anchor pins spaced 6 inches (150 mm) o.c.

10. Apply vapor-retarder mastic to open joints, breaks,staples and punctures for insulation indicated to receive vapor retarder.

B. Board Applications for Ducts and Plenums: Secure board insulation with adhesive and anchor pins and speed washers.

1. Apply adhesives according to manufacturer's recommended coverage rates per square foot, for 100 percent coverage of duct and plenum surfaces.

2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.

3. Space anchor pins as follows:

a. On duct sides with dimensions 18 inches (450 mm) and smaller, along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.

b. On duct sides with dimensions larger than 18 inches (450 mm). Space 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from insulation joints. Apply additional pins and clips to hold insulation tightly against surface at cross bracing.

c. Anchor pins may be omitted from top surface of horizontal, rectangular ducts and plenums.

d. Do not overcompress insulation during installation.

4. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

5. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from one edge and one end of insulation segment. Secure laps to adjacent insulation segment with 1/2-inch (13-mm) staples, 1 inch (25 mm) o.c., and cover with pressure-sensitive tape having same facing as insulation.

6. Apply insulation on rectangular duct elbows and transitions with a full insulation segment for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Apply insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.

7. Insulate duct stiffeners, hangers, and flanges that protrude beyond the insulation surface with 6-inch- (150-mm-) wide strips of the same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with anchor pins spaced 6 inches (150 mm) o.c.

8. Apply vapor-retarder mastic to open joints, breaks,staples and punctures for insulation indicated to receive vapor retarder.

3.05 FLEXIBLE ELASTOMERIC THERMAL INSULATION APPLICATION

A. Apply insulation to ducts and plenums as follows:

1. Follow the manufacturer's written instructions for applying insulation.

2. Seal longitudinal seams and end joints with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the duct and plenum surface.

3.06 CLOSED-CELL PHENOLIC-FOAM INSULATION APPLICATION

A. Apply insulation as follows:

1. Secure each layer of insulation to duct with stainless-steel bands at 12-inch (300-mm) intervals and tighten without deforming the insulation materials.

2. Apply two-layer insulation with joints tightly butted and staggered at least 3 inches (75 mm). Secure inner layer with 0.062-inch (1.6-mm), soft-annealed, stainless-steel wire spaced at 12-inch (300-mm) intervals. Secure outer layer with stainless-steel bands at 12-inch (300-mm) intervals.

3. On exposed applications, finish insulation with a skim coat of mineral-fiber, hydraulic-setting cement to surface of installed insulation. When dry, apply flood coat of lagging adhesive and press on one layer of glass cloth or tape. Overlap edges at least 1 inch (25 mm). Apply finish coat of lagging adhesive over glass cloth or tape. Thin the finish coat to achieve smooth finish.

3.07 CALCIUM SILICATE INSULATION APPLICATION

A. Apply insulation according to the manufacturer's written instructions and as follows:

1. Secure single layer of insulation to duct with stainless-steel bands. Tighten bands without deforming the insulation material.

2. Apply two-layer insulation with joints tightly butted and staggered at least 3 inches (75 mm). Secure inner layer with 0.062-inch (1.6-mm), soft-annealed, stainless-steel wire. Secure outer layer with stainless-steel bands.

3. On exposed applications, without metal jacket, finish insulation with a skim coat of mineral-fiber, hydraulic-setting cement to surface of installed insulation. When dry, apply flood coat of lagging adhesive and press on one layer of glass cloth or tape. Overlap edges at least 1 inch (25 mm). Apply finish coat of lagging adhesive over glass cloth or tape. Thin the finish coat to achieve smooth finish.

3.08 FIELD-APPLIED JACKET APPLICATION

A. Apply glass-cloth jacket, where indicated, directly over bare insulation or insulation with factory-applied jackets.

1. Apply jacket smooth and tight to surface with 2-inch (50-mm) overlap at seams and joints.

2. Embed glass cloth between two 0.062-inch- (1.6-mm-) thick coats of jacket manufacturer's recommended adhesive.

3. Completely encapsulate insulation with jacket, leaving no exposed raw insulation.

3.09 FINISHES

A. Glass-Cloth Jacketed Insulation: Paint insulation finished with glass-cloth jacket as specified in Division 9 Section "Painting."

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

3.010 DUCT SYSTEM APPLICATIONS

A. Insulation materials and thicknesses are specified in schedules at the end of this Section.

B. Materials and thicknesses for systems listed below are specified in schedules at the end of this Section.

C. Insulate the following plenums and duct systems:

1. Indoor concealed supply, and outside-air ductwork.

2. Indoor exposed supply, and outside-air ductwork.

D. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:

1. Fibrous-glass ducts.

2. Metal ducts with duct liner.

3. Factory-insulated flexible ducts.

4. Factory-insulated plenums, casings, terminal boxes, and filter boxes and sections.

5. Flexible connectors.

6. Vibration-control devices.

7. Testing agency labels and stamps.

8. Nameplates and data plates.

9. Supply ducts in air conditioned spaces.

10. Access panels and doors in air-distribution systems.

3.011 INDOOR DUCT AND PLENUM APPLICATION SCHEDULE

A. Service: Round, supply-air ducts, concealed.

1. Material: Mineral-fiber blanket.

2. Thickness: [1-1/2 inches (38 mm).

3. Number of Layers: One.

4. Field-Applied Jacket: Foil and paper.

5. Vapor Retarder Required: Yes.

B. Service: Round, outside-air ducts, concealed.

1. Material: Mineral-fiber blanket.

2. Thickness: 1-1/2 inches (38 mm).

3. Number of Layers: One.

4. Field-Applied Jacket: Foil and paper.

5. Vapor Retarder Required: Yes.

C. Service: Rectangular, supply-air ducts, concealed.

1. Material: Mineral-fiber blanket.

2. Thickness: 1-1/2 inches (38 mm).

3. Number of Layers: One.

4. Field-Applied Jacket: Foil and paper.

5. Vapor Retarder Required: Yes.

D. Service: Rectangular, outside-air ducts, concealed.

1. Material: Mineral-fiber blanket.

2. Thickness: 1-1/2 inches (38 mm)].

3. Number of Layers: One.

4. Field-Applied Jacket: Foil and paper.

5. Vapor Retarder Required: Yes.

E. Service: Round, supply-air ducts, exposed.

1. Material: Mineral-fiber board.
2. Thickness: 1-1/2 inches (38 mm).
3. Number of Layers: One.
4. Field-Applied Jacket: Foil and paper, ASJ Finish.
5. Vapor Retarder Required: Yes.

F. Service: Round, outside-air ducts, exposed.

1. Material: Mineral-fiber blanket.
2. Thickness: 2 inches (52 mm).
3. Number of Layers: One.
4. Field-Applied Jacket: Foil and paper, ASJ Finish.
5. Vapor Retarder Required: Yes.

G. Service: Rectangular, supply-air ducts, exposed.

1. Material: Mineral-fiber board.
2. Thickness: 1-1/2 inches (38 mm)].
3. Number of Layers: One.
4. Field-Applied Jacket: Foil and paper, ASJ Finish.
5. Vapor Retarder Required: Yes.

H. Service: Rectangular, outside-air ducts, exposed.

1. Material: Mineral-fiber board.
2. Thickness: 2 inches (52 mm)].
3. Number of Layers: One.
4. Field-Applied Jacket: Foil and paper, ASJ Finish.
5. Vapor Retarder Required: Yes.

END OF SECTION 15081

SECTION 15143 – AIR-SOURCE UNITARY HEAT PUMPS

PART 1 – GENERAL

1.1 DESCRIPTION

A. This Section specifies electrically operated air-source unitary heat pumps.

B. Definitions:

1. Coefficient of Performance (COP) - Cooling: The ratio of the rate of heat removed to the rate of energy input in consistent units, for a complete refrigerating system or some specific portion of that system under designated operating conditions.
2. Coefficient of Performance (COP) - Heating: The ratio of the rate of heat delivered to the rate of energy input is consistent units for a complete heat pump system, including the compressor and, if applicable, auxiliary heat under designated operating conditions.
3. Energy Efficiency Ratio (EER): The ratio of net cooling capacity is Btu/h to total rate of electricity input in watts under designated operating conditions.
4. Heating Seasonal Performance Factor (HSPF) - Total heating output of heat pump during its normal annual usage period for heating in Btu/h divided by total electric energy input in watts during the same period.
5. Seasonal Energy Efficiency Ratio (SEER) - Total cooling output of an air conditioner during its normal annual usage period for cooling in Btu/h divided by total electric energy input in watts during the same period.
6. Air-Source Unitary Heat Pump: One or more factory made assemblies that normally include an indoor conditioning coil, compressor(s) and an outdoor refrigerant-to-air coil. These units provide both heating and cooling functions.

1.2 RELATED WORK

A. Section 01 00 00, GENERAL REQUIREMENTS: For pre-test requirements.

C. Section 23 05 11, COMMON WORK RESULTS FOR HVAC: General mechanical requirements and items, which are common to more than one section of Division 23.

D. Section 23 23 00, REFRIGERANT PIPING: Requirements for field refrigerant piping.

E. Section 23 31 00, HVAC DUCTS AND CASINGS: Requirements for sheet metal ductwork.

F. Section 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC: Requirements for controls and instrumentation.

G. Section 23 05 93, TESTING, ADJUSTING, AND BALANCING FOR HVAC: Requirements for testing, adjusting and balancing of HVAC system.

H. Section 23 08 00 – COMMISSIONING OF HVAC SYSTEMS: Requirements for commissioning, systems readiness checklists, and training.

I. Section 01 91 00 – GENERAL COMMISSIONING REQUIREMENTS

1.3 QUALITY ASSURANCE:

A. Refer to specification Section 23 05 11, COMMON WORK RESULTS FOR HVAC

B. Comply with ASHRAE Standard 15, Safety Code for Mechanical Refrigeration.

C. Comply with ASHRAE Standard 90.1-2010, Energy Standard for Buildings except Low-Rise Residential Buildings for cooling and heating performance requirements when tested in accordance with AHRI and UL 1995.

D. Heating Performance shall conform to ASHRAE requirements when tested in accordance with AHRI 210and UL 1995.

1.4 SUBMITTALS

A. Submit in accordance with specification Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES.

B. Manufacturer's Literature and Data.

1. Air-Source Unitary Heat pump:

a. Packaged units

b. Split system

C. Certification: Submit, simultaneously with shop drawings, a proof of certification that this product has been certified by AHRI.

D. Performance Rating: Submit catalog selection data showing equipment ratings and compliance with required cooling and heating capacities EER and COP values as applicable.

E. Completed System Readiness Checklists provided by the Commissioning Agent and completed by the contractor, signed by a qualified technician and dated on the date of completion, in accordance with the requirements of Section 23 08 00 COMMISSIONING OF HVAC SYSTEMS.

1.5 APPLICABLE PUBLICATIONS:

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

B. Federal Specification (Fed. Spec.):

A-A-50502-90 .....Air-conditioner (UNITARY HEAT PUMP), AIR TO AIR (3000 TO 300,000 BTUH)

C. Air-Conditioning Heating and Refrigeration Institute (AHRI) Standards:

AHRI-DCPP.....Directory of Certified Product Performance - Applied Directory of Certified Products

210/240-08 .....Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment

270-08 .....Sound Rating of Outdoor Unitary Equipment

310/380-04 .....Standard for Packaged Terminal Air-Conditioners and Heat Pumps (CSA-C744-04)

340/360-07 .....Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment

D. Air Movement and Control Association (AMCA):

210-07 .....Laboratory Methods of Testing Fans for Aerodynamic Performance Rating (ANSI)

410-96 .....Recommended Safety Practices for Users and Installers of Industrial and Commercial Fans

E. American National Standards Institute (ANSI):

S12.51-02 (R2007).....Acoustics - Determination of Sound Power Levels of Noise Sources Using Sound Pressure - Precision Method for Reverberation Rooms (same as ISO 3741:1999)

F. American Society of Heating, Refrigerating and Air-Conditioning Engineers Inc (ASHRAE):

15-10 .....Safety Standard for Refrigeration Systems (ANSI)

62.1-10 .....Ventilation for Acceptable Indoor Air Quality (ANSI)

90.1-07 .....Energy Standard for Buildings except Low-Rise Residential Buildings

2008 Handbook.....HVAC Systems and Equipment

G. American Society of Testing and Materials (ASTM):

B117-09.....Standard Practice for Operating Salt Spray (Fog) Apparatus

H. National Electrical Manufacturer's Association (NEMA):

MG 1-09 (R2010).....Motors and Generators (ANSI)

ICS 1-00 (R2005).....Industrial Controls and Systems: General Requirements

I. National Fire Protection Association (NFPA):

90A-09 .....Standard for the Installation of Air-Conditioning and Ventilating Systems

J. Underwriters Laboratory (UL):

1995-05 .....Heating and Cooling Equipment

PART II- PRODUCTS

2.1 UNITARY HEAT PUMPS, AIR TO AIR

A. Units shall comply with Fed Spec A-A-50502Type I, having factory assembled refrigerant circuit or circuits (Packaged Unit), Type II, (Split System) having remote outdoor section separate from indoor Section, Class 1, "Department of Energy" (DOE) covered products (units with cooling capacity up to 65000 Btu/hr// Class 2, Non–DOE covered products (units with cooling capacity up to 300,000 Btu/hr.

1. Unitary heat pumps shall bear the United States Environmental Protection Agency, Energy Star label and shall have a minimum Heating Season Performance Factor (HSPF) of 8

B. Applicable AHRI Standards: Units shall be listed in the corresponding ARI Directory of Certified products shown in paragraph, APPLICABLE PUBLICATIONS:

1. Air Source Unitary heat pumps with capacity less than 19 KW (65,000 Btu/hr), Comply with AHRI 210/240.
2. Air Source heat pump with capacity above 19KW (above 65,000 Btu/hr, Comply with AHRI 340/360.

C. Casing: Unit shall be constructed of zinc coated, galvanized steel. Exterior surfaces shall be cleaned, phosphatized, and finished with a weather-resistant baked enamel finish. Unit surfaces shall be tested 500 hours in a salt spray test in compliance with ASTM B117. Cabinet panels shall have lifting handles and shall be water- and air-tight seal. All exposed vertical, top covers and base pan shall be insulated with 13-mm (1/2–inch) fire-resistant, odorless, glass fiber material. Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2010. The base of the unit shall have provisions for forklift and crane lifting.

D. Filters: One inch, MERV 7, throwaway filter shall be standard on all units below 19kW (6 Tons). Filter rack can be converted to two inch capability. Two inch, MERV 8, throwaway filters shall be factory supplied on all units above 19 kW (6 Tons).

E. Compressors: Compressors shall be direct-drive, hermetic scroll type with centrifugal type oil pumps. Motor shall be suction gas-cooled. Internal overloads and crankcase heaters shall be utilized with all compressors.

F. Refrigerant Circuit: A minimum of two circuits is required. Each refrigerant circuit shall have independent fixed orifice or thermostatic expansion devices, service pressure ports, and refrigerant line filter driers factory installed as standard. An area shall be provided for replacement suction line driers.

G. Evaporator and Condenser Coils: Internally finned, DN 10 (NPS 3/8) copper tubes mechanically bonded to a configured aluminum plate fin shall be standard. The evaporated coil and condenser coil shall be leak tested at the factory to 1378 kPa (200 psig) and pressure tested to 2756 kPa (400 psig). All dual compressor units shall have intermingled evaporator coils. Sloped condensate drain pans shall be provided.

H. Outdoor fans: Direct driven, statically and dynamically balanced, draw-through in the vertical discharge position. The fan motors shall be permanently lubricated and shall have built-in thermal overload protection.

I. Indoor Fan:

1. Forward-Curved, Centrifugal Fan: Provide V-belt driven with adjustable motor sheaves //adjustable idler-arm assembly for quick-adjustment of fan belts and motor sheaves//. Motors shall be thermally protected. Provide oversized motors for high static application. Motors shall meet the U.S. Energy Policy Act of 2005 (EPACT

J. Defrost Controls: A time initiated, temperature terminated defrost system shall ship with a setting of 70-minute cycle, with a choice of 50- or 90-minute cycle. Timed override limits defrost cycle to 10 minutes shall be available on units from 35- to 70-kW (10 to 20 tons). Adaptive demand defrost shall be provided on units below 35 kW (10 Tons).

K. Unit Electrical

1. Provide single point unit power connection.
2. Unit control box shall be located within the unit and shall contain controls for compressor, reversing valve and fan motor operation and shall have a 50 VA 24-volt control circuit transformer and a terminal block for low voltage field wiring connections.
3. Safety Controls - High pressure, low temperature, and low pressure safety switches shall be wired through a latching lockout circuit to hold the conditioner off until it is reset electrically be interrupting the power supply to the conditioner. All safety switches shall be normally closed, opening upon fault detection.

L. Operating Controls

1. Provide unit with low voltage electric controls.

2. Low voltage, adjustable room thermostat to control heating and cooling in sequence with delay between stages, compressor and supply fan to maintain temperature setting. Include system selector switch (heat-off-cool.

M. Accessories:

1. Electric Heater: Constructed of heavy-duty nickel chromium elements. Staging shall be achieved through the unit control processor. Each heater shall have automatically reset high limit control. Heaters shall be individually fused from the factory and shall comply with NEC and CEC requirements. Power assemblies shall provide single point connection. Electric heat modules shall be listed and labeled by a national recognized testing laboratory acceptable to authorities having jurisdiction. Electric heater controls shall confirm the supply fan is operating before electric elements are energized. Operate electric heater in 2 stages when outdoor ambient is too low to maintain space thermostat setting with compressor operation.

2.2 CORROSION PROTECTION

A. Remote Outdoor Condenser Coils:

1. Epoxy Immersion Coating – Electrically Deposited: The multi-stage corrosion-resistant coating application comprises of cleaning (heated alkaline immersion bath) and reverse-osmosis immersion rinse prior to the start of the coating process. The coating thickness shall be maintained between 0.6-mil and 1.2-mil. Before the coils are subjected to high-temperature oven cure, they are treated to permeate immersion rinse and spray. Where the coils are subject to UV exposure, UV protection spray treatment comprising of UV-resistant urethane mastic topcoat shall be applied. Provide complete coating process traceability for each coil and minimum five years of limited warranty. The coating process shall be such that uniform coating thickness is maintained at the fin edges. The quality control shall be maintained by ensuring compliance to the applicable ASTM Standards for the following:

a. Salt Spray Resistance (Minimum 6,000 Hours)
b. Humidity Resistance (Minimum 1,000 Hours)
c. Water Immersion (Minimum 260 Hours)
d. Cross-Hatch Adhesion (Minimum 4B-5B Rating)
e. Impact Resistance (Up to 160 Inch/Pound)

B. Exposed Outdoor Cabinet:

1. Casing Surfaces (Exterior and Interior): All exposed and accessible metal surfaces shall be protected with a water-reducible acrylic with stainless steel pigment spray-applied over the

manufacturer's standard finish. The spray coating thickness shall be 2-4 mils and provide minimum salt-spray resistance of 1,000 hours (ASTM B117) AND 500 hours UV resistance (ASTM D4587).

PART 3- EXECUTION

3.1 INSTALLATION

A. Install heat pumps according to manufacturers printed instructions.

B. Install electrical and control devices furnished by the manufacturer but not specified to be factory mounted. All electrical work shall comply with Division 26 Sections.

C. Ductwork: Comply with requirements in Section 23 31 00, HVAC DUCTS AND CASINGS.

D. Piping: Comply with requirements in Section 23 23 00, REFRIGERANT PIPING.

3.2 STARTUP AND TESTING:

A. Perform startup checks according to manufacturer's written instructions.

B. Test controls and demonstrate its compliance with project requirements. Replace damaged or malfunctioning controls and equipment and retest the equipment to the satisfaction of the Resident Engineer.

C. Furnish test reports to the Senior Resident Engineer in accordance with specification Section 01 00 00, GENERAL REQUIREMENTS.

3.3 INSTRUCTIONS

Provide services of manufacturer's technical representative for four hours to instruct VA personnel in operation and maintenance of heat pumps.

3.4 STARTUP AND TESTING

A. The Commissioning Agent will observe startup and contractor testing of selected equipment. Coordinate the startup and contractor testing schedules with the Resident Engineer and Commissioning Agent. Provide a minimum of 7 days prior notice.

3.5 DEMONSTRATION AND TRAINING

A. Provide services of manufacturer's technical representative for four hours to instruct personnel in operation and maintenance of units.

END OF SECTION 15143

SECTION 15183 – REFRIGERANT PIPING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Field refrigerant piping for direct expansion HVAC systems

B. Definitions:

1. Refrigerating system: Combination of interconnected refrigerant-containing parts constituting one closed refrigeration circuit in which a refrigerant is circulated for the purpose of extracting heat.

a. Low side means the parts of a refrigerating system subjected to evaporator pressure.

b. High side means the parts of a refrigerating system subjected to condenser pressure.

2. Brazed joint: A gas-tight joint obtained by the joining of metal parts with alloys which melt at temperatures higher than 449 degrees C (840 degrees F) but less than the melting temperatures of the joined parts.

1.2 RELATED WORK

A. 15846 Dehumidification Unit

1.3 QUALITY ASSURANCE

A. Comply with ASHRAE Standard 15, Safety Code for Mechanical Refrigeration. The application of this Code is intended to assure the safe design, construction, installation, operation, and inspection of every refrigerating system employing a fluid which normally is vaporized and liquefied in its refrigerating cycle.

C. Comply with ASME B31.5: Refrigerant Piping and Heat Transfer Components.

D. Products shall comply with UL 207 "Refrigerant–Containing Components and Accessories, "Nonelectrical"; or UL 429 "Electrical Operated Valves."

1.4 SUBMITTALS

A. Submit in accordance with specification Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Shop Drawings:

1. Sufficient information for components noted, including valves and refrigerant piping accessories, clearly presented, shall be included to determine compliance with drawings and specifications for components noted below:

a. Tubing and fittings
b. Valves
c. Strainers
d. Moisture-liquid indicators
e. Filter-driers
f. Flexible metal hose
g. Liquid-suction interchanges
h. Oil separators (when specified)
i. Gages
j. Pipe and equipment supports
k. Refrigerant and oil
l. Pipe/conduit roof penetration cover
m. Soldering and brazing materials

2. Layout of refrigerant piping and accessories, including flow capacities, valves locations, and oil traps slopes of horizontal runs, floor/wall penetrations, and equipment connection details.

C. Certification: Copies of certificates for welding procedure, performance qualification record and list of welders' names and symbols.

D. Design Manual: Furnish two copies of design manual of refrigerant valves and accessories.

1.5 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

B. Air Conditioning and Refrigeration Institute (ARI):

495-05 .....Standard for Refrigerant Liquid Receivers

730-05 .....Flow Capacity Rating of Suction-Line Filters and Suction-Line Filter-Driers

750-01 .....Thermostatic Refrigerant Expansion Valves

760-01 .....Solenoid Valves for Use with Volatile Refrigerants

C. American Society of Heating Refrigerating and Air Conditioning Engineers (ASHRAE):

15-04 .....Safety Standard for Refrigeration Systems (ANSI)

17-98 (RA2003) .....Method of Testing Capacity of Thermostatic Refrigerant Expansion Valves (ANSI)

63.1-95 (RA 01) .....Method of Testing Liquid Line Refrigerant Driers (ANSI)

D. American National Standards Institute (ANSI):

A13.1-96 (REAF 2002).....Scheme for Identification of Piping Systems

Z535.1-02.....Safety Color Code

E. American Society of Mechanical Engineers (ASME):

B16.22-2001.....Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings (ANSI)

B16.24-2001.....Cast Copper Alloy Pipe Flanges and Flanged Fittings, Class 150, 300, 400, 600, 900, 1500 and 2500 (ANSI)

B31.5-2001 (ADA 2004).....Refrigeration Piping and Heat Transfer Components (ANSI)

B40.100-05.....Pressure Gauges and Gauge Attachments

B40.200-01.....Thermometers, Direct Reading and Remote Reading

F. American Society for Testing and Materials (ASTM)

A126-04.....Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings

B32-04.....Standard Specification for Solder Metal

B88-03.....Standard Specification for Seamless Copper Water Tube

B88M-05.....Standard Specification for Seamless Copper Water Tube (Metric)

B280-03.....Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service

G. American Welding Society, Inc. (AWS):

Brazing Handbook

A5.8/A5.8M-04.....Standard Specification for Filler Metals for Brazing and Braze Welding

H. Federal Specifications (Fed. Spec.)

Fed. Spec. GG

H. Underwriters Laboratories (U.L.):

U.L.207-01 (Rev.2004).....Standard for Refrigerant-Containing Components and Accessories, Nonelectrical

U.L.429-99 (Rev.2006).....Standard for Electrically Operated Valves

2.1 PIPING AND FITTINGS

A. Refrigerant Piping: Copper refrigerant tube, ASTM B280, cleaned, dehydrated and sealed, marked ACR on hard temper straight lengths. Coils shall be tagged ASTM B280 by the manufacturer.

B. Fittings, Valves and Accessories:

1. Solder joints: Wrought copper fittings, ASME B16.22.
   a. Solder, refrigerant tubing: Cadmium free, AWS A5.8/A5.8M, 45 percent silver brazing alloy, Class BAg-5.
   b. Solder, water and drain: 95-5 tin-antimony, ASTM B32 (95TA).
2. Flanges and flanged fittings: ASME B16.24.
3. Refrigeration Valves:
   a. Stop Valves: Brass or bronze alloy, packless, or packed type with gas tight cap, frost proof, backseating.
   b. Pressure Relief Valves: Comply with ASME Boiler and Pressure Vessel Code; UL listed. Forged brass with nonferrous, corrosion resistant internal working parts of high strength, cast iron bodies conforming to ASTM A126, Grade B. Set valves in accordance with ASHRAE Standard 15.
   c. Solenoid Valves: Comply with ARI 760 and UL 429, UL-listed, two-position, direct acting or pilot-operated, moisture and vapor-proof type of corrosion resisting materials, designed for intended service, and solder-end connections.
   d. Thermostatic Expansion Valves: Comply with ARI 750. Brass body with stainless-steel or non-corrosive non ferrous internal parts, diaphragm and spring-loaded (direct-operated) type with sensing bulb and distributor having side connection for hot-gas bypass and external equalizer. Size and operating characteristics as recommended by manufacturer of evaporator and factory set for superheat requirements. Solder-end connections. Testing and rating in accordance with ASHRAE Standard 17.
   e. Check Valves: Brass or bronze alloy with swing or lift type, with tight closing resilient seals for silent operation; designed for low pressure drop, and with solder-end connections. Direction of flow shall be legibly and permanently indicated on the valve body.
4. Strainers: Designed to permit removing screen without removing strainer from piping system, and provided with screens 80 to 100 mesh in liquid lines DN 25 (NPS 1) and smaller, 60 mesh in liquid lines larger than DN 25 (NPS 1), and 40 mesh in suction lines. Provide

strainers in liquid line serving each thermostatic expansion valve, and in suction line serving each refrigerant compressor not equipped with integral strainer.

5. Refrigerant Moisture/Liquid Indicators: Double-ported type having heavy sight glasses sealed into forged bronze body and incorporating means of indicating refrigerant charge and moisture indication. Provide screwed brass seal caps.
6. Refrigerant Filter-Dryers: UL listed, angle or in-line type, as shown on drawings. Conform to ARI Standard 730 and ASHRAE Standard 63.1. Heavy gage steel shell protected with corrosion-resistant paint; perforated baffle plates to prevent desiccant bypass. Size as recommended by manufacturer for service and capacity of system with connection not less than the line size in which installed. Filter driers with replaceable filters shall be furnished with one spare element of each type and size.
7. Flexible Metal Hose: Seamless bronze corrugated hose, covered with bronze wire braid, with standard copper tube ends. Provide in suction and discharge piping of each compressor.

8. Liquid-Suction Heat Exchanger: Designed for counter flow and for free drainage of oil. Size shall suit system conditions and refrigerant used. Interchangers shall be ASME construction or UL listed.

10. Oil Separators: Provide for condensing units, as shown. All welded steel construction with capacity to eliminate a minimum of 95 percent of the oil from the hot gas flowing through it. Provide manufacturer's published ratings for minimum and maximum refrigeration tonnage corresponding to this oil separating efficiency. Separator shall be equipped with a float valve to prevent return of the hot gas to crankcase, and shall have isolating stop valves so it can be opened and services without pumping out any other part of the system. ASME construction or UL listed.

/11. Receivers: Conform to ARI 495, steel construction, equipped with tappings for liquid inlet and outlet valves, pressure relief valve and liquid level indicator.

2.2 GAGES

A. Temperature Gages: Comply with ASME B40.200. Industrial-duty type and in required temperature range for service in which installed. Gages shall have Celsius scale in 1-degree (Fahrenheit scale in 2-degree) graduations and with black number on a white face. The pointer shall be adjustable. Rigid stem type temperature gages shall be provided in thermal wells located within 1525 mm (5 feet) of the finished floor. Universal adjustable angle type or remote element type temperature gages shall be provided in thermal wells located 1525 to 2135 mm (5 to 7 feet)

above the finished floor. Remote element type temperature gages shall be provided in thermal wells located 2135 mm (7 feet) above the finished floor.

B. Vacuum and Pressure Gages: Comply with ASME B40.100 and provide with throttling type needle valve or a pulsation dampener and shut-off valve. Gage shall be a minimum of 90 mm (3-1/2 inches) in diameter with a range from 0 kPa (0 psig) to approximately 1.5 times the maximum system working pressure. Each gage range shall be selected so that at normal operating pressure, the needle is within the middle-third of the range.
   1. Suction: 101 kPa (30 inches Hg) vacuum to 1723 kPa (gage) (250 psig).
   2. Discharge: 0 to 3445 kPa (gage) (0 to 500 psig).

2.6 REFRIGERANTS AND OIL

Provide required refrigerant and oil for proper system operation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install refrigerant piping and refrigerant containing parts in accordance with ASHRAE Standard 15 and ASME B31.5
   1. Install piping as short as possible, with a minimum number of joints, elbow and fittings.
   2. Install piping with adequate clearance between pipe and adjacent walls and hangers to allow for service and inspection. Space piping, including insulation, to provide 25 mm (1 inch) minimum clearance between adjacent piping or other surface. Use pipe sleeves through walls, floors, and ceilings, sized to permit installation of pipes with full thickness insulation.
   3. Locate and orient valves to permit proper operation and access for maintenance of packing, seat and disc. Generally locate valve stems in overhead piping in horizontal position. Provide a union adjacent to one end of all threaded end valves. Control valves usually require reducers to connect to pipe sizes shown on the drawing.
   4. Use copper tubing in protective conduit when installed below ground.
   6. Install hangers and supports per ASME B31.5 and the refrigerant piping manufacturer's recommendations.

B. Joint Construction:
   1. Brazed Joints: Comply with AWS "Brazing Handbook" and with filler materials complying with AWS A5.8/A5.8M.

a. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper tubing.
b. Use Type BAg, cadmium-free silver alloy for joining copper with bronze or steel.
c. Swab fittings and valves with manufacturer's recommended cleaning fluid to remove oil and other compounds prior to installation.
d. Pass nitrogen gas through the pipe or tubing to prevent oxidation as each joint is brazed. Cap the system with a reusable plug after each brazing operation to retain the nitrogen and prevent entrance of air and moisture.

C. Protect refrigerant system during construction against entrance of foreign matter, dirt and moisture; have open ends of piping and connections to compressors, condensers, evaporators and other equipment tightly capped until assembly.

D. Pipe relief valve discharge to outdoors for systems containing more than 45 kg (100 lbs) of refrigerant.

E. Firestopping: Fill openings around uninsulated piping penetrating floors or fire walls, with firestop material.

3.3 SIGNS AND IDENTIFICATION

A. Each refrigerating system erected on the premises shall be provided with an easily legible permanent sign securely attached and easily accessible, indicating thereon the name and address of the installer, the kind and total number of pounds of refrigerant required in the system for normal operations, and the field test pressure applied.

B. Systems containing more than 50 kg (110 lb) of refrigerant shall be provided with durable signs, in accordance with ANSI A13.1 and ANSI Z535.1, having letters not less than 13 mm (1/2 inch) in height designating:

1. Valves and switches for controlling refrigerant flow, the ventilation and the refrigerant compressor(s).
2. Signs on all exposed high pressure and low pressure piping installed outside the machinery room, with name of the refrigerant and the letters "HP" or "LP."

3.4 FIELD QUALITY CONTROL

Prior to initial operation examine and inspect piping system for conformance to plans and specifications and ASME B31.5. Correct equipment, material, or work rejected because of defects or nonconformance with plans and specifications, and ANSI codes for pressure piping.

3.4 FIELD TESTS

A. After completion of piping installation and prior to initial operation, conduct test on piping system according to ASME B31.5. Furnish materials and equipment required for tests. Perform tests in the presence of Resident Engineer. If the test fails, correct defects and perform the test again until it is satisfactorily done and all joints are proved tight.
   1. Every refrigerant-containing parts of the system that is erected on the premises, except compressors, condensers, evaporators, safety devices, pressure gages, control mechanisms and systems that are factory tested, shall be tested and proved tight after complete installation, and before operation.
   2. The high and low side of each system shall be tested and proved tight at not less than the lower of the design pressure or the setting of the pressure-relief device protecting the high or low side of the system, respectively, except systems erected on the premises using non-toxic and non-flammable Group A1 refrigerants with copper tubing not exceeding DN 18 (NPS 5/8). This may be tested by means of the refrigerant charged into the system at the saturated vapor pressure of the refrigerant at 20 degrees C (68 degrees F) minimum.

B. Test Medium: A suitable dry gas such as nitrogen or shall be used for pressure testing. The means used to build up test pressure shall have either a pressure-limiting device or pressure-reducing device with a pressure-relief device and a gage on the outlet side. The pressure relief device shall be set above the test pressure but low enough to prevent permanent deformation of the system components.

3.5 SYSTEM TEST AND CHARGING

A. System Test and Charging: As recommended by the equipment manufacturer or as follows:
   1. Connect a drum of refrigerant to charging connection and introduce enough refrigerant into system to raise the pressure to 70 kPa (10 psi) gage. Close valves and disconnect refrigerant drum. Test system for leaks with halide test torch or other approved method suitable for the test gas used. Repair all leaking joints and retest.
   2. Connect a drum of dry nitrogen to charging valve and bring test pressure to design pressure for low side and for high side. Test entire system again for leaks.
   3. Evacuate the entire refrigerant system by the triplicate evacuation method with a vacuum pump equipped with an electronic gage reading in mPa (microns). Pull the system down to 665 mPa (500 microns) 665 mPa (2245.6 inches of mercury at 60 degrees F) and hold for four hours then break the vacuum with dry nitrogen (or refrigerant). Repeat the evacuation

two more times breaking the third vacuum with the refrigeration to be charged and charge with the proper volume of refrigerant.

END OF SECTION 15183

SECTION 15194 – FUEL GAS PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes fuel gas piping, specialties, and accessories within the building.

1.03 PROJECT CONDITIONS

A. Gas System Pressures: Two pressure ranges. Primary pressure is more than 0.5 psig (3.45 kPa) but not more than 60 psig, and is reduced to secondary pressure of 10 psig or less.

B. Design values of fuel gas supplied for these systems are as follows:

1. Nominal Heating Value: 1000 Btu/cu. ft. (37.3 MJ/cu. m).

2. Nominal Specific Gravity: 0.6.

1.04 SUBMITTALS

A. Product Data: For the following:

1. Corrugated, stainless-steel tubing systems. Include associated components.

2. Specialty valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.

3. Service-meter bars. Include service-meter size of selected models.

4. Service meters. Include pressure rating and capacity of selected models.

5. Service-meter bypass fittings.

6. Pressure regulators. Include pressure rating, capacity, and settings of selected models.

B. Shop Drawings: For fuel gas piping. Include plans and attachments to other Work

1. Wiring Diagrams: Power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.

C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

D. Maintenance Data: For natural gas specialties and accessories to include in maintenance manuals specified in Division 1.

1.05 QUALITY ASSURANCE

A. Electrical Components and Devices: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. ANSI Standard: Comply with ANSI Z223.1, "National Fuel Gas Code."

C. FM Standard: Provide components listed in FM's "Fire Protection Approval Guide" if specified to be FM approved.

D. IAS Standard: Provide components listed in IAS's "Directory of A. G. A. and C. G. A Certified Appliances and Accessories" if specified to be IAS listed.

E. UL Standard: Provide components listed in UL's "Gas and Oil Equipment Directory" if specified to be UL listed.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Handling Flammable Liquids: Remove and legally dispose of liquids from drips in existing gas piping. Handle cautiously to avoid spillage and ignition. Notify fuel gas supplier. Handle flammable liquids used by Installer with proper precautions and do not leave on premises from end of one day to beginning of next day.

1.07 COORDINATION

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

1. Notify Architect not less than two days in advance of proposed utility interruptions.

2. Do not proceed with utility interruptions without Architect's written permission.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Corrugated, Stainless-Steel Tubing Systems:

a. Omega Flex, Inc.

b. Titeflex Corp.

c. Tru-Flex Metal Hose Corp.

d. Ward Manufacturing, Inc.

2. Gas Valves, NPS 2 (DN 50) and Smaller:

a. BMI Canada, Inc.

b. Crane Valves.

c. Dungs: Karl Dungs, Inc.

d. Flow Control Equipment, Inc.

e. Grinnell Corp.

f. Honeywell, Inc.

g. Jomar International, Ltd.

h. Kitz Corp. of America.

i. Legend Valve and Fitting, Inc.

j. Lyall: R. W. Lyall & Co., Inc.

k. McDonald: A. Y. McDonald Mfg. Co.

l. Milwaukee Valve Co., Inc.

m. Mueller Co.; Mueller Gas Products Div.

n. Nibco, Inc.

o. Red-White Valve Corp.

p. Velan Valve Corp.

q. Watts Industries, Inc.; Water Products Div.

3. Plug Valves, NPS 2-1/2 (DN 65) and Larger:

a. Flow Control Equipment, Inc.

b. Milliken Valve Co., Inc.

c. Nordstrom Valves, Inc.

d. Olson Technologies, Inc.; Homestead Valve Div.

e. Walworth Co.

4. Line Pressure Regulators:

a. American Meter Co.

b. Donkin: Bryan Donkin RMG Canada, Ltd.

c. Eclipse Combustion, Inc.

d. Equimeter, Inc.

e. Fisher Controls International, Inc.

f. Maxitrol Co.

g. National Meter.

h. Richards Industries, Inc.; Jordan Valve Div.

i. Schlumberger Industries; Gas Div.

5. Appliance Pressure Regulators:

a. Canadian Meter Co., Inc.

b. Eaton Corp.; Controls Div.

c. Harper Wyman Co.

d. Maxitrol Co.

e. SCP, Inc.

2.02 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.03 PIPES, TUBES, FITTINGS, AND JOINING MATERIALS

A. Steel Pipe: ASTM A 53; Type E or S; Grade B; Schedule 40; black.

1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern, with threaded ends according to ASME B1.20.1.

2. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends according to ASME B1.20.1.

3. Cast-Iron Flanges and Flanged Fittings: ASME B16.1, Class 125.

4. Steel Welding Fittings: ASME B16.9, wrought steel or ASME B16.11, forged steel.

5. Steel Threaded Fittings: ASME B16.11, forged steel with threaded ends according to ASME B1.20.1.

6. Joint Compound and Tape: Suitable for natural gas.

7. Steel Flanges and Flanged Fittings: ASME B16.5.

8. Gasket Material: Thickness, material, and type suitable for natural gas.

B. Transition Fittings: Type, material, and end connections to match piping being joined.

C. Common Joining Materials: Refer to Division 15 Section "Basic Mechanical Materials and Methods" for joining materials not in this Section.

2.04 PIPING SPECIALTIES

A. Flexible Connectors: ANSI Z21.24, copper alloy.

B. Quick-Disconnect Devices: ANSI Z21.41, convenience outlets and matching plug connector.

2.05 SPECIALTY VALVES

A. Valves, NPS 2 (DN 50) and Smaller: Threaded ends according to ASME B1.20.1 for pipe threads.

B. Valves, NPS 2-1/2 (DN 65) and Larger: Flanged ends according to ASME B16.5 for steel flanges and according to ASME B16.24 for copper and copper-alloy flanges.

C. Appliance Connector Valves: ANSI Z21.15 and IAS listed.

D. Gas Stops: Bronze body with AGA stamp, plug type with bronze plug and flat or square head, ball type with chrome-plated brass ball and lever handle, or butterfly valve with stainless-steel disc and fluorocarbon elastomer seal and lever handle; 2-psig (13.8-kPa) minimum pressure rating.

E. Gas Valves, NPS 2 (DN 50) and Smaller: ASME B16.33 and IAS-listed bronze body and 125-psig (860-kPa) pressure rating.

1. Tamperproof Feature: Include design for locking.

F. Plug Valves, NPS 2-1/2 (DN 65) and Larger: ASME B16.38 and MSS SP-78 cast-iron, lubricated plug valves, with 125-psig (860-kPa) pressure rating.

1. Tamperproof Feature: Include design for locking.

G. General-Duty Valves, NPS 2-1/2 (DN 65) and Larger: ASME B16.38, cast-iron body, suitable for fuel gas service, with "WOG" indicated on valve body, and 125-psig (860-kPa) pressure rating.

1. Gate Valves: MSS SP-70, OS&Y type with solid wedge.

2. Butterfly Valves: MSS SP-67, lug type with lever handle.

H. Automatic Gas Valves: ANSI Z21.21, with mechanical operator for actuation by appliance automatic shutoff device.

I. Electrically Operated Gas Valves: UL 429, bronze, aluminum, or cast-iron body solenoid valve; 120-V ac, 60 Hz, Class B, continuous-duty molded coil. Include NEMA ISC 6, Type 4, coil enclosure and electrically opened and closed dual coils. Valve position shall normally be closed.

2.06 PRESSURE REGULATORS

A. Description: Single stage and suitable for fuel gas service. Include steel jacket and corrosion-resistant components, elevation compensator, and atmospheric vent.

1. NPS 2 (DN 50) and Smaller: Threaded ends according to ASME B1.20.1 for pipe threads.

2. NPS 2-1/2 (DN 65) and Larger: Flanged ends according to ASME B16.5 for steel flanges and according to ASME B16.24 for copper and copper-alloy flanges.

3. Service Pressure Regulators: ANSI Z21.80. Include 100-psig- (690-kPa-) minimum inlet pressure rating.

4. Line Pressure Regulators: ANSI Z21.80 with 10-psig (68.9-kPa) inlet pressure rating, unless otherwise indicated.

5. Appliance Pressure Regulators: ANSI Z21.18. Regulator may include vent limiting device, instead of vent connection, if approved by authorities having jurisdiction.

B. Pressure Regulator Vents: Factory- or field-installed, corrosion-resistant screen in opening if not connected to vent piping.

2.07 CONCRETE BASES

A. Description: Precast, reinforced concrete base, made of 3000-psi- (20-MPa-) minimum, 28-day compressive strength concrete, and measuring 4 inches (100 mm) thick and 4 inches (100 mm) larger in each dimension than supported item, unless otherwise indicated.

PART 3 - EXECUTION

3.01 PREPARATION

A. Close equipment shutoff valves before turning off fuel gas to premises or section of piping. Perform leakage test as specified in "Field Quality Control" Article to determine that all equipment is turned off in affected piping section.

B. Comply with ANSI Z223.1, "Prevention of Accidental Ignition" Paragraph.

3.02 SERVICE-METER ASSEMBLY INSTALLATION

A. Install service-meter assemblies aboveground and supported over precast concrete bases. Include gas valve or plug valve, strainer, service pressure regulator, service-meter bar for

9. NPS 1-1/4 to NPS 2 (DN 32 to DN 50): Steel pipe, steel welding fittings, and welded joints.

10. NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Steel pipe, malleable-iron threaded fittings, and threaded joints.

11. NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Steel pipe, steel welding fittings, and welded joints.

12. Larger Than NPS 4 (DN 100): Steel pipe, steel welding fittings, and welded joints.

C. Fuel Gas Piping, 0.5 to 2 psig (3.45 to 13.8 kPa): Use the following:

1. NPS 1/2 (DN 15) and Smaller: NPS 3/4 (DN 20) steel pipe, malleable-iron threaded fittings, and threaded joints.

2. NPS 1/2 (DN 15) and Smaller: Hard copper tube, copper fittings, and brazed joints.

   a. Option: Soft copper tube, copper fittings, and brazed joints may be used for runouts at individual appliances.

3. NPS 1/2 (DN 15) and Smaller: Tin-lined copper tube, copper fittings, and brazed joints.

4. NPS 1/2 (DN 15) and Smaller: Corrugated, stainless-steel tubing system and threaded joints.

5. NPS 3/4 and NPS 1 (DN 20 and DN 25): Steel pipe, malleable-iron threaded fittings, and threaded joints.

6. NPS 3/4 and NPS 1 (DN 20 and DN 25): Hard copper tube, copper fittings, and brazed joints.

   a. Option: Soft copper tube, copper fittings, and brazed joints may be used for runouts at individual appliances.

7. NPS 3/4 and NPS 1 (DN 20 and DN 25): Corrugated, stainless-steel tubing system and threaded joints.

8. NPS 1-1/4 to NPS 2 (DN 32 to DN 50): Steel pipe, malleable-iron threaded fittings, and threaded joints.

9. NPS 1-1/4 to NPS 2 (DN 32 to DN 50): Steel pipe, steel welding fittings, and welded joints.

10. NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Steel pipe, malleable-iron threaded fittings, and threaded joints.

11. NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Steel pipe, steel welding fittings, and welded joints.

12. Larger Than NPS 4 (DN 100): Steel pipe, steel welding fittings, and welded joints.

D. Fuel Gas Piping 2 to 5 psig (13.8 to 34.5 kPa): Use the following:

1. NPS 2 (DN 50) and Smaller: Steel pipe, malleable-iron threaded fittings, and threaded joints.

2. NPS 2 (DN 50) and Smaller: Steel pipe, steel welding fittings, and welded joints.

3. NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Steel pipe, malleable-iron threaded fittings, and threaded joints.

4. NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Steel pipe, steel welding fittings, and welded joints.

5. Larger Than NPS 4 (DN 100): Steel pipe, steel welding fittings, and welded joints.

E. Underground Fuel Gas Piping: Steel pipe, steel welding fittings, and welded joints. Encase in containment conduit.

F. Containment Conduits: Steel pipe, steel welding fittings, and welded joints.

G. Gas Service Piping at Meters and Regulators, Above 5 psig (34.5 kPa): Steel pipe, steel welding fittings, and welded joints.

3.04 VALVE APPLICATIONS

A. Appliance Shutoff Valves for Pressure 0.5 psig (3.45 kPa) or Less: Appliance connector valve or gas stop.

B. Appliance Shutoff Valves for Pressure 0.5 to 2 psig (3.45 to 13.8 kPa): Gas stop or gas valve.

C. Appliance Shutoff Valves for Pressure 2 to 5 psig (13.8 to 34.5 kPa): Gas valve.

D. Piping Line Valves, NPS 2 (DN 50) and Smaller: Gas valve.

E. Piping Line Valves, NPS 2-1/2 (DN 65) and Larger: Plug valve or general-duty valve.

F. Valves at Service Meter, NPS 2 (DN 50) and Smaller: Gas valve.

G. Valves at Service Meter, NPS 2-1/2 (DN 65) and Larger: Plug valve.

3.05 PIPING INSTALLATION

A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping installation requirements.

B. Concealed Locations: Except as specified below, install concealed gas piping in airtight conduit constructed of Schedule 40, seamless, black steel pipe with welded joints. Vent conduit to outside and terminate with screened vent cap.

1. In Floors: Gas piping with welded joints and protective wrapping specified in "Protective Coating" Article in Part 2 may be installed in floors, subject to approval

of authorities having jurisdiction. Surround piping cast in concrete slabs with minimum of 1-1/2 inches (40 mm) of concrete. Piping may not be in physical contact with other metallic structures such as reinforcing rods or electrically neutral conductors. Do not embed piping in concrete slabs containing quick-set additives or cinder aggregate.

2. In Floor Channels: Gas piping may be installed in floor channels, subject to approval of authorities having jurisdiction. Channels must have cover and be open to space above cover for ventilation.

3. In Partitions: Do not install concealed piping in solid partitions. Protect tubing from physical damage when installed inside partitions or hollow walls.

   a. Exception: Tubing passing through partitions or walls.

4. In Walls: Gas piping with welded joints and protective wrapping specified in "Protective Coating" Article in Part 2 may be installed in masonry walls, subject to approval of authorities having jurisdiction.

5. Prohibited Locations: Do not install gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.

   a. Exception: Accessible above-ceiling space specified above.

C. Drips and Sediment Traps: Install drips at points where condensate may collect. Include outlets of service meters. Locate where readily accessible for cleaning and emptying. Do not install where condensate would be subject to freezing.

   1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use minimum-length nipple of 3 pipe diameters, but not less than 3 inches (75 mm) long, and same size as connected pipe. Install with space between bottom of drip and floor for removal of plug or cap.

D. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels, unless indicated to be exposed to view.

E. Install fuel gas piping at uniform grade of 0.1 percent slope upward toward risers.

F. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

G. Connect branch piping from top or side of horizontal piping.

H. Install unions in pipes NPS 2 (DN 50) and smaller, adjacent to each valve, at final connection to each piece of equipment, and elsewhere as indicated. Unions are not required on flanged devices.

I. Install corrugated, stainless-steel tubing system according to manufacturer's written instructions. Include striker plates to protect tubing from puncture where tubing is restrained and cannot move.

J. Install strainer on inlet of each line pressure regulator and automatic and electrically operated valve.

K. Install pressure gage upstream and downstream from each line pressure regulator.

L. Install flanges on valves, specialties, and equipment having NPS 2-1/2 (DN 65) and larger connections.

M. Install vent piping for gas pressure regulators and gas trains, extend outside building, and vent to atmosphere. Terminate vents with turned-down, reducing-elbow fittings with corrosion-resistant insect screens in large end.

N. Install containment conduits for gas piping below slabs, within building, in gastight conduits extending minimum of 4 inches (100 mm) outside building, and vented to atmosphere. Terminate vents with turned-down, reducing-elbow fittings with corrosion-resistant insect screens in large end. Prepare and paint outside of conduits with coal-tar, epoxy-polyamide paint according to SSPC-Paint 16.

3.06 JOINT CONSTRUCTION

A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.

B. Use materials suitable for fuel gas.

1. Brazed Joints: Make with brazing alloy with melting point greater than 1000 deg F (540 deg C). Brazing alloys containing phosphorus are prohibited.

3.07 HANGER AND SUPPORT INSTALLATION

A. Refer to Division 15 Section "Hangers and Supports" for pipe hanger and support devices.

B. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 1 (DN 25) and Smaller: Maximum span, 96 inches (2438 mm); minimum rod size, 3/8 inch (10 mm).

2. NPS 1-1/4 (DN 32): Maximum span, 108 inches (2743 mm); minimum rod size, 3/8 inch (10 mm).

3. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): Maximum span, 108 inches (2743 mm); minimum rod size, 3/8 inch (10 mm).

4. NPS 2-1/2 to NPS 3-1/2 (DN 65 to DN 90): Maximum span, 10 feet (3 m); minimum rod size, 1/2 inch (13 mm).

5. NPS 4 (DN 100) and Larger: Maximum span, 10 feet (3 m); minimum rod size, 5/8 inch (16 mm).

C. Install hangers for horizontal hard copper tubing with the following maximum spacing and minimum rod sizes:

1. NPS 3/8 (DN 10): Maximum span, 48 inches (1219 mm); minimum rod size, 3/8 inch (10 mm).

2. NPS 1/2 and NPS 5/8 (DN 15 and DN 18): Maximum span, 72 inches (1829 mm); minimum rod size, 3/8 inch (10 mm).

3. NPS 3/4 and NPS 7/8 (DN 20 and DN 22): Maximum span, 84 inches (2134 mm); minimum rod size, 3/8 inch (10 mm).

4. NPS 1 (DN 25): Maximum span, 96 inches (2438 mm); minimum rod size, 3/8 inch (10 mm).

D. Install hangers for horizontal corrugated, stainless-steel tubing with the following maximum spacing and minimum rod sizes:

1. NPS 3/8 and NPS 1/2 (DN 10 and DN 15): Maximum span, 48 inches (1219 mm); minimum rod size, 3/8 inch (10 mm).

2. NPS 3/4 and NPS 1 (DN 20 and DN 25): Maximum span, 72 inches (1829 mm); minimum rod size, 3/8 inch (10 mm).

3. Option: Support tubing from structure according to manufacturer's written instructions.

3.08 CONNECTIONS

A. Drawings indicate general arrangement of fuel gas piping, fittings, and specialties.

B. Install piping adjacent to appliances to allow service and maintenance.

C. Connect piping to appliances using gas with shutoff valves and unions. Install valve upstream from and within 72 inches (1800 mm) of each appliance. Install union downstream from valve.

D. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance using gas.

E. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

2. Do not use gas pipe as grounding electrode.

3.09 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each service meter, pressure regulator, and specialty valve.

1. Text: In addition to name of identified unit, distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.

2. Refer to Division 15 Section "Basic Mechanical Materials and Methods" "Mechanical Identification" for nameplates and signs.

3.010 PAINTING

A. Use materials and procedures in Division 9 Section "Painting," "Exterior Paint Schedule" Article, "Ferrous Metal" Paragraph, "Full-Gloss, Alkyd-Enamel Finish" Subparagraph.

B. Paint exterior service meters, pressure regulators, and specialty valves.

1. Color: Gray.

3.011 FIELD QUALITY CONTROL

A. Inspect, test, and purge piping according to ANSI Z223.1, Part 4 "Inspection, Testing, and Purging," and requirements of authorities having jurisdiction.

B. Repair leaks and defects with new materials and retest system until satisfactory results are obtained.

C. Report test results promptly and in writing to Architect and authorities having jurisdiction.

D. Verify capacities and pressure ratings of service meters, pressure regulators, valves, and specialties.

E. Verify correct pressure settings for pressure regulators.

F. Verify that specified piping tests are complete.

3.012 ADJUSTING

A. Adjust controls and safety devices. Replace damaged and malfunctioning controls and safety devices.

END OF SECTION 15194

SECTION 15410 – PLUMBING PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Provide materials and installation for complete first class plumbing systems, within and to five feet beyond building perimeter unless noted otherwise on Contract Drawings; Sanitary Waste and Vent Piping, Storm Drain Piping, Domestic Water Piping, Domestic Water Valves, Testing and other normal parts that make the systems operable, code compliant and acceptable to the authorities having jurisdiction.

1.03 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

1. 2009 Edition of the International Plumbing Code.

2. NOTE: MDACC takes various exceptions to the International Plumbing Code and has adopted the more stringent requirements within the Uniform Plumbing Code. These exceptions are included within Project Specifications and/or Project Design Drawings.

3. ANSI/NSF Standard 61 - Drinking Water System Components - Health Effects.

1.04 QUALITY ASSURANCE

A. Manufacturer's name and pressure rating shall be permanently marked on valve body.

B. The Contractor shall notify the manufacturer's representative prior to installing any copper press fittings. The Contractor shall obtain the representative's guidance in any unfamiliar installation procedures. The manufacturer's representative of copper press fittings shall conduct periodic inspections of the installation and shall report in writing to the Contractor and Owner of any observed deviations from manufacturer's recommended installation practices.

C. Manufacturer Qualifications: Company shall have minimum three years documented experience specializing in manufacturing the products specified in this section. All pipe, fittings, couplings, gaskets and valves shall be manufactured domestically.

D. Installer Qualifications:

1. Company shall have minimum three years documented experience specializing in performing the work of this section.

2. Installation of plumbing systems shall be performed by individuals licensed by the Texas State Board of Plumbing Examiners as a Journeyman or Master Plumber. Installation may be performed by Apprentice Plumbers provided they are registered with the Texas State Board of Plumbing examiners and under direct supervision of a licensed plumber. All installation shall be supervised by a licensed Master Plumber.

3. All installers of copper press fittings shall be trained by the fitting manufacturer's appointed representative. Written notification of training shall be submitted to Owner prior to any installation.

1.05 SUBMITTALS

A. Product Data:

1. Code and Standards compliance, manufacturer's data for pipe, fittings, valves and all other products included within this specification section.

2. Manufacturer's installation instructions.

B. Record Documents:

1. Record actual locations of valves, etc. and prepare valve charts.

2. Test reports and inspection certification for all systems listed herein.

3. Provide a certificate of completion detailing the domestic water system chlorination procedure and all laboratory test results.

4. Submit proposed location of access panels which vary from quantities or locations indicated on Contract Drawings.

5. Provide full written description of manufacturer's warranty.

C. Operation and Maintenance Data:

1. Include components of system, servicing requirements, Record Drawings, inspection data, installation instructions, exploded assembly views, replacement part numbers and availability, location and contact numbers of service depot.

1.06 DELIVERY, STORAGE AND HANDLING

A. All materials shall be new, undamaged, and free of rust.

B. Accept valves on Site in shipping containers and maintain in place until installation.

C. Provide temporary protective coating and end plugs on valves not packaged within containers. Maintain in place until installation.

D. Provide temporary end caps and closures on pipe and fittings. Maintain in place until installation.

E. Protect installed piping, valves and associated materials during progression of the construction period to avoid clogging with dirt, and debris and to prevent damage, rust, etc. Remove dirt and debris and repair materials as work progresses and isolate parts of completed system from uncompleted parts.

F. Protect all materials that are to be installed within this project from exposure to rain, freezing temperatures and direct sunlight. EXCEPTION: Materials manufactured for exterior locations.

1.07 EXTRA MATERIALS

A. Provide the Owner with one differential pressure meter kit for use with domestic hot water return circuit balancing valves installed within this project. Kit shall include meter, hoses, connection accessories, circular slide rule, carrying case and valve manufacturer's curve charts.

PART 2 - PRODUCTS

2.01 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

B. Provide materials as specified herein and indicated on Contract Drawings. All materials and work shall meet or exceed all applicable Federal and State requirements and conform to adopted codes and ordinances of authorities having jurisdiction.

C. Pressure ratings of pipe, fittings, couplings, valves, and all other appurtenances shall be suitable for the anticipated system pressures in which they are installed.

2.02 SANITARY WASTE AND VENT PIPING

A. Service weight cast iron soil pipe and fittings with hubless connections using clamp type gasketed mechanical fasteners above ground and hub and spigot DWV pipe and fittings with neoprene compression gasket joints for all buried pipe. Cast iron soil pipe, fittings and hub gaskets shall be manufactured by Tyler Pipe or Charlotte Pipe and Foundry. All cast iron pipe and fittings shall be of the same manufacturer.

B. Indirect waste piping sizes 1-1/4" through 2" serving fixtures and equipment shall be seamless copper DWV tube with wrought copper or wrought copper alloy solder joint drainage pattern DWV fittings.

C. Indirect waste piping sizes 1" and smaller serving equipment shall be type "L" hard drawn copper pipe and wrought copper or cast copper alloy solder joint fittings using lead-free solder and non-corrosive flux. Elbows shall be long radius type. Tee fittings shall be combination wye with 45 degree elbow.

D. Cast iron soil pipe compression gaskets shall be monolithically molded from an elastomer meeting ASTM C 564 and shall be of same manufacturer as pipe and fittings.

E. Clamps for joining hubless cast iron pipe and fittings sizes 10" and smaller shall meet the performance criteria of FM 1680, have 28 gauge type 304 stainless steel jacket, minimum .094 inch thick ASTM C 564 neoprene gasket and type 305 stainless steel band screws designed to be installed with a pre-set torque wrench calibrated at 80 inch pounds. Couplings shall be manufactured by Clamp-All, Inc. HI-TORQ 80 or Husky, Inc., Orangeshield HD 4000.

F. Hubless piping systems shall not be used in a directly buried, underground application. EXCEPTION: No-hub type fittings with clamp type coupling joints may be used below ground for pipe sizes up to 10" at connections to existing cast iron sewers provided couplings are cast iron with stainless steel bolts as manufactured by MG Piping Products.

G. Solder for copper piping shall be lead-free Tin/Copper/Silver/Nickle(optional) solder conforming to ASTM B32, Wolverine Silvabrite 100 Lead-Free Solder or Harris Nick Lead-Free Solder. Use water soluble flux recommended by solder manufacturer and conforming to ASTM B813 and NSF 61, Wolverine Silvabrite 100 Water Soluable Flux or Bridgit Water Soluble Paste Flux.

H. Lubricant for drainage cleanout plugs shall be Loctite Marine Grade Anti-Seize or approved equal by Bostik Chemical Group, or Dow Corning Corporation.

I. Double sanitary tee fittings shall be not be used as a drainage fitting.

J. Provide IAPMO figure one, IAPMO figure five or double wye and eighth bend fittings on vertical lines serving back-to-back fixture drains.

K. Double wye and eighth bend fittings shall not be installed in horizontal drain lines.

L. All P-traps for floor drains, floor sinks and hub drains shall be deep-seal type.

M. Provide threaded brass or copper adapters to connect fixture supply stops and waste to service piping within walls. Galvanized nipples shall not be acceptable. Provide DWV copper trap adapters to connect lavatory, sink and drinking fountain trap outlets to sanitary system.

2.03 DOMESTIC WATER PIPING (INCLUDING COLD & HOT)

A. All materials within domestic water distribution systems that may come in contact with the potable water delivered shall comply with ANSI/NSF Standard 61.

B. All brass and bronze piping materials within domestic water distribution systems that may come in contact with the potable water delivered shall have no more than 15% zinc content.

C. Unburied piping shall be type "L" hard drawn copper pipe and wrought copper or cast copper alloy solder joint fittings using lead-free solder and non-corrosive flux.

D. Solder for copper piping shall be lead-free Tin/Copper/Silver/Nickle(optional) solder conforming to ASTM B32, Wolverine Silvabrite 100 Lead-Free Solder or Harris Nick Lead-Free Solder. Use water soluble flux recommended by solder manufacturer and conforming to ASTM B813 and NSF 61, Wolverine Silvabrite 100 Water Soluable Flux or Bridgit Water Soluble Paste Flux.

E. Buried pressurized piping sizes 1" and smaller shall be type "K" soft copper. No joints shall be allowed below slab. Encase piping within ½" thick un-slit flexible tube type elastomeric thermal insulation up to 1" above slab at both ends. Insulation shall be AP/Armaflex or Rubatex Insul-Tube 180.

F. Unburied trap primer piping shall be same as specified for domestic water except all elbows shall be long radius type.

G. Buried trap primer piping shall be type "K" soft copper. No joints shall be allowed below slab except at connection to drain. Encase piping within ½" thick un-slit flexible tube type elastomeric thermal insulation up 1" above slab. Insulation shall be AP/Armaflex or Rubatex Insul-Tube 180.

H. Dielectric waterway fittings shall have zinc electroplated steel pipe body with high temperature stabilized polyolefin polymer liner; manufactured by Victaulic, Style 47 or PPP, Inc. Series 19000.

I. Dielectric unions shall be rated at 250 psi, ground-joint type with inert, non-corrosive thermoplastic sleeve. End connection materials shall be compatible with respective piping materials; manufactured by EPCO Sales, Inc. Provide models to suit applicable transitions.

J. Dielectric flanges shall be rated at 175 psi, have nylon bolt isolators and dielectric gasket. Materials shall be compatible with respective piping materials; manufactured by EPCO Sales, Inc. Provide models to suit applicable transitions.

K. Pipe joint compound shall be lead-free, non-toxic, non-hardening and compliant with ANSI/NSF 61 and Federal Specification TT-S-1732. Temperature service range of -15°F to +400°F, manufactured by Hercules "MegaLoc" or approved equal by Rectorseal, La-Co or Oatey.

2.04 DOMESTIC WATER VALVES: (INCLUDING COLD, HOT & WATER)

A. All materials within domestic water distribution systems that may come in contact with the potable water delivered shall comply with ANSI/NSF Standard 61.

B. All brass and bronze valve materials within domestic water distribution systems that may come in contact with the potable water delivered shall have no more than 15% zinc content.

C. Similar types of valves shall be the product of one manufacturer; i.e., all butterfly valves shall be of the same manufacturer, all ball valves shall be of the same manufacturer, etc.

D. Line Shut-Off Valves up to and including 2" shall be two-piece bronze body of ASTM B584 Alloy 844, ASTM B61, or ASTM B62, full port ball type rated at 600 WOG with threaded connections, blow-out proof stem, plastic coated handle, Teflon packing, 316 stainless steel ball and stem. Acceptable valves are NIBCO Model T-585-70-66, or approved equivalent model by Crane, Milwaukee or Apollo.

E. Provide stem extensions of a non-thermal conducting material for valves in insulated lines to allow unobstructed operation.

F. Provide memory stops on all ball valves installed in domestic hot water return lines. Memory stops shall be adjustable after pipe insulation is applied.

G. Provide line shut-off valves that have the same inside diameter of the upstream pipe in which they are installed.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that excavations are to required grade, dry and not over-excavated. Do not install underground piping when bedding is wet or frozen.

B. Before commencing work, check final grade and pipe invert elevations required for drain terminations and connections to ensure proper slope.

3.02 PREPARATION

A. Ream pipes and tubes. Remove burrs, scale and dirt, inside and outside, before assembly. Remove foreign material from piping.

B. Prepare piping connections to equipment with flanges or unions.

3.03 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with manufacturer's published recommendations.

C. General

1. Care shall be exercised to avoid all cross connections and to construct the plumbing systems in a manner which eliminates the possibility of water contamination.

2. Install all materials and products in accordance with manufacturer's published recommendations. Use tools manufactured for the installation of the specific material or product.

3. Heat generated by soldering procedures shall not be transmitted to valves, copper alloy roll groove fittings, copper press fittings, no-hub clamps, or any other components installed within the piping system that may be damaged due to high temperatures. Contractor shall take all precautions necessary, including utilizing wet wrapping or allowing heated piping to cool to ambient temperature before attachment.

4. Pipe joints, no-hub clamps, flanges, unions, etc., shall not directly contact or be encased in concrete, or be located within wall, floor or roof penetrations.

5. Route piping in direct orderly manner and maintain proper grades. Installation shall conserve headroom and interfere as little as possible with use of spaces. Route exposed piping parallel to walls. Group piping whenever practical at common elevations.

6. Install piping to allow for expansion and Contraction without stressing pipe, joints or connected equipment.

7. Furnish all supports required by the piping included in this specification section.

8. Penetrations through fire rated walls, floors and partitions shall be sealed to provide a U.L. rating equal to or greater than the wall, floor or partition.

9. Seal all penetrations through floors, exterior building walls and grade beams air and water tight.

10. Each plumbing pipe projecting through roof shall be installed in accordance with Contract Specifications and Drawings. Penetrations shall be sealed air and water tight. Refer to details on Contract Drawings and coordinate with General Contractor for flashing requirements.

11. Furnish and install all necessary valves, traps, gauges, strainers, unions, etc. for each piece of equipment (including Owner furnished equipment) having plumbing connections, to facilitate proper functioning, servicing and compliance with code.

12. Provide code-approved transition adapters when joining dissimilar piping materials. Adaptors installed shall be manufactured specifically for the particular transition.

13. All piping shall have reducing fittings used for reducing or increasing where any change in the pipe sizes occurs. No bushing of any nature shall be allowed in piping.

14. Bury outside water and drainage pipe minimum one foot below recorded frost depth.

15. Buried piping shall be supported throughout its entire length.

16. All excavation required for plumbing work is the responsibility of the plumbing Contractor and shall be done in accordance with Contract Documents.

17. Piping shall be insulated in accordance with Contract Documents.

18. Provide clearance for installation of insulation and for access to valves, air vents, drains, unions, etc.

19. Provide dielectric isolation device where non-ferrous components connect to ferrous components. Devices shall be dielectric union, coupling or dielectric flange fitting.

20. All piping shall be isolated from building structures, including partition studs, to prevent transmission of vibration and noise.

21. Isolate all bare copper pipe from ferrous building materials. "Tape is not an acceptable isolator.

D. Drainage and Vent Systems

1. Slope drainage lines uniformly at 1/4" per foot, for lines 3" and less, and 1/8" per foot for larger lines, unless noted otherwise on Contract Drawings. Maintain gradients through each joint of pipe and throughout system.

2. Buried pipe shall be laid on a smoothly graded, prepared subgrade soil foundation true to alignment and uniformly graded. Bell holes shall be hand-excavated so that the bottom of the pipe is in continuous contact with the surface of the prepared subgrade material. Piping invert shall form a true and straight line.

3. The size of drainage piping shall not be reduced in size in the direction of flow. Drainage and vent piping shall conform to the sizes indicated on the Contract Drawings. Waste lines from water closets shall not be smaller than four inches. Under no circumstances shall any drain or vent line below slab be smaller than two inches.

4. Unburied horizontal cast iron soil piping shall be supported at least at every other joint except that when the developed length between supports exceeds four feet, they shall be provided at each joint. Supports shall also be provided at each horizontal branch connection and at the base of each vertical rise. Supports shall be placed immediately adjacent to the joint. Suspended lines shall be braced to prevent horizontal movement. Unburied vertical cast iron soil piping rising through more than one floor level shall be supported with riser clamps at each floor level.

5. Install couplings for hubless pipe and fittings in accordance with manufacturer's published recommendations. Use pre-set torque wrench and tighten band screws to 80 inch pounds minimum or as required by manufacturer's published instructions.

6. All unburied change of direction fittings within the roof drainage system shall be braced against thrust loads that might result in joint separation due to dynamic forces caused by sudden, heavy rainfall conditions. Bracing shall incorporate galvanized steel pipe clamps and tie rods.

7. Provide cleanouts within sanitary waste systems at locations and with clearances as required by the code, at the base of each waste stack and at intervals not exceeding 75 feet in horizontal runs.

8. A removable sink or lavatory p-trap with cleanout plug shall be considered as an approved cleanout for 2" diameter pipe.

9. All interior cleanouts shall be accessible from walls or floors. Provide wall cleanouts in lieu of floor cleanouts wherever possible. A floor cleanout shall be installed only where installation of a wall cleanout is not practical.

10. Provide a wall cleanout for each water closet. Locate wall cleanouts above the flood level rim of the highest water closet but no more than twenty four inches above the finished floor.

11. Coordinate the location of all cleanouts with the architectural features of the building and obtain approval of locations from the Project Architect.

12. Lubricate cleanout plugs with anti-seize lubricant before installation. Prior to final completion, remove cleanout plugs, re-lubricate and reinstall using only enough force to provide a water and gas tight seal.

13. Install trap primer supply to floor drains in the pumping station. Primer unit installation shall comply with manufacturer's published recommendations. Trap primer lines shall slope to drain at a minimum ¼" per foot.

14. Capped waste and vent connections for future extensions shall be located accessibly and not extend more than 24" from active main. Waste connections and vent connections shall be located at elevations that will allow future installation of properly sloped piping without the need to dismantle or relocate installed ductwork, piping, conduit, light fixtures, etc.

15. Unless indicated otherwise within Contract Documents, all sanitary vent pipes passing through the roof shall be provided with lead roof flashings constructed of 2-1/2 pound sheet lead with bases extending no less than ten inches on each side of the pipe. The vertical portion of the flashing shall extend upward the entire length of pipe and be turned tightly inside the pipe at least two inches and shall not reduce the inside diameter of vent pipe more than the thickness of the flashing. Lead flashings shall be furnished by Plumbing Contractor and turned over to Roofing Contractor for installation.

16. Locate all sanitary vent terminals a minimum of 25 feet horizontally from or 3 feet vertically above all air intakes, operable windows, doors and any other building openings.

E. Domestic Water System

1. On each water supply line serving a plumbing fixture, item of equipment, or other device which has a water supply discharge outlet below the overflow rim, or where cross contamination may occur, provide and install an approved vacuum breaker or backflow preventer. Installation of vacuum breakers shall prevent any possible backflow through them.

2. Provide thrust blocking and clamps for mechanical joint or gasketed underground water pipe at fittings with 3/4" rods, and properly anchor and support. Restraining rods, clamps and hardware shall be thoroughly coated with bituminous material to prevent corrosion.

3. Copper piping shall be supported at no greater than six foot intervals for piping 1-1/2" and smaller and ten foot intervals for piping 2" and larger in diameter.

4. Install all water piping to allow all piping within the system to be drained at low points.

5. Air chambers, dead-legs, or any other piping arrangement that may allow water to stagnate shall not be installed within domestic water systems. Valves installed for future connections shall not extend more than 24" from an active main.

6. Provide manufactured water hammer arrestors in water supply lines as indicated on Contract Drawings and in accordance with Standard PDI-WH201.

7. Pipe insulation shall be applied over installed freeze protection heat tracing tape.

8. Install union type fitting downstream of isolation valves at equipment connections.

9. Solder joint fittings shall not be installed within 24" of a copper press fitting.

10. Threaded adaptors shall be of the same manufacture and type as the system's copper fittings.

11. Threaded adaptors on supply stub-outs shall be installed prior to construction of wall and shall not extend more than 1" beyond wall face.

12. Identify piping utilizing copper press fittings in accordance with project specification section 20 05 53.

F. Domestic Water Valves

1. Domestic water shut-off valves shall be installed where shown on Drawings, at each fixture and piece of equipment, at each branch take-off from mains, at the base of each riser, and at each battery of fixtures.

2. Install shut-off valves in accessible locations. Provide access panels where valves would otherwise be inaccessible. Coordinate quantity, size and location requirements of access panels with General Contractor.

3. Install shut-off valves with stems upright or horizontal, not inverted.

4. Where threaded valves are installed in copper piping systems special care shall be taken to avoid damaging the valve or its parts due to overheating. Install copper or bronze male adapters in each inlet of threaded valves. Sweat solder adapters to pipe prior to connecting to valve body.

5. Provide spring loaded type check valves on discharge of water pumps.

6. Provide accessible check valves in the individual cold and hot water fixture supply lines serving mixing valve type faucets or assemblies having hose connection outlets that are not equipped with integral check stops.

7. Install domestic hot water return circuit balancing valves where indicated on Contract Drawings and locate a minimum of five pipe diameters downstream and three pipe diameters upstream of all fittings and/or line shut-off valves. Location of valves shall allow unobstructed access for monitoring and adjustment.

8. Adjust and set domestic hot water return circuit balancing valves to flows indicated on Contract Drawings and in accordance with valve manufacturer's published instructions. Use flow meter recommended by valve manufacturer.

9. Provide a temperature gauge, strainer, union and line shut-off valve upstream of each hot water return circuit balancing valve.

3.04 TESTING

A. General

1. Equipment, material, power, and labor necessary for the cleaning, flushing, sterilization, inspection and testing of systems covered within this Specification Section shall be furnished by the Plumbing Contractor. All testing and inspection procedures shall be in accordance with Division 1 and Special Condition requirements of this Contract.

2. All new and parts of existing altered, extended, or repaired plumbing system piping shall be tested and inspected for leaks and defects. Piping being tested shall not leak nor show any loss in test pressure for duration specified.

3. In cases of minor installation and repairs where specified water and/or air test procedures are deemed impractical, Contractor shall obtain written approval from Owner's Representative to perform alternate testing and inspection procedures. Alternate testing and inspection procedures for minor installation and repairs shall include visual evaluation of installed components by Owner's Representative during a simulation of use.

4. The water utilized for tests shall be obtained from a potable source of supply.

5. Prepare testing reports. If testing is performed in segments, submit separate report for each segment, complete with diagram or clear description of applicable portion of piping. After inspection has been approved or portions thereof, certify in writing the time, date, name and title of the persons reviewing the test. This shall also include the description of what portion of the system has been approved. Obtain approval signature by Owner's Representative. A complete record shall be maintained of all testing that has been approved, and shall be made available at the job Site. Upon completion of the work, all records and certifications approving testing requirements shall be submitted to the Owner's Representative before final payment is made.

6. Verify systems are complete, flushed and clean prior to testing. Isolate all equipment subject to damage from test pressure. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. Leave piping uninsulated, uncovered and unconcealed until it has been tested and approved. Where any portion of piping system must be concealed before completion of entire system, the portion shall be tested separately as specified for the entire system prior to concealment. Contractor shall expose all untested covered or concealed piping.

7. Gauges used for testing shall have increments as follows:

   a. Tests requiring a pressure of 10 psi or less shall utilize a testing gauge having increments of 0.10 psi or less.

   b. Tests requiring a pressure of greater than 10 psi but less than or equal to 100 psi shall utilize a testing gauge having increments of 1 psi or less.

   c. Tests requiring a pressure of greater than 100 psi shall utilize a testing gauge having increments of 2 psi or less.

8. Separately test above and below ground piping.

9. Do not introduce test water into piping systems when exposure to freezing temperatures is possible.

10. Do not introduce test water into sections of piping located above existing sensitive areas and/or equipment that may be damaged or contaminated by water leakage. Coordinate with Owner's Representative to determine areas and/or equipment considered as being sensitive.

11. Defective work or material shall be reworked and replaced, and inspection and test repeated. Repairs shall be made with new materials. Pipe dope, caulking, tape, dresser couplings, etc., shall not be used to correct deficiencies.

12. The Contractor shall be responsible for cleaning up any leakage during flushing, testing, repairing and disinfecting to the original condition any building parts subjected to spills or leakage.

B. Drainage and Vent System

1. Subject gravity drainage and vent piping and joints to a vertical water column pressure of at least ten feet. If after 12 hours the level of the water has been lowered by leakage, the leaks must be found and stopped and the water level shall again be raised to the level described and the test repeated until, after a 12 hour retention period, there shall be no perceptible lowering of the water level in the system being tested. EXCEPTION: Portions of drainage and vent piping located on uppermost level of building shall be subjected to a water column pressure created by filling the system to point of overflow at roof vent terminals and roof drains. The pipes for the level being tested shall be filled with water to a verifiable and visible level as described above and be allowed to remain so for 12 hours.

2. Piping located above sensitive areas and/or equipment that may be damaged or become contaminated due to test water leakage shall be tested with air. Isolate the test section from all other sections and slowly fill pipe with oil-free air until there is a uniform gauge pressure of 5 pounds per square inch (34.5 kPa) or sufficient pressure to balance a 10-inch (254 mm) column of mercury. The air pressure shall be regulated to prevent the pressure inside the pipe from exceeding 5.0 PSIG. This pressure shall be held for a test period of at least 15 minutes. Any adjustments to the test pressure required because of changes in ambient temperature or the seating of gaskets shall be made prior to the beginning of the test period.

3. Test forced (pumped) drainage piping by plugging the end of the piping at the point of connection with the gravity drainage system and applying a pressure of 5psi (34.5 kPa) greater than the pump rating, and maintaining such pressure for 15 minutes.

4. After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent and drain piping as required to isolate system being tested. Introduce air into piping system equal to pressure of 1-inch wg (250 Pa). Use U-tube or manometer inserted in fixture trap to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.

5. Should the completion of these tests leave any reasonable question of a doubt relative to the integrity of the installation, additional tests or measures shall be performed to demonstrate the reliability of these systems to the complete satisfaction of the Owner's Representative.

6. Test plugs must extend outside the end of pipe to provide a visible indication for removal after the test has been completed.

C. Domestic Water System

1. Subject piping system to a hydrostatic pressure of at least 125 pounds per square inch gauge, but not less than the operating pressure under which it is to be used, for a period of no less than 12 hours. During test period, all pipe, fittings and accessories in the particular piping system that is being tested shall be carefully inspected. If leaks are detected, such leaks shall be stopped and the hydrostatic test shall again be applied. This procedure shall be repeated until no leaks are detected for an entire 12 hour period. EXCEPTION: Piping located above sensitive areas and/or equipment that may be damaged or become contaminated due to test water leakage shall be tested with oil-free air in lieu of water.

2. After completion of the testing, all new and/or altered water piping systems shall be thoroughly sterilized with a solution containing not less than 50 parts per million of available chlorine. Do not exceed 150 parts per million at any time. Introduce chlorine into the supply stream at a rate sufficient to provide a uniform concentration throughout the system. All outlets shall be opened and closed several times. When the specified level of chlorine is detected at every outlet in the system, close all valves to prevent release of water from the system for 24 hours. At the completion of the 24 hour disinfection period, test every outlet for a minimum chlorine residual of fifty parts per million. This minimum residual must be present to proceed with flushing. Flush the system with clean water at a sufficient velocity until the residual chlorine detected at every outlet is within 0.2 parts per million of the normal water supply's level.

3. Sufficient samples must be taken no sooner than 24 hours after sterilization and flushing to represent the extent and complexity of the affected water system, along with a control sample to indicate municipal water quality at the time of testing. Send water samples to an accredited laboratory to perform qualitative and quantitative bacteriological analysis in accordance with AWWA C651. Contractor shall obtain written certification from the independent testing agency stating that the water samples meet Federal and State guidelines for safe drinking water. Upon satisfactory completion of all procedures, and receipt of acceptable laboratory test results, obtain written approval by Owner's representative. Failure to fully comply with the above procedures will result in a requirement to repeat the procedure until acceptable results are achieved, at no additional cost to the Owner.

4. Isolate or bypass equipment that would be detrimentally affected by disinfecting solution. Isolate all other sections of the domestic water system not being disinfected to prevent migration of chlorine.

5. Prior to injection of chlorine into the piping system, strategically place signs stating "Heavily Chlorinated Water - Do Not Drink", and protect all outlets to prevent use during disinfection and flushing procedures.

D. A bacteria test is not necessary for small scale work. However, disinfection is required. Examples of small scale work are less than 20 feet of pipe, replacement and/or installation of a sink, drinking fountain, eyewash, backflow preventer, isolation valve, etc. Disinfect individual parts, fixtures, isolation valves, pipes, etc. by swabbing with full strength bleach (5.25%) or soaking for at least 30 minutes in a 500 ppm chlorine solution. The 500 ppm solution can be made by adding one part 5.25% bleach (household bleach) to 100 parts drinking water. For example 3-1/2 ounces of bleach can be added to 2-1/2 gallons drinking water. Materials should then be thoroughly rinsed before putting into service.

END OF SECTION 15410

SECTION 15430 – PLUMBING SPECIALTIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following plumbing specialties:

1. Backflow preventers.
2. Balancing valves.
3. Thermostatic water mixing valves.
4. Water tempering valves.
5. Strainers.
6. Outlet boxes.
7. Non-draining non-
8. freeze post hydrants.
9. Trap seal primer valves.
10. Miscellaneous piping specialties.
11. Sleeve penetration systems.
12. Flashing materials.
13. Cleanouts.
14. Floor drains.

B. Related Sections include the following:

1. Division 15 Section "Meters and Gages" for water meters, thermometers, and pressure gages.

1.03 DEFINITIONS

A. The following are industry abbreviations for plastic piping materials:

1. ABS: Acrylonitrile-butadiene-styrene plastic.

2. PE: Polyethylene plastic.

3. PUR: Polyurethane plastic.

4. PVC: Polyvinyl chloride plastic.

1.04 PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing piping systems with following minimum working-pressure ratings, unless otherwise indicated:

1. Domestic Water Piping: 125 psig (860 kPa)

2. Sanitary Waste and Vent Piping: 10-foot head of water (30 kPa).

1.05 SUBMITTALS

A. Product Data: Include rated capacities and shipping, installed, and operating weights. Indicate materials, finishes, dimensions, required clearances, and methods of assembly of components; and piping and wiring connections for the following:

1. Backflow preventers and water regulators.

2. Balancing valves, water filters, and strainers.

3. Thermostatic water mixing valves and water tempering valves.

4. Water hammer arresters, air vents, and trap seal primer valves and systems.

5. Drain valves, hose bibbs, hydrants, and hose stations.

6. Outlet boxes and washer-supply outlets.

7. Sleeve penetration systems.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Field test reports.

D. Maintenance Data: For plumbing specialties to include in maintenance manuals. Include the following:

1. Backflow preventers and water regulators.

2. Thermostatic water mixing valves and water tempering valves.

3. Trap seal primer valves and systems.

4. Hydrants.

1.06 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of plumbing specialties and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

B. Plumbing specialties shall bear label, stamp, or other markings of specified testing agency.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for piping materials and installation.

E. NSF Compliance:

1. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components. Include marking "NSF-pw" on plastic potable-water piping and "NSF-dwv" on plastic drain, waste, and vent piping.

2. Comply with NSF 61, "Drinking Water System Components--Health Effects, Sections 1 through 9," for potable domestic water plumbing specialties.

1.07 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Operating Key Handles: Equal to 100 percent of amount installed for each key-operated hose bibb and hydrant installed.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.02 BACKFLOW PREVENTERS

A. Manufacturers:

1. Ames Co., Inc.

2. B & K Industries, Inc.

3. Cla-Val Co.

4. CMB Industries, Inc.; Febco Backflow Preventers.

5. Conbraco Industries, Inc.

6. FLOMATIC Corp.

7. IMI Cash Valve.

8. Mueller Co.; Hersey Meters Div.

9. Sparco, Inc.

10. Watts Industries, Inc.; Water Products Div.

11. Zurn Industries, Inc.; Wilkins Div.

B. General: ASSE standard, backflow preventers.

1. NPS 2 (DN 50) and Smaller: Bronze body with threaded ends.

2. NPS 2-1/2 (DN 65) and Larger: Bronze, cast-iron, steel, or stainless-steel body with flanged ends.

a. Interior Lining: AWWA C550 or FDA-approved, epoxy coating for backflow preventers having cast-iron or steel body.

3. Interior Components: Corrosion-resistant materials.

4. Exterior Finish: Polished chrome plate if used in chrome-plated piping system.

5. Strainer: On inlet, if indicated.

C. Pipe-Applied, Atmospheric-Type Vacuum Breakers: ASSE 1001, with floating disc and atmospheric vent.

D. Hose-Connection Vacuum Breakers: ASSE 1011, nickel plated, with nonremovable and manual drain features, and ASME B1.20.7, garden-hose threads on outlet. Units attached to rough-bronze-finish hose connections may be rough bronze.

E. Intermediate Atmospheric-Vent Backflow Preventers: ASSE 1012, suitable for continuous pressure application. Include inlet screen and two independent check valves with intermediate atmospheric vent.

F. Reduced-Pressure-Principle Backflow Preventers: ASSE 1013, suitable for continuous pressure application. Include outside screw and yoke gate valves on inlet and outlet, and strainer on inlet; test cocks; and pressure-differential relief valve with ASME A112.1.2 air-gap fitting located between two positive-seating check valves.

1. Pressure Loss: 12 psig (83 kPa) maximum, through middle 1/3 of flow range.

G. Double-Check Backflow Prevention Assemblies: ASSE 1015, suitable for continuous pressure application. Include shutoff valves on inlet and outlet, and strainer on inlet; test cocks; and two positive-seating check valves.

1. Pressure Loss: 5 psig (35 kPa) maximum, through middle 1/3 of flow range.

H. Antisiphon-Pressure-Type Vacuum Breakers: ASSE 1020, suitable for continuous pressure application. Include shutoff valves, spring-loaded check valve, spring-loaded floating disc, test cocks, and atmospheric vent.

1. Pressure Loss: 5 psig (35 kPa) maximum, through middle 1/3 of flow range.

I. Dual-Check-Valve-Type Backflow Preventers: ASSE 1024, suitable for continuous pressure application. Include union inlet and two independent check valves.

J. Dual-Check-Valve-Type Backflow Preventers: ASSE 1032, suitable for continuous pressure application for carbonated beverage dispensers. Include stainless-steel body; primary and secondary checks; ball check; intermediate atmospheric-vent port for relieving carbon dioxide; and threaded ends, NPS 3/8 (DN 10).

K. Laboratory Faucet Vacuum Breakers: ASSE 1035, suitable for continuous pressure application and chrome plated; consisting of primary and secondary checks; intermediate vacuum breaker; and threaded ends, NPS 1/4 or NPS 3/8 (DN 8 or DN 10) as required.

L. Reduced-Pressure Detector Assembly Backflow Preventers: ASSE 1047, FM approved or UL listed, and suitable for continuous pressure application. Include outside screw and yoke gate valves on inlet and outlet, and strainer on inlet. Include test cocks; pressure-differential relief valve with ASME A112.1.2 air-gap fitting located between two positive-seating check valves; and bypass with displacement-type water meter, valves, and reduced-pressure backflow preventer.

1. Pressure Loss: 12 psig (83 kPa) maximum, through middle 1/3 of flow range.

M. Double-Check Detector Assembly Backflow Preventers: ASSE 1048, FM approved or UL listed, and suitable for continuous pressure application. Include outside screw and yoke gate valves on inlet and outlet, and strainer on inlet. Include test cocks; two positive-seating check valves; and bypass with displacement-type water meter, valves, and double-check backflow preventer.

1. Pressure Loss: 5 psig (35 kPa) maximum, through middle 1/3 of flow range.

N. Hose-Connection Backflow Preventers: ASSE 1052, suitable for at least 3-gpm (0.19-L/s) flow and applications with up to 10-foot head of water (30-kPa) back pressure. Include two check valves; intermediate atmospheric vent; and nonremovable, ASME B1.20.7, garden-hose threads on outlet.

O. Back-Siphonage Backflow Vacuum Breakers: ASSE 1056, suitable for continuous pressure and backflow applications. Include shutoff valves, check valve, test cocks, and vacuum vent.

2.03 WATER REGULATORS

A. Available Manufacturers:

B. Manufacturers:

1. Armstrong-Yoshitake, Inc.

2. BERMAD.

3. Cashco, Inc.

4. Cla-Val Co.

5. Conbraco Industries, Inc.

6. FLOMATIC Corp.

7. G A Industries, Inc.

8. Honeywell Braukmann.

9. IMI Cash Valve.

10. Watts Industries, Inc.; Water Products Div.

11. Zurn Industries, Inc.; Wilkins Div.

C. General: ASSE 1003, water regulators, rated for initial working pressure of 150 psig (1035 kPa) minimum. Include integral factory-installed or separate field-installed, Y-pattern strainer.

1. NPS 2 (DN 50) and Smaller: Bronze body with threaded ends.

a. General-Duty Service: Single-seated, direct operated, unless otherwise indicated.

b. Booster Heater Water Supply: Single-seated, direct operated with integral bypass.

2. NPS 2-1/2 (DN 65) and Larger: Bronze or cast-iron body with flanged ends. Include AWWA C550 or FDA-approved, interior epoxy coating for regulators with cast-iron body.

a. Type: Single-seated, direct operated.

b. Type: Pilot-operated, single- or double-seated, cast-iron-body main valve, with bronze-body pilot valve.

3. Interior Components: Corrosion-resistant materials.

4. Exterior Finish: Polished chrome plate if used in chrome-plated piping system.

2.04 BALANCING VALVES

A. Calibrated Balancing Valves: Adjustable, with two readout ports and memory setting indicator. Include manufacturer's standard hoses, fittings, valves, differential pressure meter, and carrying case.

1. Available Manufacturers:

2. Manufacturers:

a. Amtrol, Inc.

b. Armstrong Pumps, Inc.

c. Armstrong-Yoshitake, Inc.

d. Flow Design, Inc.

e. ITT Industries; Bell & Gossett Div.

f. ROMAC Industries, Inc.; Hays Fluid Control Div.

g. Taco, Inc.

h. Tour & Andersson, Inc.

i. Watts Industries, Inc.; Water Products Div.

3. NPS 2 (DN 50) and Smaller: Bronze body with brass ball, adjustment knob, calibrated nameplate, and threaded or solder-joint ends.

4. NPS 2 (DN 50) and Smaller: Bronze, Y-pattern body with adjustment knob and threaded ends.

5. NPS 2-1/2 (DN 65) and Larger: Cast-iron, Y-pattern body with bronze disc and flanged or grooved ends.

B. Memory-Stop Balancing Valves, NPS 2 (DN 50) and Smaller: MSS SP-110, ball valve, rated for 400-psig (2760-kPa) minimum CWP. Include two-piece, copper-alloy body with standard or full-port, chrome-plated brass ball, replaceable seats and seals, threaded or solder-joint ends, and vinyl-covered steel handle with memory-stop device.

1. Available Manufacturers:

2. Manufacturers:

a. Conbraco Industries, Inc.

b. Crane Co.; Crane Valve Group; Crane Valves.

c. Crane Co.; Crane Valve Group; Jenkins Valves.

d. Crane Co.; Crane Valve Group; Stockham Div.

e. Grinnell Corporation.

f. Hammond Valve.

g. Milwaukee Valve Company.

h. NIBCO INC.

i. Red-White Valve Corp.

2.05 THERMOSTATIC WATER MIXING VALVES

A. Available Manufacturers:

B. Manufacturers:

1. Lawler Manufacturing Company, Inc.

2. Leonard Valve Company.

3. Mark Controls Corp.; Powers Process Controls.

4. Symmons Industries, Inc.

5. T & S Brass and Bronze Works, Inc.

C. General: ASSE 1017, manually adjustable, thermostatic water mixing valve with bronze body. Include check stop and union on hot- and cold-water-supply inlets, adjustable temperature setting, and thermometer.

1. Type: Bimetal thermostat, operation and pressure rating 125 psig (860 kPa) minimum.

2. Type: Liquid-filled motor, operation and pressure rating 100 psig (690 kPa) minimum.

D. Thermostatic Water Mixing Valves: Unit, with the following:

1. Piping, valves, and unions. Include thermometer if not in cabinet.

2. Piping Component Finish: Polished chrome plate.

3. Cabinet: Surface-mounting stainless-steel box with stainless-steel hinged door and thermometer in front.

E. Manifolded, Thermostatic Water Mixing-Valve Assemblies: Factory-fabricated unit consisting of parallel arrangement of thermostatic water mixing valves.

1. Arrangement: One large-flow, thermostatic water mixing valve with flow-control valve, pressure regulator, inlet and outlet pressure gages, and one small-flow, thermostatic water mixing valve with flow-control valve. Include outlet thermometer, factory- or field-installed inlet and outlet valves, and other indicated options.

2. Include piping, valves, and unions.

3. Piping Component Finish: Polished chrome plate.

4. Cabinet: Surface-mounting steel box with steel hinged door, white enameled finish, and thermometer in front.

5. Cabinet: Surface-mounting stainless-steel box with stainless-steel hinged door and thermometer in front.

2.06 WATER TEMPERING VALVES

A. Manufacturers:

1. Heat-Timer Corporation.

2. Holby Valve Co., Inc.

3. Sparco, Inc.

4. Watts Industries, Inc.; Water Products Div.

B. General: Manually adjustable, thermostatically controlled water tempering valve; bronze body; and adjustable temperature setting.

C. System Water Tempering Valves: Piston or discs controlling both hot- and cold-water flow, capable of limited antiscald protection. Include threaded inlets and outlet.

1. Finish: Rough bronze.

D. Limited-Volume, Water Tempering Valves: Solder-joint inlets and NPS 3/4 (DN 20) maximum outlet.

2.07 STRAINERS

A. Strainers: Y-pattern, unless otherwise indicated, and full size of connecting piping. Include ASTM A 666, Type 304, stainless-steel screens with 3/64-inch (1.2-mm) round perforations, unless otherwise indicated.

1. Pressure Rating: 125-psig (860-kPa) minimum steam working pressure, unless otherwise indicated.

2. NPS 2 (DN 50) and Smaller: Bronze body, with female threaded ends.

3. NPS 2-1/2 (DN 65) and Larger: Cast-iron body, with interior AWWA C550 or FDA-approved, epoxy coating and flanged ends.

4. Y-Pattern Strainers: Screwed screen retainer with centered blowdown.

   a. Drain: Pipe plug.

5. T-Pattern Strainers: Malleable-iron or ductile-iron body with grooved ends; access end cap with drain plug and access coupling with rubber gasket.

6. Basket Strainers: Bolted flange or clamp cover, and basket with lift-out handle.

   a. Type: Simplex with one basket.

   b. Drain: Pipe plug.

B. Drainage Basket Strainers: Non-pressure-rated, cast-iron or coated-steel body; with bolted flange or clamp cover and drain with plug.

1. Basket: Bronze or stainless steel with 1/8- or 3/16-inch- (3.2- or 4.8-mm-) diameter holes and lift-out handle.

2. Female threaded ends for NPS 2 (DN 50) and smaller, and flanged ends for NPS 2-1/2 (DN 65) and larger.

2.08 KEY-OPERATION HYDRANTS

A. Available Manufacturers:

B. Manufacturers:

1. Josam Co.

2. Murdock, Inc.

3. Simmons Manufacturing Co.

4. Smith, Jay R. Mfg. Co.

5. Tyler Pipe; Wade Div.

6. Watts Industries, Inc.; Drainage Products Div.

7. Woodford Manufacturing Co.

8. Zurn Industries, Inc.; Jonespec Div.

9. Zurn Industries, Inc.; Specification Drainage Operation.

C. General: ASME A112.21.3M, key-operation hydrant with pressure rating of 125 psig (860 kPa).

1. Inlet: NPS 3/4 or NPS 1 (DN 20 or DN 25) threaded or solder joint.

2. Outlet: ASME B1.20.7, garden-hose threads.

3. Operating Keys: One with each key-operation hydrant.

D. Nonfreeze Exposed-Outlet Wall Hydrants: ASSE 1019, self-drainable with integral nonremovable hose-connection vacuum breaker casing and operating rod to match wall thickness, projecting outlet, and wall clamp.

1. Classification: Type A, for automatic draining with hose removed .

2. Nozzle and Wall Plate Finish: Polished bronze.

3. Nozzle and Wall Plate Finish: Polished chrome plate.

2.09 TRAP SEAL PRIMER VALVES

A. Supply-Type Trap Seal Primer Valves: ASSE 1018, water-supply-fed type, with the following characteristics:

1. Available Manufacturers:

2. Manufacturers:

a. E & S Valves.

b. Josam Co.

c. MIFAB Manufacturing, Inc.

d. Precision Plumbing Products, Inc.

e. Smith, Jay R. Mfg. Co.

f. Tyler Pipe; Wade Div.

g. Watts Industries, Inc.; Drainage Products Div.

h. Watts Industries, Inc.; Water Products Div.

i. Zurn Industries, Inc.; Jonespec Div.

j. Zurn Industries, Inc.; Specification Drainage Operation.

3. 125-psig (860-kPa) minimum working pressure.

4. Bronze body with atmospheric-vented drain chamber.

5. Inlet and Outlet Connections: NPS 1/2 (DN 15) threaded, union, or solder joint.

6. Gravity Drain Outlet Connection: NPS 1/2 (DN 15) threaded or solder joint.

7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

B. Drainage-Type Trap Seal Primer Valves: ASSE 1044, fixture-trap, waste-drainage-fed type, with the following characteristics:

1. Manufacturers:

a. Smith, Jay R. Mfg. Co.

2. Chrome-plated, cast-brass, NPS 1-1/4 (DN 32) minimum, lavatory P-trap with NPS 3/8 (DN 10) minimum, trap makeup connection.

C. Trap Seal Primer System: Factory-fabricated, automatic-operation assembly for wall mounting with the following:

1. Manufacturers:

a. Precision Plumbing Products, Inc.

2. Piping: NPS 3/4, ASTM B 88, Type L (DN 20, ASTM B 88M, Type B); copper, water tubing inlet and manifold with number of NPS 1/2 (DN 15) outlets as indicated.

3. Cabinet: Steel box with stainless-steel cover.

4. Electric Controls: 24-hour timer, solenoid valve, and manual switch for 120-V ac power.

5. Water Hammer Arrester: ASSE 1010.

6. Vacuum Breaker: ASSE 1001.

2.010 MISCELLANEOUS PIPING SPECIALTIES

A. Water Hammer Arresters: ASSE 1010 or PDI-WH 201, metal-bellows type with pressurized metal cushioning chamber. Sizes indicated are based on ASSE 1010 or PDI-WH 201, Sizes A through F.

1. Manufacturers:

a. Josam Co.

b. Smith, Jay R. Mfg. Co.

c. Tyler Pipe; Wade Div.

d. Zurn Industries, Inc.; Specification Drainage Operation.

B. Hose Bibbs: Bronze body with replaceable seat disc complying with ASME A112.18.1M for compression-type faucets. Include NPS 1/2 or NPS 3/4 (DN 15 or DN 20) threaded or solder-joint inlet, of design suitable for pressure of at least 125 psig (860 kPa); integral [or field-installed,] nonremovable, drainable hose-connection vacuum breaker; and garden-hose threads complying with ASME B1.20.7 on outlet.

1. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.

2. Include operating key with each operating-key hose bibb.

3. Include integral wall flange with each chrome- or nickel-plated hose bibb.

C. Air Vents: Float type for automatic air venting.

1. Bolted Construction: Bronze body with replaceable, corrosion-resistant metal float and stainless-steel mechanism and seat; threaded [NPS 3/8 (DN 10)] [NPS 1/2 (DN 15)] minimum inlet; 125-psig (860-kPa) minimum pressure rating at 140 deg F (60 deg C); and threaded vent outlet.

2. Welded Construction: Stainless-steel body with corrosion-resistant metal float, stainless-steel mechanism and seat, threaded NPS 3/8 (DN 10) minimum inlet, 150-psig (1035-kPa) minimum pressure rating, and threaded vent outlet.

D. Deep-Seal Traps: Cast-iron or bronze casting, with inlet and outlet matching connected piping and cleanout trap seal primer valve connection.

1. NPS 2 (DN 50): 4-inch- (100-mm-) minimum water seal.

2. NPS 2-1/2 (DN 65) and Larger: 5-inch- (125-mm-) minimum water seal.

E. Floor-Drain Inlet Fittings: Cast iron, with threaded inlet and threaded or spigot outlet, and trap seal primer valve connection.

Expansion Joints: ASME A112.21.2M, assembly with cast-iron body with bronze sleeve, packing gland, and packing; of size and end types corresponding to connected piping.

2.011 SLEEVE PENETRATION SYSTEMS

A. Available Manufacturers:

B. Manufacturers:

1. ProSet Systems, Inc.

C. Description: UL 1479, through-penetration firestop assembly consisting of sleeve and stack fitting with firestopping plug.

1. Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.

2. Stack Fitting: ASTM A 48 (ASTM A 48M), gray-iron, hubless-pattern, wye-branch stack fitting with neoprene O-ring at base and gray-iron plug in thermal-release harness in branch. Include PVC protective cap for plug.

a. Special Coating: Include corrosion-resistant interior coating on fittings for plastic chemical waste and vent stacks.

2.012 FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: 4-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness.

2. Vent Pipe Flashing: 3-lb/sq. ft. (15-kg/sq. m), 0.0469-inch (1.2-mm) thickness.

3. Burning: 6-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness.

B. Copper Sheet: ASTM B 152 (ASTM B 152M), of the following minimum weights and thicknesses, unless otherwise indicated:

1. General Applications: 12 oz./sq. ft. (3.7 kg/sq. m or 0.41-mm thickness).

2. Vent Pipe Flashing: 8 oz./sq. ft. (2.5 kg/sq. m or 0.27-mm thickness).

C. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch (1.01-mm) minimum thickness, unless otherwise indicated. Include G90 (Z275) hot-dip galvanized, mill-phosphatized finish for painting if indicated.

D. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil (1.01-mm) minimum thickness.

E. Fasteners: Metal compatible with material and substrate being fastened.

F. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

G. Solder: ASTM B 32, lead-free alloy.

H. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

2.013 CLEANOUTS

A. Cleanouts, CO: Comply with ASME A112.36.2M.

1. Application: Floor cleanout.

2. Available Products:

3. Products:

a. Josam Co.;

b. Josam Co., Blucher-Josam Div

c. LSP Products Group.;

d. Sioux Chief Manufacturing Co., Inc

e. Smith, Jay R. Mfg. Co

f. Tyler Pipe, Wade Div.;

g. Watts Industries, Inc., Drainage Products Div.;

h. Zurn Industries, Inc., Jonespec Div.;

i. Zurn Industries, Inc., Specification Drainage Operation;

4. Body or Ferrule Material: stainless steel.

5. Clamping Device: Required.

6. Outlet Connection: Threaded.

7. Closure: Brass plug with straight threads and gasket.

8. Adjustable Housing Material: stainless steel.

9. Frame and Cover Material and Finish: Painted cast iron.

10. Frame and Cover Shape: Round.

11. Top Loading Classification: Heavy Duty.

2.014 FLOOR DRAINS

A. Floor Drains, FD, Comply with ASME A112.21.1, backwater valve.

1. Application: Floor drain.

2. Available Products: All pumping station floor drains shall be made of stainless steel.

3. Products:

a. Josam Co.;

b. Josam Co., Blucher-Josam Div

c. Sioux Chief Manufacturing Co., Inc.;

d. Smith, Jay R. Mfg. Co

e. Tyler Pipe, Wade Div.;

f. Watts Industries, Inc., Drainage Products Div.;

g. Zurn Industries, Inc., Jonespec Div.;

h. Zurn Industries, Inc., Specification Drainage Operation;

4. Body Material: Stainless steel

5. Seepage Flange: Required.

6. Clamping Device: Required.

7. Outlet: Bottom.

8. Exposed Surfaces and Interior Lining:

9. Sediment Bucket:

10. Top or Strainer Material: Stainless steel

11. Top of Body and Strainer Finish: Stainless steel

12. Top Shape: Round.

13. Dimensions of Top or Strainer:

14. Top Loading Classification: Heavy Duty.

15. Funnel: Not required

16. Inlet Fitting: Stainless steel, with threaded inlet and threaded or spigot outlet, and trap seal primer valve connection.

17. Trap Material: Stainless steel

18. Trap Pattern: Standard P-trap.

19. Trap Features: Cleanout.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for piping joining materials, joint construction, and basic installation requirements.

B. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.

1. Locate backflow preventers in same room as connected equipment or system.

2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are not acceptable for this application.

3. Do not install bypass piping around backflow preventers.

C. Install pressure regulators with inlet and outlet shutoff valves and balance valve bypass. Install pressure gages on inlet and outlet.

D. Install strainers on supply side of each control valve, pressure regulator, and solenoid valve.

E. Install trap seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

F. Install backwater valves in building drain piping. For interior installation, provide cleanout deck plate flush with floor and centered over backwater valve cover, and of adequate size to remove valve cover for servicing.

G. Install expansion joints on vertical risers, stacks, and conductors if indicated.

H. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4 (DN 100). Use NPS 4 (DN 100) for larger drainage piping unless larger cleanout is indicated.

2. Locate at each change in direction of piping greater than 45 degrees.

3. Locate at minimum intervals of 50 feet (15 m) for piping NPS 4 (DN 100) and smaller and 100 feet (30 m) for larger piping.

4. Locate at base of each vertical soil and waste stack.

I. Install cleanout deck plates with top flush with finished floor, for floor cleanouts for piping below floors.

J. Install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall, for cleanouts located in concealed piping.

K. Install flashing flange and clamping device with each stack and cleanout passing through floors with waterproof membrane.

L. Install vent flashing sleeves on stacks passing through roof. Secure over stack flashing according to manufacturer's written instructions.

M. Install frost-proof vent caps on each vent pipe passing through roof. Maintain 1-inch (25-mm) clearance between vent pipe and roof substrate.

N. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.

2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:

a. Radius, 30 Inches (750 mm) or Less: Equivalent to 1 percent slope, but not less than 1/4-inch (6.35-mm) total depression.

b. Radius, 30 to 60 Inches (750 to 1500 mm): Equivalent to 1 percent slope.

c. Radius, 60 Inches (1500 mm) or Larger: Equivalent to 1 percent slope, but not greater than 1-inch (25-mm) total depression.

3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.

4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

O. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions.

1. Install roof-drain flashing collar or flange so no leakage occurs between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.

2. Position roof drains for easy access and maintenance.

P. Install interceptors, including trapping, venting, and flow-control fitting, according to authorities having jurisdiction and with clear space for servicing.

1. Above-Floor Installation: Set unit with bottom resting on floor, unless otherwise indicated.

2. Flush with Floor Installation: Set unit and extension, if required, with cover flush with finished floor.

3. Recessed Floor Installation: Set unit in receiver housing having bottom or cradle supports, with receiver housing cover flush with finished floor.

4. Install cleanout immediately downstream from interceptors not having integral cleanout on outlet.

5. Coordinate oil-interceptor storage tank and gravity drain with Division 2 Section "Fuel-Oil Distribution."

Q. Install grease recovery units on floor. Install trap, vent, and flow-control fitting according to authorities having jurisdiction.

1. Install control panel adjacent to unit, unless otherwise indicated.

R. Fasten wall-hanging plumbing specialties securely to supports attached to building substrate if supports are specified and to building wall construction if no support is indicated.

S. Fasten recessed-type plumbing specialties to reinforcement built into walls.

T. Install wood-blocking reinforcement for wall-mounting and recessed-type plumbing specialties.

U. Install individual shutoff valve in each water supply to plumbing specialties. Use ball, gate, or globe valve if specific valve is not indicated. Install shutoff valves in accessible locations. Refer to Division 15 Section "Valves" for general-duty ball, butterfly, check, gate, and globe valves.

V. Install air vents at piping high points. Include ball, gate, or globe valve in inlet and drain piping from outlet to floor drain.

W. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

X. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

3.02 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Connect plumbing specialties to piping specified in other Division 15 Sections.

D. Ground equipment.

E. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

F. Connect plumbing specialties and devices that require power according to Division 16 Sections.

G. Interceptor Connections: Connect piping, flow-control fittings, and accessories.

1. Grease Interceptors: Connect inlet and outlet to unit, and flow-control fitting and vent to unit inlet piping. Install valve on outlet of automatic drawoff-type unit.

2. Grease Recovery Units: Connect inlet, outlet, and vent piping; controls; electric power; and factory-furnished accessories to unit.

3. Oil Interceptors: Connect inlet, outlet, vent, and gravity drawoff piping to unit; flow-control fitting and vent to unit inlet piping; and gravity drawoff and suction piping to oil storage tank.

4. Solids Interceptors: Connect inlet and outlet.

3.03 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead Sheets: Burn joints of lead sheets 6-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness or thicker. Solder joints of lead sheets 4-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness or thinner.

2. Copper Sheets: Solder joints of copper sheets.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches (250 mm), and skirt or flange extending at least 8 inches (200 mm) around pipe.

2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around sleeve.

3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Division 7 Section "Sheet Metal Flashing and Trim."

F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

G. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.04 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each backflow preventer, thermostatic water mixing valve, trap seal primer system.

1. Text: Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit.

2. Refer to Division 15 Section "[Basic Mechanical Materials and Methods] [Mechanical Identification]" for nameplates and signs.

3.05 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled trap seal primer systems and their installation, including piping and electrical connections. Report results in writing.

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.

3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.06 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

3.07 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain trap seal primer systems.

END OF SECTION 15430

SECTION 15450 – PLUMBING FIXTURES AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes plumbing fixtures and related components.

B. Related Sections include the following:
   1. Division 15 Section "Plumbing Specialties" for backflow preventers and specialty fixtures not in this Section.

1.3 DEFINITIONS

A. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.

B. Fitting: Device that controls flow of water into or out of plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, shower heads and tub spouts, drains and tailpieces, and traps and waste pipes. Piping and general-duty valves are included where indicated.

1.4 SUBMITTALS

A. Product Data: Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports and indicate materials and finishes, dimensions, construction details, and flow-control rates for each type of fixture indicated.

B. Shop Drawings: Diagram power, signal, and control wiring and differentiate between manufacturer-installed and field-installed wiring.

C. Maintenance Data: For plumbing fixtures to include in maintenance manuals specified in Division 1.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.

1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; Georgia Accessibility Code and Georgia Energy Code; about plumbing fixtures for people with disabilities.

D. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

E. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

F. Comply with the following applicable standards and other requirements specified for plumbing fixtures:

1. Enameled, Cast-Iron Fixtures: ASME A112.19.1M.
2. Hand Sinks: NSF 2 construction.
3. Plastic Bathtubs: ANSI Z124.1.
4. Vitreous-China Fixtures: ASME A112.19.2M.
5. Water-Closet, Flush Valve, Tank Trim: ASME A112.19.5.
6. Water-Closet, Flushometer Tank Trim: ASSE 1037.

G. Comply with the following applicable standards and other requirements specified for lavatory and sink faucets:

1. Backflow Protection Devices for Faucets with Side Spray: ASME A112.18.3M.
2. Backflow Protection Devices for Faucets with Hose-Thread Outlet: ASME A112.18.3M.
3. Diverter Valves for Faucets with Hose Spray: ASSE 1025.
4. Faucets: ASME A112.18.1M.
5. Hose-Coupling Threads: ASME B1.20.7.
6. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
7. NSF Materials: NSF 61.
8. Pipe Threads: ASME B1.20.1.
9. Supply and Drain Fittings: ASME A112.18.1M.

H. Comply with the following applicable standards and other requirements specified for bathtub and shower faucets:

1. Backflow Protection Devices for Hand-Held Showers: ASME A112.18.3M.
2. Combination, Pressure-Equalizing and Thermostatic-Control Antiscald Faucets: ASSE 1016.
3. Faucets: ASME A112.18.1M.
4. Hand-Held Showers: ASSE 1014.

5. High-Temperature-Limit Controls for Thermal-Shock-Preventing Devices: ASTM F 445.
6. Manual-Control Antiscald Faucets: ASTM F 444.
7. Pipe Threads: ASME B1.20.1.
8. Pressure-Equalizing-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.
9. Thermostatic-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.

I. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:

1. Atmospheric Vacuum Breakers: ASSE 1001.
2. Brass and Copper Supplies: ASME A112.18.1M.
3. Manual-Operation Flushometers: ASSE 1037.
4. Sensor-Operation Flushometers: ASSE 1037 and UL 1951.
5. Tubular Brass Drainage Fittings and Piping: ASME A112.18.1M.

J. Comply with the following applicable standards and other requirements specified for miscellaneous components:
1. Floor Drains: ASME A112.21.1M.
2. Grab Bars: ASTM F 446.
3. Hose-Coupling Threads: ASME B1.20.7.
4. Off-Floor Fixture Supports: ASME A112.6.1M.
5. Pipe
6. Threads: ASME B1.20.1.
7. Plastic Shower Receptors: ANSI Z124.2.
8. Plastic Toilet Seats: ANSI Z124.5.
9. Supply and Drain Protective Shielding Guards: ICC A117.1.
10. Whirlpool Bathtub Equipment: UL 1795.

1.6 COORDINATION

A. Coordinate roughing-in and final plumbing fixture locations, and verify that fixtures can be installed to comply with original design and referenced standards.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. For fixture descriptions in other Part 2 articles where the subparagraph titles introduce a list of manufacturers and their products or manufacturers only, the following requirements apply for product selection:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified in other Part 2 articles.

2.2 LAVATORY FAUCETS

A. Lavatory Faucet: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes and outlet with spout and fixture receptor.

1. Available Products: Chicago
   a. Chicago #802A-665 adjustable self-closing, 4 in. centers, two pushbutton faucet with No. 665 tapered handles, 4 in. spout and ½ GPM or less aerator.
   b. McGuire No. 155-A chrome plated P.O. plug with open grid strainer and 1-1/4 in., 17 gauge tailpiece.
   c. McGuire No. 8902 chrome plated, 17 gauge, 1-1/4 in. x 1-1/2 in. "P" trap with cleanout plug and set screw wall escutcheon.
   d. McGuire #167LK, 3/8 in. chrome plated wall supplies with loose key angle stops, cast brass set screw escutcheons and 12 in. long flexible risers.
   e. Jay R. Smith Series 700 concealed arm floor mounted carrier.

2.3 TOILET SEATS

A. Toilet Seat: Solid plastic.

1. Available Manufacturers: Church
2. Manufacturers:

   a. Church - #9500N55C

3. Configuration: Open front without cover.
4. Class: Standard commercial.
5. Hinge Type: SC, self-sustaining, check.
6. Color: White.

2.4 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Guard, all handicapped fixtures: Manufactured, plastic covering for hot- and cold-water supplies and trap and drain piping and complying with ADA requirements.

1. Available Manufacturers: Brocar
2. Manufacturers:

   a. Trap Wrap Kit 500R.

2.5 FIXTURE SUPPORTS

A. Water-Closet Support: Water-closet combination carrier designed for standard mounting height. Include single or double, vertical or horizontal, hub-and-spigot or hubless waste fitting as required for piping arrangement; faceplates; couplings with gaskets; feet; and fixture bolts and hardware matching fixture. Include additional extension coupling, faceplate, and feet for installation in wide pipe space.

1. Available Manufacturers:
2. Manufacturers:

   a. Jay R. Smith 0209

B. Lavatory Support, Type II, lavatory carrier with concealed arms and tie rod. Include steel uprights with feet.

1. Available Manufacturers:
2. Manufacturers:

   a. Jay R. Smith 700 Series

3. Accessible Fixture Support: Include rectangular steel uprights.

2.6 WATER CLOSETS

A. Water Closets, Type WC hanging, back-outlet, vitreous-china fixture designed for flushometer valve operation.

1. Available Products:
2. Products:

   a. American Standard, Inc.; #2257.103 Afwall.
   b. Crane Plumbing/Fiat Products.
   c. Kohler Co.

3. Style: One piece.

   a. Bowl Type: Elongated with siphon-jet design.
   b. Design Consumption: 1.6 gal./flush (6 L/flush).
   c. Color: White.

4. Supply: Stop.

   a. #111YO Sloan "Royal" flush valve with screwdriver angle.

      1) Stop, quiet flush equipment, vacuum breaker and seat bumper on angle stop.

5. Fixture Support: Water-closet support - Jay R. Smith Series 200 combination carrier.

2.7 LAVATORIES

A. Lavatories, LAV with front overflow and faucet ledge; vitreous-china fixture, countertop mounted.

1. Available Products: American Standard
2. Products:

a. American Standard, Inc.; #0476.028 Aqualyn.
3. Type: Self rimming countertop lav.
4. Size: 20 by 17 inches oval.
5. Faucet Hole Punching: 4-inch centers hole[s].
6. Faucet Hole Location: Top.
7. Color: White.
8. Faucet: Lavatory Chicago #802A-665 with No. 665 handles 4" spout and ½ gpm aerator.
9. Supplies: NPS 3/8 (DN 10) chrome-plated copper loose key angle with stops. Cast brass set screw wall escutcheons and 12" long flexible risers.
10. Drain: McGoire No. 155-A chrome plated PO plug with open grid strainer and 1-1/4", 17 GA tailpiece.
11. Drain Piping: NPS 1-1/4 by NPS 1-1/2 (DN 32 by DN 40) chrome-plated cast-brass trap with cleanout plug, and wall set screw escutcheon.
12. Drain Piping: NPS 1-1/4 by NPS 1-1/2 (DN 32 by DN 40) chrome-plated cast-brass trap, and wall escutcheon. Same as LAV-A.

2.8 DRINKING FOUNTAIN

A. Drinking Fountain, DF.

1. Available Products: OASIS
1. Products: P8ACLSS.
2. Wall mount two level barrier free water cooler.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water soil and for waste piping systems and supports to verify actual locations and sizes of piping connections and that locations and types of supports match those indicated, before plumbing fixture installation. Use manufacturer's roughing-in data if roughing-in data are not indicated.

B. Examine walls, floors, and cabinets for suitable conditions where fixtures are to be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FIXTURE INSTALLATION

A. Assemble fixtures, trim, fittings, and other components according to manufacturers' written instructions.

B. For wall-hanging fixtures, install off-floor supports affixed to building substrate.

1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
2. Use carrier supports without waste fitting for fixtures with tubular waste piping.

3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.

C. Install back-outlet, wall-hanging fixtures onto waste fitting seals and attach to supports.

D. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.

E. Install wall-hanging fixtures with tubular waste piping attached to supports.

F. Install floor-mounting, back-outlet water closets attached to building floor substrate and wall bracket and onto waste fitting seals.

G. Install counter-mounting fixtures in and attached to casework.

H. Install fixtures level and plumb according to manufacturers' written instructions and roughing-in drawings.

I. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

1. Exception: Use ball, gate, or globe valve if stops are not specified with fixture. Refer to Division 15 Section "Valves" for general-duty valves.

J. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.

K. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.

L. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.

M. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.

N. Install toilet seats on water closets.

O. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

P. Install water-supply, flow-control fittings with specified flow rates in fixture supplies at stop valves.

Q. Install faucet, flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

R. Install shower, flow-control fittings with specified maximum flow rates in shower arms.

S. Install traps on fixture outlets.

1. Exception: Omit trap on fixtures with integral traps.
2. Exception: Omit trap on indirect wastes, unless otherwise indicated.

T. Install disposer in outlet of sinks indicated to have disposer. Install switch where indicated or in wall adjacent to sink if location is not indicated.

U. Install hot-water dispensers in back top surface of sink or in counter with spout over sink.

V. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for escutcheons.

W. Set service basins in leveling bed of cement grout. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for grout.

X. Seal joints between fixtures and walls, floors, and counters using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Refer to Division 7 Section "Joint Sealants" for sealant and installation requirements.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect water supplies from water distribution piping to fixtures.

C. Connect drain piping from fixtures to drainage piping.

D. Supply and Waste Connections to Plumbing Fixtures: Connect fixtures with water supplies, stops, risers, traps, and waste piping. Use size fittings required to match fixtures. Connect to plumbing piping.

E. Supply and Waste Connections to Fixtures and Equipment Specified in Other Sections: Connect fixtures and equipment with water supplies, stops, risers, traps, and waste piping specified. Use size fittings required to match fixtures and equipment. Connect to plumbing piping.

3.4 FIELD QUALITY CONTROL

A. Verify that installed fixtures are categories and types specified for locations where installed.

B. Check that fixtures are complete with trim, faucets, fittings, and other specified components.

C. Inspect installed fixtures for damage. Replace damaged fixtures and components.

D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

E. Install fresh batteries in sensor-operated mechanisms.

3.5 ADJUSTING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Adjust water pressure at faucets to produce proper flow and stream.

C. Replace washers and seals of leaking and dripping faucets and stops.

3.6 CLEANING

A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:

B. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
   1. Remove sediment and debris from drains.

3.7 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 15450

SECTION 15671 – AIR COOLED CONDENSING UNIT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following:

1. Air cooled condensing units.

1.03 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data including rated capacities of selected models, weights (shipping, installed, and operating), furnished specialties, accessories, and installation and startup instructions.

C. Shop Drawings from manufacturer detailing equipment assemblies and indicating dimensions, weights, loadings, required clearances, method of field assembly, components, and location and size of each field connection.

D. Wiring diagrams detailing wiring for power and control systems and differentiating between manufacturer-installed and field-installed wiring.

E. Maintenance data for each condensing unit, control, and accessory to include in the operation and maintenance manual specified in Division 1.

1.04 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with provisions of the following codes:

1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Code for Mechanical Refrigeration."

B. UL Standard: Condensing unit shall be certified in accordance with UL Standard 1995.

C. The condensing unit shall be safety certified by an accredited testing laboratory and the nameplates shall carry the label of the certification agency.

1.05 WARRANTY

A. The complete unit shall be warranted for a period of not less than 18 months from the date of shipment. Any component of the unit found not working prior to, or during the original start-up of the unit shall be replaced with no labor or freight expenses to the owner or

installing contractor. After the initial start-up the warranty shall be limited to the original cost of the component.

B. The scroll compressors shall be warranted for a period of not less than 60 months from date of shipment. Warranty is limited to parts only.

C. Warranty excludes failures cause by improper installation, abuse, misuse and misapplication improper maintenance, lack of maintenance, negligence, accident and normal deterioration, including wear and tear.

1.06 SEQUENCING AND SCHEDULING

A. Coordinate size and location of concrete housekeeping bases. Cast anchor-bolt inserts into base. Concrete reinforcement and formwork requirements as specified

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements and space constraints, provide products by one of the following:

1. Air Cooled Condensing Unit:

a. AAON

b. McQuay

c. Trane

d. Carrier

2.02 AIR COOLED CONDENSING UNIT (410a)

A. Unit shall be completely factory assembled, piped and wired and shipped in one section.

B. Unit shall be specifically designed for outdoor application.

C. All cabinet walls roof and floor shall be a high performance composite panel constructed with G90 galvanized steel on both sides and a closed cell polyurethane foam interior core providing a rigid, impact resistant surface.

D. Paint finish shall be capable of withstanding at least 2000 hours, with no visible corrosive effects, when tested in a salt spray and fog atmosphere in accordance with ASTM B 117-95 test procedure.

E. A walk-in compartment shall contain the compressors and electrical control panel. The compartment shall be provided with a fluorescent light fixture with a wire guard. The light shall be controlled by a wall switch and shall remain energized regardless of the position of the main power switch.

F. Unit specific color coded wiring diagrams shall match the unit color coded wiring and will be provided in both point-to-point and ladder form. Diagrams shall also be laminated in plastic and permanently affixed inside the control compartment.

G. Access to items needing periodic checking or maintenance shall be through hinged access doors with latches that have provisions for a padlock.

H. Access doors shall have stainless steel hinges and full perimeter gasketing.

I. Side service access doors shall have a rain gutter over the door.

J. Unit shall have decals and tags to indicate unit lifting and rigging, service areas and caution areas. Installation and maintenance manuals shall be supplied with each unit.

K. The condensing section shall be equipped vertical discharge axial flow direct drive 1170 RPM fans with all aluminum construction and adjustable blade pitch. Direct drive fans shall be directly connected to and supported by the motor shaft. Motor bearings have external lubrication connections.

L. The condenser coils shall be sloped to protect the coils from damage. The condenser coils, facing out, shall be protected by a sheet of perforated metal.

M. Condenser coils shall be copper tubes with aluminum fins mechanically bonded to the tubes.

N. Condenser coils to be sized for a minimum of 10°F of refrigerant sub-cooling.

O. The mechanical refrigerant system shall be capable of operation down to an ambient of 25^0F.

P. Compressors shall be 410a scroll type tandem arrangement with internal thermal overload protection and mounted on the compressor manufacturer's recommended rubber vibration isolators. Each pair of tandem compressors shall have independent refrigerant circuits.

Q. Compressors shall be mounted in a sound attenuating and lighted compartment to permit operation of the unit without affecting performance during routine maintenance or service. Compressors shall be isolated from the base to avoid any transmission of noise from the compressor into the support structure.

R. System shall be equipped with automatic reset low pressure switches, manual reset high pressure refrigerant controls, Schrader type service fittings on both the high side and low pressure sides of the system, replaceable core refrigerant liquid line driers with isolation valves, and sight glasses.

S. Field connections to each circuit shall be provided with ball type shutoff valves that shall be opened after the field connections are made and the all the field connected circuits have been properly evacuated. An HFC-410a holding charge shall be provided.

T. Unit shall be provided with a factory installed and wired, non-fused, disconnect switch.

U. Unit shall be provided with phase and brown-out protection to shut down all motors in the unit if the phases are more than 10% out of balance on voltage, or the voltage is more than 10% under design voltage or on phase reversal.

V. Unit shall be provided with a factory installed and wired 115 volt, 15 amp ground fault service receptacle.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas to receive air cooled condensing units for compliance with requirements for installation tolerances and other conditions affecting performance. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install air cooled condensing units as indicated, according to manufacturer's written instructions.

B. Install grade mounted units on 6-inch concrete slab.

3.03 CONNECTIONS

A. Drawings indicate the general arrangement of piping, fittings, and specialties.

B. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.04 CLEANING

A. After completing system installation, including outlet fittings and devices, inspect and clean exposed finishes. Remove dirt and construction debris and repair damaged finishes.

3.05 START-UP

A. Manufacturer's authorized personnel shall start the unit and train owner's designee per the Installation, Operation, and Maintenance Manual instructions.

3.06 INSTALLATION, OPERATION, AND MAINTENANCE MANUALS

A. One copy of the Installation, Operation, and Maintenance Manual shall be enclosed in the unit control panel. Three copies shall be forwarded to the installing contractor.

B. The manual shall consist of recommended installation procedures and guidelines, sequence of operation, inspection, initial start-up, operating, maintenance and troubleshooting sections. All electrical components shall have individual maintenance cut sheets included in the manual as printed by the manufactures of those components.

3.07 DEMONSTRATION

A. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance.

B. Schedule training with Owner, Project manager, with at least 7 days' advance notice.

END OF SECTION 15671

SECTION 15820 – DUCT ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:

1. Backdraft dampers.
2. Manual-volume dampers.
3. Fire and smoke dampers.
4. Turning vanes.
5. Duct-mounted access doors and panels.
6. Flexible ducts.
7. Flexible connectors.
8. Duct accessory hardware.

B. Related Sections include the following:

1. Division 15 Section "Diffusers, Registers, and Grilles."
2. Division 15 Section "HVAC Controls & Instrumentation" for electric damper actuators.

1.02 SUBMITTALS

A. Product Data: For the following:

1. Backdraft dampers.
2. Manual-volume dampers.
3. Fire and smoke dampers.
4. Duct-mounted access doors and panels.
5. Flexible ducts.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loadings, required clearances, method of field assembly, components, location, and size of each field connection. Detail the following:

1. Special fittings and manual- and automatic-volume-damper installations.

2. Fire- and smoke-damper installations, including sleeves and duct-mounted access doors and panels.

C. Product Certificates: Submit certified test data on dynamic insertion loss; self-noise power levels; and airflow performance data, static-pressure loss, dimensions, and weights.

1.03 QUALITY ASSURANCE

A. NFPA Compliance: Comply with the following NFPA standards:

1. NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."

2. NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

1.04 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

1. Fusible Links: Furnish quantity equal to 10 percent of amount installed.

PART 2 - PRODUCTS

2.01 SHEET METAL MATERIALS

A. Galvanized, Sheet Steel: Lock-forming quality; ASTM A 653/A 653M, G90 (Z275) coating designation; mill-phosphatized finish for surfaces of ducts exposed to view.

B. Carbon-Steel Sheets: ASTM A 366/A 366M, cold-rolled sheets, commercial quality, with oiled, exposed matte finish.

C. Aluminum Sheets: ASTM B 209 (ASTM B 209M), Alloy 3003, Temper H14, sheet form; with standard, one-side bright finish for ducts exposed to view and mill finish for concealed ducts.

D. Extruded Aluminum: ASTM B 221 (ASTM B 221M), Alloy 6063, Temper T6.

E. Reinforcement Shapes and Plates: Galvanized steel reinforcement where installed on galvanized, sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

F. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for 36-inch (900-mm) length or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.02 BACKDRAFT DAMPERS

A. Description: Suitable for horizontal or vertical installations.

B. Frame: 0.052-inch- (1.3-mm-) thick, galvanized, sheet steel, with welded corners.

C. Blades: 0.050-inch- (1.2-mm-) thick aluminum sheet.

D. Blade Seals: Vinyl.

E. Blade Seals: Neoprene.

F. Blade Axles: Galvanized steel.

G. Tie Bars and Brackets: Galvanized steel.

H. Return Spring: Adjustable tension.

2.03 MANUAL-VOLUME DAMPERS

A. General: Factory fabricated with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.

1. Pressure Classifications of 3-Inch wg (750 Pa) or Higher: End bearings or other seals for ducts with axles full length of damper blades and bearings at both ends of operating shaft.

B. Standard Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, standard leakage rating, with linkage outside airstream, and suitable for horizontal or vertical applications.

C. Jackshaft: 1-inch- (25-mm-) diameter, galvanized steel pipe rotating within a pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.

1. Length and Number of Mountings: Appropriate to connect linkage of each damper of a multiple-damper assembly.

D. Damper Hardware: Zinc-plated, die-cast core with dial and handle made of 3/32-inch- (2.4-mm-) thick zinc-plated steel, and a 3/4-inch (19-mm) hexagon locking nut. Include center hole to suit damper operating-rod size. Include elevated platform for insulated duct mounting.

2.04 FIRE DAMPERS

A. General: Labeled to UL 555.

B. Fire Rating: One and one-half hours.

C. Frame: SMACNA Type B with blades out of airstream; fabricated with roll-formed, 0.034-inch- (0.85-mm-) thick galvanized steel; with mitered and interlocking corners.

D. Mounting Sleeve: Factory- or field-installed galvanized, sheet steel.

1. Minimum Thickness: 0.052 inch (1.3 mm) or 0.138 inch (3.5 mm) thick as indicated, and length to suit application.

2. Exceptions: Omit sleeve where damper frame width permits direct attachment of perimeter mounting angles on each side of wall or floor, and thickness of damper frame complies with sleeve requirements.

E. Mounting Orientation: Vertical or horizontal as indicated.

F. Blades: Roll-formed, interlocking, 0.034-inch- (0.85-mm-) thick, galvanized, sheet steel. In place of interlocking blades, use full-length, 0.034-inch- (0.85-mm-) thick, galvanized steel blade connectors.

G. Horizontal Dampers: Include a blade lock and stainless-steel negator closure spring.

H. Fusible Link: Replaceable, 165 or 212 deg F (74 or 100 deg C) rated as indicated.

2.05 SMOKE DAMPERS

A. General: Labeled to UL 555S. Combination fire and smoke dampers shall be labeled for one-and-one-half-hour rating to UL 555.

B. Fusible Link: Replaceable, 165 or 212 deg F (74 or 100 deg C) rated as indicated.

C. Frame and Blades: 0.064-inch- (1.62-mm-) thick, galvanized, sheet steel.

D. Mounting Sleeve: Factory-installed, 0.052-inch- (1.3-mm-) thick, galvanized, sheet steel; length to suit wall or floor application.

E. Damper Motors: Two-position action.

1. Spring-Return Motors: Equip with an integral spiral-spring mechanism where indicated. Enclose entire spring mechanism in a removable housing designed for service or adjustments. Size for running torque rating of 150 in. x lbf (17 N x m) and breakaway torque rating of 150 in. x lbf (17 N x m).

2. Two position motor: 115V, single phase, 60 HZ.

2.06 TURNING VANES

A. Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

B. Manufactured Turning Vanes: Fabricate of 1-1/2-inch- (38-mm-) wide, curved blades set 3/4 inch (19 mm) o.c.; support with bars perpendicular to blades set 2 inches (50 mm) o.c.; and set into side strips suitable for mounting in ducts.

2.07 DUCT-MOUNTED ACCESS DOORS AND PANELS

A. General: Fabricate doors and panels airtight and suitable for duct pressure class.

B. Frame: Galvanized, sheet steel, with bend-over tabs and foam gaskets.

C. Door: Double-wall, galvanized, sheet metal construction with insulation fill and thickness, and number of hinges and locks as indicated for duct pressure class. Include vision panel where indicated. Include 1-by-1-inch (25-by-25-mm) butt or piano hinge and cam latches.

D. Seal around frame attachment to duct and door to frame with neoprene or foam rubber.

E. Insulation: 1-inch- (25-mm-) thick, fibrous-glass or polystyrene-foam board.

2.08 FLEXIBLE CONNECTORS

A. General: Flame-retarded or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.

B. Standard Metal-Edged Connectors: Factory fabricated with a strip of fabric 3-1/2 inches (89 mm) wide attached to two strips of 2-3/4-inch- (70-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized, sheet steel or 0.032-inch (0.8-mm) aluminum sheets. Select metal compatible with connected ducts.

C. Extra-Wide Metal-Edged Connectors: Factory fabricated with a strip of fabric 5-3/4 inches (146 mm) wide attached to two strips of 2-3/4-inch- (70-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized, sheet steel or 0.032-inch (0.8-mm) aluminum sheets. Select metal compatible with connected ducts.

D. Transverse Metal-Edged Connectors: Factory fabricated with a strip of fabric 3-1/2 inches (89 mm) wide attached to two strips of 4-3/8-inch- (111-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized, sheet steel or 0.032-inch (0.8-mm) aluminum sheets. Select metal compatible with connected ducts.

E. Conventional, Indoor System Flexible Connector Fabric: Glass fabric double coated with polychloroprene.

1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).

2. Tensile Strength: 480 lbf/inch (84 N/mm) in the warp, and 360 lbf/inch (63 N/mm) in the filling.

F. Conventional, Outdoor System Flexible Connector Fabric: Glass fabric double coated with a synthetic-rubber, weatherproof coating resistant to the sun's ultraviolet rays and ozone environment.

1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).

2. Tensile Strength: 530 lbf/inch (93 N/mm) in the warp, and 440 lbf/inch (77 N/mm) in the filling.

G. High-Temperature System Flexible Connectors: Glass fabric coated with silicone rubber and having a minimum weight of 16 oz./sq. yd. (542 g/sq. m) and tensile strength of 285 lbf/inch (50 N/mm) in the warp, and 185 lbf/inch (32 N/mm) in the filling.

H. High-Corrosive-Environment System Flexible Connectors: Glass fabric coated with a chemical-resistant coating.

1. Minimum Weight: 14 oz./sq. yd. (474 g/sq. m).

2. Tensile Strength: 450 lbf/inch (79 N/mm) in the warp, and 340 lbf/inch (60 N/mm) in the filling.

2.09 FLEXIBLE DUCTS

A. General: Comply with UL 181, Class 1.

B. Flexible Ducts, Uninsulated: Spiral-wound steel spring with flameproof vinyl sheathing.

C. Flexible Ducts, Uninsulated: Corrugated aluminum.

D. Flexible Ducts, Insulated: Factory-fabricated, insulated, round duct, with an outer jacket enclosing 1-1/2-inch- (38-mm-) thick, glass-fiber insulation around a continuous inner liner.

1. Reinforcement: Steel-wire helix encapsulated in inner liner.

2. Outer Jacket: Glass-reinforced, silver Mylar with a continuous hanging tab, integral fibrous-glass tape, and nylon hanging cord.

3. Outer Jacket: Polyethylene film.

4. Inner Liner: Polyethylene film.

E. Pressure Rating: 6-inch wg (1500 Pa) positive, 1/2-inch wg (125 Pa) negative.

2.010 ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments, and length to suit duct insulation thickness.

B. Splitter Damper Accessories: Zinc-plated damper blade bracket; 1/4-inch (6-mm), zinc-plated operating rod; and a duct-mounted, ball-joint bracket with flat rubber gasket and square-head set screw.

C. Flexible Duct Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action, in sizes 3 to 18 inches (75 to 450 mm) to suit duct size.

D. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install duct accessories according to applicable details shown in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts and NAIMA's "Fibrous Glass Duct Construction Standards" for fibrous-glass ducts.

B. Install volume dampers in lined duct; avoid damage to and erosion of duct liner.

C. Provide test holes at fan inlet and outlet and elsewhere as indicated.

D. Install fire and smoke dampers according to manufacturer's UL-approved written instructions.

1. Install fusible links in fire dampers.

E. Install duct access panels for access to both sides of duct coils. Install duct access panels downstream from fire dampers and equipment.

1. Install duct access panels to allow access to interior of ducts for cleaning, inspecting, adjusting, and maintaining accessories and terminal units.

2. Install access panels on side of duct where adequate clearance is available.

F. Label access doors according to Division 15 Section "Mechanical Identification."

3.02 ADJUSTING

A. Adjust duct accessories for proper settings.

B. Adjust fire and smoke dampers for proper action.

C. Final positioning of manual-volume dampers is specified in Division 15 Section "Testing, Adjusting, and Balancing."

END OF SECTION 15820

SECTION 15855 - DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes ceiling- and wall-mounted diffusers, registers, and grilles.

B. Related Sections include the following:

1. Division 15 Section "Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

2. Division 15 Section "Testing, Adjusting, and Balancing" for balancing diffusers, registers, and grilles.

1.03 DEFINITIONS

A. Diffuser: Circular, square, or rectangular air distribution outlet, generally located in the ceiling and comprised of deflecting members discharging supply air in various directions and planes and arranged to promote mixing of primary air with secondary room air.

B. Grille: A louvered or perforated covering for an opening in an air passage, which can be located in a sidewall, ceiling, or floor.

C. Register: A combination grille and damper assembly over an air opening.

1.04 SUBMITTALS

A. Product Data: For each model indicated, include the following:

1. Data Sheet: For each type of air outlet and inlet, and accessory furnished; indicate construction, finish, and mounting details.

2. Performance Data: Include throw and drop, static-pressure drop, and noise ratings for each type of air outlet and inlet.

3. Schedule of diffusers, registers, and grilles indicating drawing designation, room location, quantity, model number, size, and accessories furnished.

4. Assembly Drawing: For each type of air outlet and inlet; indicate materials and methods of assembly of components.

B. Coordination Drawings: Reflected ceiling plans and wall elevations drawn to scale to show locations and coordination of diffusers, registers, and grilles with other items installed in ceilings and walls.

C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for diffusers, registers, and grilles with factory-applied color finishes.

D. Samples for Verification: Of diffusers, registers, and grilles, in manufacturer's standard sizes, showing the full range of colors. Prepare Samples from the same material to be used for the Work.

1.05 QUALITY ASSURANCE

A. Product Options: Drawings and schedules indicate specific requirements of diffusers, registers, and grilles and are based on the specific requirements of the systems indicated. Other manufacturers' products with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions."

B. NFPA Compliance: Install diffusers, registers, and grilles according to NFPA 90A, "Standard for the Installation of Air-Conditioning and Ventilating Systems."

PART 2 - PRODUCTS

2.01 MANUFACTURED UNITS

A. Diffusers, registers, and grilles are scheduled on Drawings.

2.02 SOURCE QUALITY CONTROL

B. Testing: Test performance according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb, according to manufacturer's written instructions, Coordination Drawings, original design, and referenced standards.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. For units installed in lay-in ceiling panels, locate units in the center of the panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connection to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.03 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

3.04 CLEANING

A. After installation of diffusers, registers, and grilles, inspect exposed finish. Clean exposed surfaces to remove burrs, dirt, and smudges. Replace diffusers, registers, and grilles that have damaged finishes.

END OF SECTION 15855

SECTION 15870 – POWER VENTILATORS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Provide exhaust fans.

1.02 RELATED SECTIONS

A. Division 1 - General Provisions.

1.03 SUBMITTALS

A. Submit shop drawings and operation and maintenance manuals. Shop drawings shall include fan curves and manufacturer's fan noise ratings.

PART 2 - PRODUCTS

2.01 CENTRIFUGAL BLOWERS (SINGLE WIDTH, SINGLE INLET)

A. Centrifugal blowers shall be belt drive type and single width single inlet (SWSI). Blower housings shall be constructed of heavy steel and all seams shall be continuously welded. Housings shall be rigidly braced with structural supports and bearing support members shall be positioned to directly oppose belt tension.

B. The steel housed centrifugal blower shall have a steel backwardly inclined flat blade blower wheel of the non-overloading type. Blades on all sizes shall be securely welded to both a deep spun inlet shroud and to the backplate. All wheels shall be carefully trued after assembly and dynamically balanced with balancing weights welded to the wheels. All wheels shall be keyed to the shafts in all classes.

C. The fan shafts shall be hot rolled and accurately turned and polished. Close tolerances shall be maintained where the shaft makes contact with the bearings.

D. All bearings shall be grease lubricated precision anti-friction ball, self aligning pillow block type.

E. All drives shall be designed for 165% of rated horsepower capabilities. Oil resistant non-static belts shall be provided.

F. Centrifugal blowers shall be licensed to bear the AMCA seal for air.

G. Centrifugal blowers shall include housing, wheel, fan shaft, bearings and structural support members as a factory assembled unit. All steel and sheet metal parts shall be cleaned, conditioned and painted with enamel primer finish prior to final assembly. A final coat of gray enamel shall be applied to all exterior after assembly.

2.02A FIBERGLASS BELT DRIVE UPBLAST CENTRIFUGAL ROOF EXHAUSTER

The Fiberglass Belt Drive Upblast Centrifugal Roof Exhauster shall be manufactured by Hartzell Fan, Inc., Series 88 or equal. The exhausters shall use the centrifugal FE wheel to improve performance in an exhauster application. Standard sizes are 12 inch through 40 inch and fans shall be completely assembled, packaged and ready to install. The 12 inch through 18 inch sizes are available as either roof mounted or wall mounted units. The 24 inch through the 40 inch sizes are only available as roof mounted units.

The resin used on the solid fiberglass FE wheel shall be Derakane 510-A vinylester. Blades shall be backward curved to provide non-loading, highly efficient operation. The wheel shall have a totally encapsulated aluminum core insert for secure attachment to the shaft. The wheel shall be one-piece, resin transfer molded, without hand lay-up or assembly components. The fan is suitable for temperatures up to 125 deg F.

Structural parts located in the airstream are either fiberglass resin or epoxy coated stainless steel. All fiberglass surfaces shall be constructed of Ashland Hetron 693 polyester resin and glass fiber with 3% antimony trioxide added to achieve Class I flame spread below 25. All fiberglass surfaces shall be protected with a minimum 10 mil thickness of chemical, flame, and ultraviolet resin. The entire housing shall have a finish coat of resin to provide superior protection and smooth airflow. All airstream hardware shall be 304 stainless steel. All hardware outside the airstream shall be zinc plated.

Fan shafts are turned ground and polished. Monel and 304 stainless steel shafts are available as options. Bearings shall be heavy duty, self aligning ball bearings with a minimum 50,000 hours L10 life. A neoprene shaft seal is placed where the shaft leaves the housing.

Foot mount TEFC motors are standard. Motor and drive components are protected from the airstream. A conduit tube between the motor enclosure and the curb panel provides wiring access without an additional roof penetration.

The fan assembly shall be dynamically balanced at the l factory prior to shipping. Fans shall be balanced in accordance with AMCA Standard 204-96, fan application category BV-3 (comparable to Grade G6.3). Fans shall be manufactured in accordance with standard quality assurance procedures. Fan performance shall be based on tests conducted in AMCA accredited test laboratory and in accordance with the latest revision of AMCA Standard 210 for air performance and AMCA Standard 300 for sound. AMCA certification for sound and air performance is pending.

2.02B FIBERGLASS BACKWARD CURVED UTILITY SET

The Belt drive Fiberglass Backward Curved Utility Set shall be manufactured by Hartzell Fan, Inc.®, Series 41U, Arrg. 10. Standard sizes are 12", 18" and 24". Rotation as determined by the drive side of the fan, shall be clockwise or counter-clockwise. Fan housing shall be field rotatable and the discharge shall be any of the eight AMCA standard positions. The fan shall be completely assembled, packaged and ready to install.

The wheel type shall be FA. The resin used on the solid fiberglass wheel shall be Dow Derakane 510-A vinylester. Blades shall be backward curved to provide non-overloading, highly efficient operation. The wheel shall have a totally encapsulated aluminum core insert for secure attachment to the shaft. The wheel shall be one-piece, resin transfer molded, without hand lay-up or assembly of components. The fan shall be suitable for temperatures up to 200° F.

The fan housing shall be constructed of Ashland Hetron 693 polyester resin and glass fiber with 3% antimony trioxide added to achieve Class I flame spread below 25. Fan construction shall conform to ASTM Standard D4167 for fiber reinforced plastic fans and blowers. All fiberglass surfaces shall be protected with a minimum 10 mil thickness of chemical, flame and ultraviolet resistant resin. The inlet cone shall be solid fiberglass. The entire housing shall have a finish coat of resin to provide superior protection and smooth airflow. All airstream hardware shall be 304 stainless steel. The fan drive base shall be epoxy coated steel.

The fan shaft shall be ground and polished carbon steel with an FRP sleeve in the airstream. Bearings shall be heavy-duty, self-aligning, with extended lube tubes for continuous service, with a minimum of 50,000 hours L10 life. A neoprene shaft seal shall be located where the shaft enters the housing with a neoprene shaft slinger between the seal and wheel. V-belt drives shall be sized for continuous service.

The fan assembly shall be dynamically balanced at the factory prior to shipping. Fans shall be balanced in accordance with AMCA Standard 204-96, fan application category BV-3 (comparable to Grade G6.3). Fans shall be manufactured in accordance with standard quality assurance procedures. Fan performance shall be based on tests conducted in AMCA accredited test laboratory and in accordance with the latest revision of AMCA Standard 210 for air performance and AMCA Standard 300 for sound. Fans shall be licensed to bear the AMCA Certified Sound and Air Performance Rating Seal.

2.02.C FIBERGLASS BELT DRIVE HOODED ROOF VENTILATOR

The Fiberglass Belt Drive Hooded Roof Ventilator, Exhaust shall be manufactured by Hartzell Fan, Inc. Series 58E. Standard sizes are 12" through 60". The hood shall be complete with mounting panel, shipped separately sizes 24" to 60". The fan shall be pre-mounted to the curb base up to and including the 48". The 54" and 60" curb bases shall be shipped separately. The 12" to 18" shall be completely assembled, packaged and ready to install.

The resin used on the Series 58E is Ashland Hetron 693 which is a polyester resin with 3% antimony oxide added to achieve a Class I flame spread rate below 25 per ASTM E84 tunnel test standard and NFPA Code 91. The propeller shall be an aluminum insert molded into the hub for secure attachment to the shaft. The 54" to 60" shall be composed of either 4 or 6 blades securely clamped in a 2-piece hub. The hub shall be assembled with Type 304 stainless bolts and mounted on the fan shaft with tapered bushing. Propellers shall be given two coats of resin before final assembly. Fiberglass fan housings and components may be used in temperatures up to 200° F.

Fan housings, curb bases, and hoods shall be constructed of solid fiberglass including the flanges which have drilled mounting holes. Motor mountings shall be steel plate coated with resin and mounted on the drum exterior with glass mat, cloth and resin. All surfaces of the housing shall have one coat of heavy resin applied. Construction shall conform to ASTM Standard D4167 for fiber reinforced plastic fans and blowers. The encapsulated assembly base, zinc plated steel riser bolts and epoxy coated motor base provide support for the motor, out of the air stream. Motors shall be open end protected. All other hardware shall be Type 304 stainless steel.

Fan shafts shall be ground and polished Type 304 stainless steel. Bearings shall be located in a drive compartment sealed to prevent corrosive element entry which shall include a shaft seal and slinger. Bearings shall be heavy duty, self-aligning. Bearings shall have extended lube tubes and be relubricable for continuous service. Variable pitch sheaves shall be standard on fans up through 10 HP and belts shall be heat, oil, and static resistant and sized for continuous service. Fans shall be designed for mounting in vertical position.

The fan assembly shall be dynamically balanced at the factory prior to shipping. Fans shall be balanced in accordance with AMCA Standard 204-96, fan application category BV-3 (comparable to Grade G6.3). Fans shall be manufactured in accordance with standard quality assurance procedures. Fan performance shall be based on tests conducted in AMCA certified test laboratory in accordance with AMCA Standard 210 for air performance and AMCA Standard 300 for sound.

2.03 MOTORS

A. All three phase fan motors shall be totally enclosed, fan cooled, high efficiency type.

2.04 ACCESSORIES

A. Centrifugal fans shall include factory spring isolators.

B. Each fan shall be equipped with the accessories called for by the drawing schedule.

C. Provide roof curbs for roof mounted fans. Roof curbs shall be factory manufactured and provided by exhaust fan manufacturer. Curbs shall be constructed of aluminum and shall be insulated with a minimum of 1-7/8 inches of acoustical and thermal insulation. Roof curbs shall be 8 inches in height.

2.05 PERFORMANCE

A. Refer to drawing schedule for fan performances. Fans with noise levels higher than scheduled will not be accepted.

2.06 ACCEPTABLE MANUFACTURERS

A. Exhaust fans indicated on the plans and schedule shall be Hartzell Fan. Other manufacturer shall be Loren Cook, Twin City, Greenheck. or approved equal.

2.07 ACCEPTABLE MANUFACTURERS

A. The fan shall be packaged, completely assembled, and ready to install.

B. The fan housing with outlet fan orifice shall be a one-piece design deep box, flanged on the intake end, with motor base plate and vertical base supports all of solid fiberglass and resin. The fiberglass propeller shall be a die formed airfoil design of cloth mat and woven roving using Ashland Hetron 693, a polyester resin with 3% antimony oxide added to achieve a Class I flame spread rate of below 25 per ASTM E84 tunnel test standard and NFPA Code 91 for blower and exhaust systems which is OSHA approved. Fan construction shall conform to ASTM Standard D4167 for fiber reinforced plastic fans and blowers. The propeller hub shall have an aluminum casting insert for secure attachment to the shaft.

C. The motor shall be a totally enclosed air over type. The maximum service temperature is 104° F. for standard Class F insulation.

D. All mounting hardware shall be Type 304 stainless steel.

E. The fan assembly shall be dynamically balanced at the factory prior to shipping. Fans shall be balanced in accordance with AMCA Standard 204-96, fan application category BV-3 (comparable to Grade G6.3). Fan performance shall be based on tests conducted in anAMCA accredited test laboratory in accordance with AMCA Standard 210 for air performance and AMCA Standard 300 for sound. Fans shall be licensed to bear the AMCA Certified Air Performance Rating Seal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install exhaust fans where shown on the plans and as recommended by the manufacturer.

END OF SECTION 15870

SECTION 15990 – TESTING, ADJUSTING AND BALANCING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes testing, adjusting, and balancing HVAC systems to produce design objectives, including the following:

1. Balancing airflow flow within distribution systems, including submains, branches, and terminals, to indicated quantities according to specified tolerances.

2. Adjusting total HVAC systems to provide indicated quantities.

3. Measuring electrical performance of HVAC equipment.

4. Setting quantitative performance of HVAC equipment.

5. Reporting results of the activities and procedures specified in this Section.

B. Related Sections include the following:

1. Testing and adjusting requirements unique to particular systems and equipment are included in the Sections that specify those systems and equipment.

2. Field quality-control testing to verify that workmanship quality for system and equipment installation is specified in system and equipment Sections.

1.03 DEFINITIONS

A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.

B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to design quantities.

C. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.

D. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.

E. Report Forms: Test data sheets for recording test data in logical order.

F. Suction Head: The height of fluid surface above the centerline of the pump on the suction side.

G. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

H. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.

I. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.

J. Test: A procedure to determine quantitative performance of a system or equipment.

K. Testing, Adjusting, and Balancing Agent: The entity responsible for performing and reporting the testing, adjusting, and balancing procedures.

L. AABC: Associated Air Balance Council.

M. AMCA: Air Movement and Control Association.

N. NEBB: National Environmental Balancing Bureau.

O. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

1.04 SUBMITTALS

A. Quality-Assurance Submittals: Within 30 days from the Contractor's Notice to Proceed, submit 2 copies of evidence that the testing, adjusting, and balancing Agent and this Project's testing, adjusting, and balancing team members meet the qualifications specified in the "Quality Assurance" Article below.

B. Contract Documents Examination Report: Within 45 days from the Contractor's Notice to Proceed, submit 2 copies of the Contract Documents review report as specified in Part 3 of this Section.

C. Strategies and Procedures Plan: Within 60 days from the Contractor's Notice to Proceed, submit 2 copies of the testing, adjusting, and balancing strategies and step-by-step procedures as specified in Part 3 "Preparation" Article below. Include a complete set of report forms intended for use on this Project.

D. Certified Testing, Adjusting, and Balancing Reports: Submit 2 copies of reports prepared, as specified in this Section, on approved forms certified by the testing, adjusting, and balancing Agent.

E. Sample Report Forms: Submit 2 sets of sample testing, adjusting, and balancing report forms.

F. Warranty: Submit 2 copies of special warranty specified in the "Warranty" Article below.

1.05 QUALITY ASSURANCE

A. Agent Qualifications: Engage a testing, adjusting, and balancing agent certified by either AABC or NEBB.

B. Testing, Adjusting, and Balancing Conference: Meet with the Owner's and the Architect's representatives on approval of the testing, adjusting, and balancing strategies and procedures plan to develop a mutual understanding of the details. Ensure the participation of testing, adjusting, and balancing team members, equipment manufacturers' authorized service representatives, HVAC controls Installer, and other support personnel. Provide 7 days' advance notice of scheduled meeting time and location.

1. Agenda Items: Include at least the following:

a. Submittal distribution requirements.

b. Contract Documents examination report.

c. Testing, adjusting, and balancing plan.

d. Work schedule and Project site access requirements.

e. Coordination and cooperation of trades and subcontractors.

f. Coordination of documentation and communication flow.

C. Certification of Testing, Adjusting, and Balancing Reports: Certify the testing, adjusting, and balancing field data reports. This certification includes the following:

1. Review field data reports to validate accuracy of data and to prepare certified testing, adjusting, and balancing reports.

2. Certify that the testing, adjusting, and balancing team complied with the approved testing, adjusting, and balancing plan and the procedures specified and referenced in this Specification.

D. Testing, Adjusting, and Balancing Reports: Use standard forms from NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."

E. Instrumentation Type, Quantity, and Accuracy: As described in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification."

F. Instrumentation Calibration: Calibrate instruments at least every 6 months or more frequently if required by the instrument manufacturer.

1.06 PROJECT CONDITIONS

A. Full Owner Occupancy: The Owner will occupy the site and existing building during the entire testing, adjusting, and balancing period. Cooperate with the Owner during testing, adjusting, and balancing operations to minimize conflicts with the Owner's operations.

B. Partial Owner Occupancy: The Owner may occupy completed areas of the building before Substantial Completion. Cooperate with the Owner during testing, adjusting, and balancing operations to minimize conflicts with the Owner's operations.

1.07 COORDINATION

A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist testing, adjusting, and balancing activities.

B. Notice: Provide 7 days' advance notice for each test. Include scheduled test dates and times.

C. Perform testing, adjusting, and balancing after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

1.08 WARRANTY

A. General Warranty: The national project performance guarantee specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. National Project Performance Guarantee: Provide a guarantee on AABC'S "National Standards" forms stating that AABC will assist in completing the requirements of the Contract Documents if the testing, adjusting, and balancing Agent fails to comply with the Contract Documents. Guarantee includes the following provisions:

1. The certified Agent has tested and balanced systems according to the Contract Documents.

2. Systems are balanced to optimum performance capabilities within design and installation limits.

C. Special Guarantee: Provide a guarantee on NEBB forms stating that NEBB will assist in completing the requirements of the Contract Documents if the testing, adjusting, and balancing Agent fails to comply with the Contract Documents. Guarantee includes the following provisions:

1. The certified Agent has tested and balanced systems according to the Contract Documents.

2. Systems are balanced to optimum performance capabilities within design and installation limits.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine Contract Documents to become familiar with project requirements and to discover conditions in systems' designs that may preclude proper testing, adjusting, and balancing of systems and equipment.

1. Contract Documents are defined in the General and Supplementary Conditions of the Contract.

2. Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.

B. Examine approved submittal data of HVAC systems and equipment.

C. Examine project record documents described in Division 1 Section "Project Record Documents."

D. Examine Engineer's design data, including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine equipment performance data, including fan and pump curves. Relate performance data to project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce the performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with the design data and installed conditions.

F. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Specification Sections have been performed.

G. Examine system and equipment test reports.

H. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, fittings, and manual volume dampers, are properly installed, and their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

I. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.

J. Examine air-handling equipment to ensure clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

K. Examine equipment for installation and for properly operating safety interlocks and controls.

L. Examine automatic temperature system components to verify the following:

1. Dampers, valves, and other controlled devices operate by the intended controller.

2. Dampers and valves are in the position indicated by the controller.

3. Thermostats and humidistats are located to avoid adverse effects of sunlight, drafts, and cold walls.

4. Sensors are located to sense only the intended conditions.

5. Sequence of operation for control modes is according to the Contract Documents.

6. Controller set points are set at design values. Observe and record system reactions to changes in conditions. Record default set points if different from design values.

7. Interlocked systems are operating.

8. Changeover from heating to cooling mode occurs according to design values.

M. Report deficiencies discovered before and during performance of testing, adjusting, and balancing procedures.

3.02 PREPARATION

A. Prepare a testing, adjusting, and balancing plan that includes strategies and step-by-step procedures.

B. Complete system readiness checks and prepare system readiness reports. Verify the following:

1. Permanent electrical power wiring is complete.

2. Automatic temperature-control systems are operational.

3. Equipment and duct access doors are securely closed.

4. Balance, smoke, and fire dampers are open.

5. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.

6. Windows and doors can be closed so design conditions for system operations can be met.

3.03 GENERAL TESTING AND BALANCING PROCEDURES

A. Perform testing and balancing procedures on each system according to the procedures contained in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and this Section.

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to the insulation Specifications for this Project.

C. Mark equipment settings with paint or other suitable, permanent identification material, including damper-control positions, valve indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

3.04 FUNDAMENTAL AIR SYSTEMS' BALANCING PROCEDURES

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. Determine the best locations in main and branch ducts for accurate duct airflow measurements.

D. Check the airflow patterns from the outside-air louvers and dampers and the return- and exhaust-air dampers, through the supply-fan discharge and mixing dampers.

E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

F. Verify that motor starters are equipped with properly sized thermal protection.

G. Check dampers for proper position to achieve desired airflow path.

H. Check for airflow blockages.

I. Check for proper sealing of air-handling unit components.

3.05 CONSTANT-VOLUME AIR SYSTEMS' BALANCING PROCEDURES

A. The procedures in this Article apply to constant-volume supply-, return-, and exhaust-air systems.

B. Adjust fans to deliver total design airflows within the maximum allowable rpm listed by the fan manufacturer.

1. Measure fan static pressures to determine actual static pressure as follows:

a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.

b. Measure static pressure directly at the fan outlet or through the flexible connection.

c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.

d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

2. Measure static pressure across each air-handling unit component.

a. Simulate dirty filter operation and record the point at which maintenance personnel must change filters.

3. Measure static pressures entering and leaving other devices such as sound traps, heat recovery equipment, and air washers under final balanced conditions.

4. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Compare actual system effect factors with calculated system effect factors to identify where variations occur. Recommend corrective action to align design and actual conditions.

5. Adjust fan speed higher or lower than design with the approval of the Architect. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes.

6. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure no overload will occur. Measure amperage in full cooling, full heating, and economizer modes to determine the maximum required brake horsepower.

C. Adjust volume dampers for main duct, submain ducts, and major branch ducts to design airflows within specified tolerances.

1. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.

a. Where sufficient space in submains and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submains and branch ducts to design airflows within specified tolerances.

D. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.06 MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer, model, and serial numbers.

2. Motor horsepower rating.

3. Motor rpm.

4. Efficiency rating if high-efficiency motor.

5. Nameplate and measured voltage, each phase.

6. Nameplate and measured amperage, each phase.

7. Starter thermal-protection-element rating.

3.07 TEMPERATURE TESTING

A. During testing, adjusting, and balancing, report need for adjustment in temperature regulation within the automatic temperature-control system.

B. Measure indoor wet- and dry-bulb temperatures every other hour for a period of 2 successive 8-hour days, in each separately controlled zone, to prove correctness of final temperature settings. Measure when the building or zone is occupied.

C. Measure outside-air, wet- and dry-bulb temperatures.

3.08 TEMPERATURE-CONTROL VERIFICATION

A. Verify that controllers are calibrated and commissioned.

B. Check transmitter and controller locations and note conditions that would adversely affect control functions.

C. Record controller settings and note variances between set points and actual measurements.

D. Verify operation of limiting controllers (i.e., high- and low-temperature controllers).

E. Verify free travel and proper operation of control devices such as damper and valve operators.

F. Verify sequence of operation of control devices. Note air pressures and device positions and correlate with airflow and water-flow measurements. Note the speed of response to input changes.

G. Confirm interaction of electrically operated switch transducers.

H. Confirm interaction of interlock and lockout systems.

I. Record voltages of power supply and controller output. Determine if the system operates on a grounded or nongrounded power supply.

J. Note operation of electric actuators using spring return for proper fail-safe operations.

3.09 TOLERANCES

A. Set HVAC system airflow and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans: Plus 5 to plus 10 percent.

2. Air Outlets and Inlets: 0 to minus 10 percent.

3.010 FINAL REPORT

A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in 3-ring binder, tabulated and divided into sections by tested and balanced systems.

B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.

1. Include a list of the instruments used for procedures, along with proof of calibration.

C. Final Report Contents: In addition to the certified field report data, include the following:

1. Fan curves.

2. Manufacturers' test data.

3. Field test reports prepared by system and equipment installers.

4. Other information relative to equipment performance, but do not include approved Shop Drawings and Product Data.

D. General Report Data: In addition to the form titles and entries, include the following data in the final report, as applicable:

1. Title page.

2. Name and address of testing, adjusting, and balancing Agent.

3. Project name.

4. Project location.

5. Engineer's name and address.

6. Contractor's name and address.

7. Report date.

8. Signature of testing, adjusting, and balancing Agent who certifies the report.

9. Summary of contents, including the following:

a. Design versus final performance.

b. Notable characteristics of systems.

c. Description of system operation sequence if it varies from the Contract Documents.

10. Nomenclature sheets for each item of equipment.

11. Data for terminal units, including manufacturer, type size, and fittings.

12. Notes to explain why certain final data in the body of reports vary from design values.

13. Test conditions for fans and pump performance forms, including the following:

a. Settings for outside-, return-, and exhaust-air dampers.

b. Conditions of filters.

c. Face and bypass damper settings at coils.

d. Fan drive settings, including settings and percentage of maximum pitch diameter.

e. Settings for supply-air, static-pressure controller.

f. Other system operating conditions that affect performance.

E. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data: Include the following:

a. System identification.

b. Location.

c. Make and type.

d. Model number and size.

e. Manufacturer's serial number.

f. Arrangement and class.

g. Sheave make, size in inches (mm), and bore.

h. Sheave dimensions, center-to-center and amount of adjustments in inches (mm).

2. Motor Data: Include the following:

a. Make and frame type and size.

b. Horsepower and rpm.

c. Volts, phase, and hertz.

d. Full-load amperage and service factor.

e. Sheave make, size in inches (mm), and bore.

f. Sheave dimensions, center-to-center and amount of adjustments in inches (mm).

g. Number of belts, make, and size.

3. Test Data: Include design and actual values for the following:

a. Total airflow rate in cfm (L/s).

b. Total system static pressure in inches wg (Pa).

c. Fan rpm.

d. Discharge static pressure in inches wg (Pa).

e. Suction static pressure in inches wg (Pa).

F. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data: Include the following:

a. System and air-handling unit number.

b. Location and zone.

c. Traverse air temperature in deg F (deg C).

d. Duct static pressure in inches wg (Pa).

e. Duct size in inches (mm).

f. Duct area in sq. ft. ((sq. m)).

g. Design airflow rate in cfm (L/s).

h. Design velocity in fpm (m/s).

i. Actual airflow rate in cfm (L/s).

j. Actual average velocity in fpm (m/s).

k. Barometric pressure in psig (Pa).

3.011 ADDITIONAL TESTS

A. Within 90 days of completing testing, adjusting, and balancing, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial testing, adjusting, and balancing procedures were not performed during near-peak summer and winter conditions, perform additional inspections, testing, and adjusting during near-peak summer and winter conditions.

END OF SECTION 15990

PART 1 - GENERAL

1.1 RELATED DOCUMENTS: The General Conditions and Supplemental General Conditions are part of this division. Contractor shall and hereby agrees that he will read carefully all paragraphs and be bound by their conditions.

1.2 WORK DESCRIPTION

A. Provide all labor, equipment, material, (tools, services), etc. required to complete installation specified herein and/or shown or scheduled on drawings.

B. This section supplements all sections of this Division and shall apply to all phases of work hereinafter specified, shown on the drawings or required to provide a complete installation of electrical systems.

C. The specifications and drawings for electrical work are complementary and are for the complete interpretation of the work.

D. Unless noted or modified by specific notation to the contrary, the modification and/or description of any electrical item in the documents carries with it the instruction to furnish, install and connect same. It shall be understood that the intent governs the work, regardless of whether or not this instruction is explicitly stated.

E. No exclusion from, or limitation in the drawings or specifications, for the electrical work shall be the reason for omitting the appurtenances or accessories necessary to complete any required system or item of equipment.

1.3 SPECIAL CONDITIONS, ELECTRICAL

A. By the act of submitting a bid, this Contractor agrees that all of the "Contract Documents" in each of the Divisions of the complete specifications have been reviewed and studied and all requirements and coordination resulting there from are included in his proposal. The Contractor further acknowledges that he has visited the site to become familiar with existing conditions.

B. In Division 16, the word "Contractor" means the Electrical Contractor. The word "provide" means furnish, install and connect.

C. Do not scale drawings having l/4" or smaller scale. Because of small scale, it is not possible to indicate all offsets, fittings and accessories; provide such as are required for complete installation.

D. The right is reserved to move any element as much as ten (10) feet at no increase in cost provided Contractor is notified before work in question is started.

E. All conductors, regardless of service, shall be installed in raceways unless specifically noted otherwise.

F. The Contract Drawings are shown in part diagrammatic, intended to convey the scope of work, indicating the general arrangement of equipment, conduit and outlets. Follow the drawings in laying out the work and verify places for the installation of the materials and equipment. Wherever a question exists as to the exact intended location of the outlets or equipment, obtain instructions from the Engineer before proceeding with the work.

1.4 RELATED WORK SPECIFIED ELSEWHERE

A. Foundations and pads required for equipment furnished under this division of the specifications are specified in Division 3.

B. Field painting, except such painting as is required to maintain shop coat painting and factory finish painting is specified in Division 9.

C. Flashing of conduits into roofing and outside walls.

D. Heating, ventilating, and air-conditioning equipment.

E. Plumbing Equipment.

F. Kitchen Equipment.

G. Fire Protection Equipment.

1.5 CODES AND STANDARDS

A. The intent is that the complete installation shall comply with applicable laws and ordinances, utility company regulations, and applicable requirements of the latest editions of the following:

1. NFC - National Fire Codes (NFPA)
2. NEC - National Electrical Code
3. UL - Underwriters Laboratories
4. NESC - National Electrical Safety Code
5. NEMA - National Electrical Manufacturers Association
6. OSHA - Occupational Safety and Health Act.
7. SBC - Standard Building Code.

B. Where the contract documents exceed minimum requirements, the contract documents take precedence.

C. Comply with all requirements for permits, licenses, fees and codes. Permits, licenses, fees,

inspections and arrangements required for the work under this contract shall be obtained prior to commencement of the work unless otherwise specified.

D. Comply with the requirements of the applicable utility companies serving this work. Make all arrangements with the utility companies for proper coordination of the work. Pay all charges required by the utility.

1.6 COORDINATION OF WORK

A. Plan all work so that it proceeds with a minimum of interference with other trades. Inform all parties concerned, of the openings required for equipment or conduit in the building construction for electrical work and provide all special frames, sleeves, inserts, supports, anchor bolts, etc. as required. Coordinate the electrical work with the mechanical installation.

B. Work lines and established heights shall be in strict accordance with architectural drawings and specifications insofar as these drawings and specifications extend. Verify all dimensions shown and establish all elevations and detailed dimensions not shown.

C. Lay out and coordinate all work well enough in advance to avoid conflicts or interferences with other work in progress so that in case of interference, the electrical layout may be altered to suit the conditions, prior to the installation of any work and without additional cost to the Owner.

D. Lines, which must pitch, shall have right-of-way over lines whose elevations can be changed.

E. Coordinate all outlets, fixtures, etc. with floor, wall and ceiling patterns (reflected ceiling drawings).

1.7 EXECUTION OF THE WORK

A. Install equipment and materials in a neat and workmanlike manner and align, level and adjust for satisfactory operation. Install equipment so that all parts are easily accessible for inspection, operation, maintenance and repair.

1.8 DATA AND SHOP DRAWINGS

A. Prior to installation, submit certified prints and/or descriptive brochures for major pieces of equipment, fixtures, materials, etc.

B. Submittals shall show: manufacturer's catalog number, finishes, optional features and modifications.

C. When work in accordance with manufacturer's recommendation is specified, a copy of recommendations will be kept in job office.

PART 2 - PRODUCTS

2.1 REFERENCE TO DRAWINGS

A. Reference shall be made to drawing schedules and details for: manufacturer, model, catalog number, size, capacity, performance, installation, etc. of equipment, fixtures and materials. Equipment of manufacturer's other than those named will be acceptable provided, in the opinion of the Engineer, it is of equal substance, function, performance and appearance.

2.2 CHOICE OF MATERIALS AND EQUIPMENT

A. In submitting substitutions, bidders should note the following minimum considerations:

1. Capacities shown are absolute minima and must be equaled.
2. Physical size limitations for space allotted.
3. Structural Properties
4. Noise Level
5. Interchangeability.
6. Compatibility with other materials, assemblies and equipment.
7. Similar items shall be same manufacturer and style, etc. except where specifically exempted.

B. All material and equipment, for which a UL Standard, or NEMA Standard is established, shall be so approved and labeled or stamped.

C. Adhesives are not acceptable as a mounting, supporting, or assembling technique.

D. Contractor shall pay any costs added to total contract as a result of an approved substitution.

2.3 ELECTRICAL EQUIPMENT

A. NEMA Standards shall be taken as minimum requirements for electrical equipment.

B. Equipment shall operate properly under a 10% plus or minus voltage variation.

PART 3 - EXECUTION

3.1 INSPECTION OF SITE

A. The drawings are prepared from the best information available and reflect the conditions commensurate with this information. However, the contractor shall visit the site prior to submitting a proposal and shall verify the locations, sizes, depths, characteristics, etc., of all existing utilities; and familiarize himself with working conditions, hazards, existing grades, soil conditions, obstructions, etc. If it becomes evident that existing site conditions will impair the proper operation of the utilities, or the construction process, the architect shall be notified in writing.

B. All proposals shall take these existing conditions and any revisions required into effect, and the lack of specific site information on the drawings shall not relieve the contractor of his responsibility.

END OF SECTION 16010

PART 1 - GENERAL

1.1 WORK DESCRIPTION

A. Provide all labor, equipment, materials, etc. required to complete installation specified herein and/or shown on scheduled drawings.

1.2 WIRING ELECTRICALLY OPERATED EQUIPMENT

A. Provide all conduit, conductors, wiring, etc. required to connect all electrically operated equipment installed, whether provided by this Division, other Divisions, or by Owner. Complete all circuits and leave in satisfactory operating condition. Install, support and connect starters, control devices, etc.

B. For equipment furnished by other Divisions of this Contract, or by Owner, the control equipment shall be furnished by the other divisions or owners except that this Division furnishes the disconnect means and all components of life safety systems such as duct smoke detectors which are to be included with the building fire alarm system.

C. Install disconnect means immediately ahead of, and in sight of, each piece of electrically operated equipment.

D. All motors 1/2 HP and larger and all fixed appliances, or equipment, rated at 1.0 KW or larger shall be on individual circuits, except where several items are built into one piece of factory-assembled equipment.

PART 2 - PRODUCTS

2.1 RECORD AND AS-BUILT DOCUMENTS

A. Maintain at job site a set of contract documents kept current by indicating thereon, all changes, substitutions, etc. between work as specified and as installed.

B. Furnish Owner with one (1) complete set of reproducible drawings and one complete, clean sets of specifications showing installed locations, size, etc. of all work and material as taken from record documents.

C. For each piece of equipment, provide three (3) sets of:

1. Manufacturer's printed catalog pages, operating and maintenance instructions, wiring and connections diagrams, etc.

2. A list giving names and addresses of nearest supply house carrying spare parts for all equipment furnished and name of installation subcontractor with address and phone

number.

D. Bind this information into 8-1/2" x 11" booklet. One complete set shall be assembled in a loose-leaf ring or post hard-backed binder.

PART 3 - EXECUTION

3.1 EQUIPMENT OPERATION

A. Operate all motors for at least one hour. During this time, check for proper lubrication, rotation and control operation. At the end of this hour's run, check for motor temperature.

B. This Division is responsible for:

1. Proper rotation,
2. Observing that lubrication has been properly performed,
3. Motors operate within nameplate limits,
4. Overload heater elements are properly sized,
5. Reporting observed discrepancies to the Engineer.

C. On equipment furnished by other sections, if lubrication is not correct, or if motors do not operate within proper limits, this Division is responsible for notifying the General Contractor as to the deficiencies and for leaving the piece of equipment involved in a locked "OFF" condition.

3.2 SYSTEM BALANCE

A. Balance all circuits so that feeders, when fully loaded, shall be no more than 10% out of balance, phase-to-phase.

3.3 CIRCUIT CONTINUITY

A. Complete installation shall be free of short circuits, grounds and open circuits. Tests shall be made as required to prove that all parts of installation meet specified performances. Note Paragraph 110-7 of N.E.C. "Megger" tests shall be performed to assure proper insulation values and system integrity.

B. Following the installation of all high voltage cables, prior to their final connections to switches, transformers, lightning arrestors, etc., D-C high potential tests shall be performed. All tests voltages and procedures are to meet cable and connector manufacturer's approval as well as the Utility supplying service. Following these tests, all final connections are to be made to switches, transformers, lightning arrestors, etc. and all circuits are to then be tested with a megohmeter.

C. All tests are to be properly recorded and submitted to the Engineer for record purposes.

3.4 OPERATING INSTRUCTIONS

A. When systems are completely adjusted, furnish personnel for one full day to instruct Owner's operators. Schedule instruction sessions with the Owner through the Engineer.

3.5 CLEANING

A. Fixtures, panels, equipment, etc. shall be free from any foreign matter and be thoroughly cleaned per manufacturer's printed instructions.

3.6 PAINTING

A. All equipment shall present a clean, painted appearance; touch-up or repair as required.

B. Paint all ferrous metal, which is not otherwise protected against corrosion. Paint exposed pipe threads with Bitumastic No. 50.

3.7 IDENTIFICATION

A. Identify feeders by stenciling a legend on conduit in all exposed locations at 50' intervals. Letter height shall be 1/2 of conduit diameter, or 2", whichever is smaller.

B. Identify all major items of equipment including controls, panels, and associated starters, switches, junction boxes, relays, etc. by 2-1/2" x 3/4" embossed nameplates, with wording approved by Engineer. Secure with screws or brad, adhesives alone are not acceptable.

C. Nameplates after installation shall be easily visible from the floor and shall bear notations corresponding to those shown on record drawings.

D. Identify location of outside underground conduits by:

1. 4" x 4" x 12" concrete stakes, flush with finish grade, located above lines at ends and/or corners.

2. 2" x 2" brass plates imbedded in building walls above conduits.

END OF SECTION 16020

PART 1 - GENERAL

1.1 WORK DESCRIPTION:

A. Provide all labor, equipment, material, etc. required to complete installation specified herein and/or shown or scheduled on drawings.

PART 2 - PRODUCTS

2.1 TEST PERIOD:

A. Each piece of equipment shall meet performance specifications after one (1) year actual operation.

PART 3 - EXECUTION

3.1 The Contractor shall replace or make good any defect due to faulty workmanship or material, which shall develop within one year from date of acceptance. This guaranty shall cover both materials and labor. The Contractor is responsible to replace work found not in conformance with the contract at any time during the life of the installation. Replacement of non-conforming work is not subject to the one (1) year warranty limitations.

3.2 For first year after final acceptance, Contractor shall provide, at no cost to Owner, any required maintenance and service necessary to assure the proper operation of the system.

3.3 Date of acceptance shall be that date on which the contract has been satisfactorily completed in accord with contract documents and verified by the Engineer. If a whole or partial system, or equipment, is put into use for benefit of any party, other than Contractor, and with prior written permission of Owner, this agreed date shall become the "date of acceptance".

3.4 CERTIFICATION: Prior to completion and final acceptance of the installation, furnish to the Engineer certification that the electrical systems have been tested and that the installation and performance of those systems conform to the requirements of the contract documents.

END OF SECTION 16030

PART 1 - GENERAL

1.1 WORK DESCRIPTION

A. Provide all labor, equipment, materials, etc. required to complete installation specified herein and/or shown on scheduled drawings.

1.2 WIRING ELECTRICALLY OPERATED EQUIPMENT

A. Provide all conduit, conductors, wiring, etc. required to connect all electrically operated equipment installed, whether provided by this Division, other Divisions, or by Owner. Complete all circuits and leave in satisfactory operating condition. Install, support and connect starters, control devices, etc.

B. For equipment furnished by other Divisions of this Contract, or by Owner, the control equipment shall be furnished by the other divisions or owners except that this Division furnishes the disconnect means and all components of life safety systems such as duct smoke detectors which are to be included with the building fire alarm system.

C. Install disconnect means immediately ahead of, and in sight of, each piece of electrically operated equipment.

D. All motors 1/2 HP and larger and all fixed appliances, or equipment, rated at 1.0 KW or larger shall be on individual circuits, except where several items are built into one piece of factory-assembled equipment.

PART 2 - PRODUCTS

2.1 RECORD AND AS-BUILT DOCUMENTS

A. Maintain at job site a set of contract documents kept current by indicating thereon, all changes, substitutions, etc. between work as specified and as installed.

B. Furnish Owner with one (1) complete set of reproducible drawings and one complete, clean sets of specifications showing installed locations, size, etc. of all work and material as taken from record documents.

C. For each piece of equipment, provide three (3) sets of:

1. Manufacturer's printed catalog pages, operating and maintenance instructions, wiring and connections diagrams, etc.
2. A list giving names and addresses of nearest supply house carrying spare parts for all equipment furnished and name of installation subcontractor with address and phone number.

D. Bind this information into 8-1/2" x 11" booklet. One complete set shall be assembled in a loose-leaf ring or post hard-backed binder.

PART 3 - EXECUTION

3.1 EQUIPMENT OPERATION

A. Operate all motors for at least one hour. During this time, check for proper lubrication, rotation and control operation. At the end of this hour's run, check for motor temperature.

B. This Division is responsible for:

1. Proper rotation,
2. Observing that lubrication has been properly performed,
3. Motors operate within nameplate limits,
4. Overload heater elements are properly sized,
5. Reporting observed discrepancies to the Engineer.

C. On equipment furnished by other sections, if lubrication is not correct, or if motors do not operate within proper limits, this Division is responsible for notifying the General Contractor as to the deficiencies and for leaving the piece of equipment involved in a locked "OFF" condition.

3.2 SYSTEM BALANCE

A. Balance all circuits so that feeders, when fully loaded, shall be no more than 10% out of balance, phase-to-phase.

3.3 CIRCUIT CONTINUITY

A. Complete installation shall be free of short circuits, grounds and open circuits. Tests shall be made as required to prove that all parts of installation meet specified performances. Note Paragraph 110-7 of N.E.C. "Megger" tests shall be performed to assure proper insulation values and system integrity.

B. Following the installation of all high voltage cables, prior to their final connections to switches, transformers, lightning arrestors, etc., D-C high potential tests shall be performed. All tests voltages and procedures are to meet cable and connector manufacturer's approval as well as the Utility supplying service. Following these tests, all final connections are to be made to switches, transformers, lightning arrestors, etc. and all circuits are to then be tested with a megohmeter.

C. All tests are to be properly recorded and submitted to the Engineer for record purposes.

3.4 OPERATING INSTRUCTIONS

A. When systems are completely adjusted, furnish personnel for one full day to instruct Owner's operators. Schedule instruction sessions with the Owner through the Engineer.

3.5 CLEANING

A. Fixtures, panels, equipment, etc. shall be free from any foreign matter and be thoroughly cleaned per manufacturer's printed instructions.

3.6 PAINTING

A. All equipment shall present a clean, painted appearance; touch-up or repair as required.

B. Paint all ferrous metal, which is not otherwise protected against corrosion. Paint exposed pipe threads with Bitumastic No. 50.

3.7 IDENTIFICATION

A. Identify feeders by stenciling a legend on conduit in all exposed locations at 50' intervals. Letter height shall be 1/2 of conduit diameter, or 2", whichever is smaller.

B. Identify all major items of equipment including controls, panels, and associated starters, switches, junction boxes, relays, etc. by 2-1/2" x 3/4" embossed nameplates, with wording

approved by Engineer. Secure with screws or brad, adhesives alone are not acceptable.

C. Nameplates after installation shall be easily visible from the floor and shall bear notations corresponding to those shown on record drawings.

D. Identify location of outside underground conduits by:

1. 4" x 4" x 12" concrete stakes, flush with finish grade, located above lines at ends and/or corners.
2. 2" x 2" brass plates imbedded in building walls above conduits.

END OF SECTION 16020

PART 1 - GENERAL

1.1 WORK DESCRIPTION

A. Provide all labor, equipment, material, etc. required to complete installation specified herein and/or shown or scheduled on drawings.

PART 2 - PRODUCTS

2.1 TEST PERIOD

A. Each piece of equipment shall meet performance specifications after one (1) year actual operation.

PART 3 - EXECUTION

3.1 The Contractor shall replace or make good any defect due to faulty workmanship or material, which shall develop within one year from date of acceptance. This guaranty shall cover both materials and labor. The Contractor is responsible to replace work found not in conformance with the contract at any time during the life of the installation. Replacement of non-conforming work is not subject to the one (1) year warranty limitations.

3.2 For first year after final acceptance, Contractor shall provide, at no cost to Owner, any required maintenance and service necessary to assure the proper operation of the system.

3.3 Date of acceptance shall be that date on which the contract has been satisfactorily completed in accord with contract documents and verified by the Engineer. If a whole or partial system, or equipment, is put into use for benefit of any party, other than Contractor, and with prior written permission of Owner, this agreed date shall become the "date of acceptance".

3.4 CERTIFICATION: Prior to completion and final acceptance of the installation, furnish to the Engineer certification that the electrical systems have been tested and that the installation and performance of those systems conform to the requirements of the contract documents.

END OF SECTION 16030

PART 1 - GENERAL

1.1 WORK DESCRIPTION:

A. Provide all labor, equipment, material, etc. required to complete installation specified herein and/or shown on scheduled on the drawings.

PART 2 - PRODUCTS

2.1 CONCRETE:

A. Where required for conduit encasement, equipment, bases, manhole construction, etc., provide 3,000 psi concrete as specified in Division 3.

PART 3 - EXECUTION

3.1 TEMPORARY LIGHT AND POWER:

A. As soon as practicable, install temporary wiring and lighting. See NEC Article 305 and Paragraph 210-8 (b).

B. Provide:

1. One pigtail lamp holder with wire guard for each 600 sq. ft. of floor space or fraction thereof equipped with a 100-watt lamp and with replacement made immediately upon burnout or theft.

2. A 30-amp, single-phase, disconnect switch for each 4,000 sq. ft. of floor area.

3. If a floor is under 4,000 sq. ft., one 30-amp switch per floor.

C. Temporary wire shall consist of plastic, non-metallic sheathed cable having ground wire to which all the receptacle ground poles shall be connected.

D. Power consumed shall be paid for by [General Contractor] [Owner].

3.2 EXCAVATION, SHORING, AND BACKFILL

A. Provide any excavation required for this Division below that needed for general construction. Unless specifically noted, no extra shall be paid if rock or excavation difficulties are encountered.

B. Provide separate trench for each utility, see drawing detail.

C. Provide:

1. Bracing, shoring, etc. to protect sides of excavation,
2. Staging and suitable ladders.

D. Remove all timber before backfilling. Backfill simultaneously on both sides of equipment, raceways, etc.

E. Compact backfill under slab, building structure, and paving to a dry density equal to that required by general contract.

F. Restore existing pavement, curbs, sidewalks, sodding, etc. removed or damaged in connection with work.

G. Sides and floor of excavated trench may be used as formwork for the concrete encasement provided the excavation is clean, neat, free of debris and is of the proper size.

3.3 CUTTING AND PATCHING

A. Provide all cutting, patching, etc. incident to this work.

B. Do not cut into any major structural element without approval of Engineer.

C. Patching shall be of quality equal to, and of appearance matching, existing construction.

3.4 FLASHING

A. Where raceways, etc. pass through walls or roof, flash per drawing detail. Where no detail is shown, use National Roofing Contractors Association details.

B. Locate raceways, etc. through roof to clear parapets, etc. by at least 18".

C. Flashing shall provide watertight seal with 8" depth of water on roof.

D. Where conduits pass through floor structures, other than lowest floor, which floors contain a waterproofing membrane, provide a watertight floor sleeve for each pipe.

E. Where conduit or buss way pass through concrete floors, provide a 3" x 8" concrete curb with sheet metal cap flashing, fill space between conduits, etc. and sleeve with rope packing and non-flammable sealant.

3.5 MOISTURE-DAMP PROTECTION

A. Whenever any electrical component such as: panel, raceways, etc. will be in contact with surfaces which may become damp or wet, mount using spacers to hold electrical work l/4" away from damp surfaces.

3.6 SLEEVES-FIRE PROTECTION

A. Where conduits, buss ways, etc. pass through floors or walls of fireproof construction, fill space between conduit and etc. and sleeves with 3M fire stopping or approved equal. The sealing process shall maintain the rating of the floor or wall that is penetrated.

3.7 FIRE STOPPING REQUIREMENTS

A. Penetrations through rated walls and floors shall be sealed with a material capable of preventing the passage of flames and hot gasses when subjected to the requirements of the Test Standard specific for Fire Stops ASTM-E-814.

3.8 FIRE RATED WALL DEVICE SEPARATION

A. Electrical devices and junction boxes on opposite sides of a wall must be separated by a horizontal distance of 24" in any vertical distance floor to ceiling.

END OF SECTION 16100

PART 1 - GENERAL

1.1 WORK DESCRIPTION

A. Provide all labor, equipment, material, etc. required to complete installation specified herein and/or shown or scheduled on drawings.

B. Conduit size shall be 3/4" minimum; provide larger conduit where noted or required by N.E.C. Exception: For switch legs with not more than 6-#12 conductors or 4-#10 conductors.

PART 2 - PRODUCTS

2.1 CONDUIT:

A. For outside buried lines, use:

1. PVC, Type EB, encased in concrete
2. Rigid Galvanized Steel (RGS) conduit with bituminous coating.
3. Intermediate Metal Conduit (IMC) with PVC or bituminous coating.

B. Use RGS or IMC, conduit in the following locations:

1. Secondary Service Entrance
2. Exposed Locations, below 6'-0"
3. In or under concrete Floors
4. Where conduit penetrates a fire-rated floor ceiling structure and for all work below ground level.
5. Panel board Feeders installed in concrete.

C. Use Electrical metallic tubing (EMT) conduit in the following:

1. Panel board feeders installed overhead
2. Branch circuits installed overhead
3. Branch circuits installed exposed above 6'-0"

D. Galvanized single strip flexible steel conduit shall be use to make connections to motors or other vibrating equipment, and it may be used between conduit and lighting fixtures in ceiling.

E. Flexible conduit connections shall not exceed 24" long for motors and 72" long for lighting fixtures. Flexible conduit may be used where required for connections in metal partitions or steel studs, where permitted by code. Maximum length shall be 24".

F. Flexible watertight conduit shall be used for equipment connections exposed to possibility of water or other liquids. Conduit shall be PVC covered.

G. Conduit fittings shall have same protective coating as conduit; rigid steel conduit fittings shall be threaded.

H. Couplings, connectors and fittings for EMT shall be case hardened steel, rain-tight, designed specifically for use with EMT; cast fittings (other than steel) will not be permitted. Split couplings shall be used where necessary to add conduit to inaccessible locations. All connectors shall be of the insulated throat type. Indented type fittings are not acceptable.

I. Conduit connections to cabinets, boxes, etc. shall have grounding wedges, bushing, double locknuts. Install insulating bushings on all conduit.

J. Aluminum rigid conduit meeting UL Standard #UL-7 may be used wherever specified. An approved anti-seize thread lubricant shall be used on all threads.

K. Plastic conduit: Schedule 40 PVC, 90 degree C., UL Listed conforming to NEMA Standards shall have a tensile strength of 7,000 psi at 73.4 degrees F., a flexural strength of 11,000 psi and a compressive strength of 8,600 psi. Conduit, fittings and cement shall be produced by same manufacturer who shall have 5 years experience manufacturing these products.

2.2 BOXES

A. Concealed boxes inside buildings, above grade: pressed steel, hot dipped galvanized at least l-l/2" deep. Use gang boxes and plates where more than one device occurs at the same location. Outlets intended to support lighting fixtures shall be 4" octagonal X 2-l/8" deep, and where required, equipped with 3/8" fixture stud through bottom of box. Sectional switch boxes are not acceptable. Thru wall boxes are not acceptable.

B. Boxes in exposed masonry: square, or rectangular, masonry module.

C. Exposed units inside building: cast aluminum.

D. Boxes, above grade, exposed to weather, or dampness: cast aluminum with threaded hubs and watertight gasketed covers.

E. Boxes flush with or below grade: Malleable iron with neoprene gasketed covers with self-retaining stainless steel screws.

F. Provide blank covers, galvanized steel, for all outlet boxes left for future use.

2.3 WIRE WAYS

A. Provide surface metal wire way where shown.

B. Use junction box at conduit connection with suitable covers, elbows, special fittings, etc. as required or shown.

C. Wire ways shall be surface-mounted, cold rolled, galvanized steel with a base thickness of 0.05" and a cover thickness of 0.05". Outside surfaces of base and cover shall be ASA-61 gray. Where combination wire ways for low and high potential distribution are noted, compartments shall be divided by metallic divider.

D. Provide all necessary fittings including couplings, device plates, flat elbows, connectors, internal and external elbows, combination single receptacle and telephone outlet covers, combination duplex receptacle and telephone outlet covers, etc. as required for a complete installation.

2.4 UNDER FLOOR DUCT

A. Provide under floor ducts, fittings, supports, couplings, adaptors, fittings, and other required accessories per drawing.

B. Ducts: Welded rectangular tubing, zinc coated, provided with outlets uniformly spaced on 24" centers. Outlets shall be factory processed and capped to prevent ingress of moisture.

C. Boxes for multiple duct systems shall be provided with partitions separating the respective duct runs.

PART 3 - EXECUTION

3.1 CONDUIT:

A. Conceal and run shortest practical path unless noted. Maximum run between junction pull boxes shall not exceed 100'. The conduit shall follow the routing described on the drawings as closely as possible. The routing and layout, however, is diagrammatic and where changes are necessary as a result of structural conditions, apparatus, or other causes, the routing shall be changed without additional cost to the owner. All conduit risers and offsets are not indicated on the drawings, but are intended to be installed as required.

B. Provide conduit expansion joints at building structural expansion joints.

C. In equipment room: conduits may be exposed, run parallel to building, cast aluminum boxes shall be used.

D. Locate conduits at least 6" from any surface, which may be above 140□ F.

E. In general, conduits below floors shall be installed in floor slab and above the waterproofing with a minimum of l-l/2" concrete above conduit. Where conduits are too large for encasement in normal slab, trench around conduit to provide a minimum concrete encasement of 2". During construction, close conduit stub-ups, provide closure which:

1. Protect threads,

2. Keep dirt out,
3. Prevent entrance of water.

F. Where groups of conduits terminate together or pass through floors, provide template to hold conduits in proper relation to each other and to building.

G. Those conduits, which are to be left for future use, shall be tested for clean bore using a ball mandrel followed by 12 AWG copper wire, which shall be left in place.

H. Circuits under 600 volts below grade outside of building shall have 24" cover; above 600 volt, shall have 36" cover, measured from top of conduit.

I. Conduit system shall be electrically and mechanically continuous from distribution center to final point of use.

3.2 BOXES

A. Boxes shall be flush with wall and/or ceiling and cover shall be accessible; use extension rings where needed. Boxes shall have no openings except those through which conduit passes. Boxes shall be secured to building structure.

B. Prior to beginning work, coordinate the location of boxes in the block module with the Engineer's representative.

3.3 SUPPORTS

A. Outlets, junction, pull boxes, etc. when overhead shall be independently supported and shall not depend upon conduit for support. Where run is not supported by slabs, walls, etc., use galvanized pipe straps, trapeze hangers, beam clamps, channel and fittings, etc. Support within 3' of each outlet box, junction box, cabinet or fitting. Support at least every 10', except per NEC 346-12 for straight run.

B. Anchors requiring explosive charges shall be used after prior approval by Engineer. Phillips "Red Head" shields may be used for loads under 300 lbs.

3.4 PLASTIC CONDUIT (PVC)

A. PVC conduits Schedule 80 heavy wall when used in lieu of RGS or EMT, for uses permitted by Part 2, Paragraph 1 above shall be installed per NEC Article 347. Contractor must obtain approval of Engineer and the authority having jurisdiction prior to using plastic conduit in lieu of metallic conduit. In addition to NEC Paragraph 347-3, note the prohibited uses in Paragraph 517-11.

B. Provide a grounding conductor per NEC in all plastic conduits as to size and type.

C. All joints shall be solvent welded per manufacturer's recommendations.

D. Nylon pull cords shall be used instead of metal fish wires to pull in conductors.

END OF SECTION 16110

PART 1 - GENERAL

1.1 WORK DESCRIPTION

A. Provide all labor, equipment, materials, etc. required to complete installation, as specified herein and/or shown or scheduled on drawings.

B. All conductor sizes are based on copper ampacities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Conductors: Shall be 98% copper unless noted otherwise. Conductor sizes No. 10-12 AWG shall be solid wire, sizes No. 8 AWG and larger shall be stranded.

B. Conductors, 110-600 volts:

1. In raceway: Type THHN/THWN, or other types when noted.
2. Direct burial outside building: Type UF and USE for service entrance.
3. Flexible cords: Type SO.

C. Lighting fixtures wiring shall be:

1. Fluorescent, #18 AWG
2. Incandescent #16 AWG.
3. Larger per NEC 402 or as noted.
4. Conductors shall be stranded.

D. Where required to "fish" in steel partitions, block walls which are dry and similar locations, metal-clad cable, Type MC having Type THW conductors can be used where the wire size is No. 8 or smaller. Note particularly NEC Art. 333 requirements.

E. All conductors are to be identified, branch circuits and feeders by color coding as follows:

	277/480V	120/208V
PHASE A	BROWN	BLACK
PHASE B	PURPLE	RED
PHASE C	YELLOW	BLUE
NEUTRAL	WHITE W/YELLOW STRIPE	WHITE
GROUND	GREEN	GREEN W/YELLOW STRIPE

601-15,000V

PHASE A	BROWN
PHASE B	PURPLE
PHASE C	YELLOW
GROUND	GREEN

Contractor shall verify with local authority any wire color requirements. Local requirements shall dictate over colors specified. If no local requirements exist, these colors shall be used. For 601-15,000V cables, in all intermediate splices, manholes, or hand holes, the conductors shall be identified.

The color-coding on #8 and smaller conductors shall be continuous in length. No taping, painting or other means of coding will be acceptable. The color-coding on #6 and larger conductors shall be in the form of colored tape visible at each point of access or view.

F. When conduit is not used:

1. Non-metallic sheathed cable Type NMC, with a ground conductor in addition to phase and neutral conductors shall be used.

2. For such service entrances, use Type SE.

G. For #10 and smaller branch circuit and fixture conductor splices, use "live spring", pressure cable connectors listed for 600 volt (1000 volt when enclosed in fixture or sign).

H. For terminal connections on copper, No. 8 or larger, or where multiple connections are made to one terminal, use solderless lugs, mechanical type as necessary.

I. After Engineer's written approval, circuits showing #1/0 AWG copper or larger, may have conductors of aluminum. Insulation and covering shall meet UL standards #71-44 or #UL-800. Conductors shall be AA-8000 series electrical grade aluminum alloy conductor materials.

J. Size aluminum conductors for ampacity and voltage drop equal to copper. When aluminum conductors are approved:

1. Use aluminum body's compression type connectors and terminals, factory pre-filled with an inhibitor.

2. Use special impression tools designed specifically for this purpose.

3. All equipment shall be furnished with compatible connectors (aluminum bodied).

4. When aluminum is terminated to a copper bus with a steel or copper stud, place the aluminum lug on the stud followed by a flat steel washer, a Belleville washer, and a steel copper nut.

5. All panels shall have lugs approved for use with aluminum conductors.

6. All aluminum wire terminators shall have Penotrox or equal, coating, including panelboard lugs, split and compression types.

PART 3 - EXECUTION

3.1 CONDUCTOR SIZE

A. Branch Circuit conductors shall be at least No. 12 AWG except:

1. On home runs over 70' in developed length, minimum wire size shall be No. 10 AWG or larger as noted.

2. Control circuits carrying 8 amps or less, may be #14 AWG.

3.2 INSTALLATION

A. All control and circuit wiring in cabinets, boxes, gutters, etc. shall be neatly tied and held using nylon cable ties and mounting brackets.

B. Where "high-press" terminals are used, provide increased cabinet gutter space as required.

C. Conductors 600 volt and below shall not be bent to a radius less than 10 times the diameter of the cable.

D. After installation, conductors shall not have dents, scars, cuts, pressure indentations, abraded areas, etc.

E. Until high-voltage conductors are terminated with potheads, they shall be kept sealed to prevent entrance of moisture into cable structure. Do not terminate cable if ambient relative humidity in working space is above 70%.

F. Talc is the only permitted wire-pulling lubricant to be used with isolated branch circuit conductors.

G. Branch circuits from isolated power systems shall be run by the most direct route keeping the overall circuit length to a minimum.

3.3 PROTECTION OF BURIED CONDUCTORS

A. When conduits, or cables, are directly buried without concrete encasement, install permanently colored polyethylene, 0.004" film, marking tape, 6" wide above conduits or cables, and at 6" below finished grade.

3.4 CABLE SUPPORT

A. Inside all manholes, all cables are to have racks with insulator supports. Supports are to be within 6" of each side of a splice and 3' centers.

END OF SECTION 16120

PART 1 - GENERAL

1.1 WORK DESCRIPTION

A. Provide all labor, equipment, materials, etc. required to complete installation as specified herein and/or shown or scheduled on drawings.

PART 2 - PRODUCTS

2.1 PANELBOARDS

A. Circuit breakers: quick-make, quick-break, thermal-magnetic, trip indicating, with common trip on all multi-pole breakers. Branch circuit breakers, feeding convenience outlets shall have sensitive instantaneous trip settings of not more than 10 times the trip rating of the breaker in order to give "flash protection" for frayed stranded wire cords. Connections to the buss shall be of the Bolt-on Type. Where Noted Provide:

1. Key Operation
2. Built-In Ground Fault Circuit Interrupter on breakers
3. Shunt Trip Breakers.
4. Lock on Clips

All breakers used to panel switch lighting circuits shall be UL listed SWD (switching duty) rated at applied voltage. All breakers used to serve package type air conditioning equipment shall be UL listed "HACR".

Verify with local utility that service entrance equipment meets fault current requirements of local conditions. Request instructions, prior to bidding, if discrepancies exist, or provide suitably rated equipment to match conditions.

B. Ground fault circuit interrupter: Shall be circuit interrupting; shall operate manually for normal switching functions and automatically under overload, short circuit, and .005 ampere line-to-ground fault conditions; shall provide circuit and self-protection; shall be of insulated cast construction; shall be interchangeable with other panel breakers, and shall not protrude into wiring space. Mechanism shall be trip-free against any abnormal over-current short-circuit or ground fault condition. The trip unit shall provide inverse time delay under overload conditions and instantaneous magnetic tripping for short-circuit protection. Additionally, unit shall sense line-to-ground faults, and open breaker contacts. The device shall be suitable for use on a system capable of delivering a maximum of 10,000 (symmetrical) RMS amperes fault current at 120 volts, or as noted.

C. Bus bar connections to the branch circuit breakers shall be "phase sequence" type. Three-phase, four-wire bussing shall be such that any three adjacent single-pole breakers are

individually connected to each of the three different phases.

D. Terminals shall be UL listed as suitable for the type of conductor specified.

E. All lighting and distribution panelboards 600 amps or less shall have provisions for a sub feed breaker equal to the size of the mains ratings.

F. Enclose panelboard bus assembly in dead-front type, galvanized steel cabinet, in accord with NEMA Standards No. PB1 and UL Standards No. 67.

G. Fronts shall include doors and have flush, corrosion proof steel, cylinder locks with catches and spring-loaded door pulls. Fronts shall have adjustable indicating trim clamps, which are concealed when the doors are closed. Doors shall be mounted by concealed hinges. Fronts shall consist of a door, which covers the dead front and also a hinge where the entire cover can be swung open revealing the wiring gutter without removing the panel trim. Where the panel trims are flush mounted, a door in door front shall be used. The first door covers the dead front and the second door reveals the wiring gutter. Fronts that have to be removed to gain access to the full wiring gutter will not be accepted. Fronts shall not be removable with door in locked position. A circuit directory frame and card with a clear plastic covering shall be provided on the inside of the door. Fronts shall be of code gauge, full finished steel with rust-inhibiting primer and baked enamel finish. Minimum panelboard width to be 20" for panelboards 250A and below, maximum width of 24" for 400A and 600A panelboards.

H. Distribution power panelboard fronts shall have a hinged gutter cover where all that is necessary to gain access to the wiring gutter is to remove two screws and the entire length of the gutter cover will open and expose the wiring gutter. Any gutter covers that have to be totally removed to expose the wiring will not be accepted.

I. Provide 2-handle lock-off devices per panel to be installed where directed.

J. Furnish 5 keys to panelboard locks, all locks keyed alike.

K. Where two or more panels are located at one point supply common trim.

L. Directory cards shall be filled in on typewriter. Indicate circuit's use such as "Lighting-Office 105". Verify proper room identification.

M. Ground fault protection, service entrance and/or main feeders: a ground sensor encircling all phase conductors including neutral in a 4-wire system connected to a solid state ground relay which initiates tripping of the main circuit interrupting device. Ground protection shall be adjustable from 200 to 1,200 primary amperes and time-current characteristic shall provide 6-cycle operation at about ten times setting. Relay output shall operate from 120V AC source.

N. TVSS Surge Protection shall be bussed directly to the panelboard bussing without the use of a circuit breaker. This is to keep clamping voltage to a minimum. Connection to the bus by cable will not be acceptable.

Key Bid Specification:
1. UL 1449 Second Addition, 1283, and 67 listed
2. UMI/RFI Filtering Active Tracking up to - 50db from 100khz to 100Mkhz
3. All Modes of Protection. L-N/L-L, L-G, and N-G
4. TVSS must be supplied by the same manufacturer as the panelboards.
5. TVSS must be serviced and warranted by the gear manufacturer.
6. TVSS must fit in a standard size panelboard with no extensions that could add to the clamping voltage.
7. TVSS must be non-modular with audible alarm/silence switch with test button.

Panelboards up to 250A Maximum-U.L. Suppression of 500V/1000V
Surge Capacity 80ka per phase L-N=40-ka, L-G=40ka----160ka per phase
L-N=80ka L-G=80ka. Equal to TPS1 (080ka or 160ka).

Panelboards up to 600A Maximum-U.L. Suppression of 400V/800V
Surge Capacity 100ka per phase L-N=50-ka, L-G=50ka----200ka per phase
L-N=100ka L-G=100ka. Equal to TPS2 (100ka or 200ka).

Panelboards up to 1200A Maximum-U.L. Suppression of 400V/800V
Surge Capacity 150ka per phase L-N=75-ka, L-G=75ka----200ka per phase
L-N=100ka L-G=100ka. Equal to TPS5 (150ka or 200ka).

2.2 INTEGRATED SURGE PROTECTIVE DEVICES

A. References

1. ANSI/IEEE C62.41 - IEEE Guide for Surge Voltages in Low Voltage AC Power Circuits
2. ANSI/IEEE C62.45-IEEE Guide for Surge Suppressor Testing
3. FIPS Pub 94 (1983) - Guide on Electrical Power for ADP Installation
4. National Electric Code - Article 280-1, 2, 4, 12, 21, 25
5. National Fire Protection Association - NFPA-20, NFPA-70, NFPA-75, NFPA-78.
6. NEMA LS-1 - Low Voltage Surge Protective Devices
7. UL 1283 - Electromagnetic Interference Filters
8. UL 1449 - Transient Voltage Surge Suppressor

B. Panelboards

1. Integral Surge Suppressor
   a. SPD shall be Listed and Component Recognized in accordance with UL 1449 and UL 1283.
   b. SPD shall be installed by and shipped from the electrical distribution equipment manufacturer's factory.
   c. SPD shall be tested with the Category C3 high exposure waveform (20kV-1.2/50, us, 10kA-8/20, us) per ANSI/IEEE C62.41-1991.
   d. SPD shall be a self-contained module design. Each suppression element shall be MOV based. Each phase of the surge current diversion module shall be fused with 200 KAIC surge rated fuses.
   e. SPD shall provide surge current diversion paths between each phase conductor and the neutral conductor, between each phase conductor and the ground and between the neutral conductor and ground. For delta configured systems, the SPD shall have components connected between each phase conductor and between each phase conductor and ground.
   f. SPD shall incorporate copper bus bars for the surge current path. Small gauge round wiring or plug-in connections shall not be used in the path for surge current diversion. Surge current diversion module shall be bolted directly to the bus bars of the distribution equipment for reliable low impedance connections.
   g. SPD shall meet or exceed the following criteria:
      1) Maximum surge current capability (single pulse rated) shall be (100kA) (200kA) per phase. In accordance with NEMA LS I Standard.

   h. SPD shall be designed to withstand a maximum continuous operating voltage (MCOV) of not less than 115% of nominal RMS voltage.
   i. SPD shall have a minimum EMI/RFI filtering of - 50dB at 100kHz.
   j. SPD shall be equipped with onboard visual and audible diagnostic monitoring. Indicator lights shall provide full time visual diagnostic monitoring of the operational status of each phase of the surge current diversion module. An amber indicator light will indicate reduced suppression capability. A red indicator light will indicator total loss of suppression capability. A green indicator light will indicate fully operational suppression capability. Audible diagnostic monitoring shall be by way of audible alarm. This alarm shall activate upon a fault condition. An alarm on/off switch shall be provided to silence the alarm. An alarm push to test switch shall be provided. The SPD diagnostic monitoring devices shall be mounted on the front of the panelboard enclosure. The diagnostic monitoring circuits shall continually monitor the operational status of the surge current diversion module. A diagnostic system press to test switch shall be provided. A set of Form C dry contacts shall be provided for remote annunciation. No other test equipment shall be required for SPO monitoring or testing before or after installation.
   k. SPD shall have a response time no greater than 1/2 nanosecond for any of the individual protection modes.

l. SPD shall have a warranty for a period of five years, incorporating unlimited replacements of suppressor parts if they are destroyed by transients during the warranty period. Warranty will be the responsibility of the electrical distribution equipment manufacturer.

m. SPD shall be equipped with the following optional items:
   1) Transient event surge counter hall be located on the front cover of the panelboard. The counter shall be equipped with a manual reset and a battery to retain memory upon loss of AC power.
   2) Remote monitor panel with indicating lights and audible alarm for mounting in a removed location.

C. Panelboard

1. The panelboard shall be UL 67 Listed and the SPD device shall be UL 1449 standard. Panelboard markings shall include clamp voltage at the SPD terminals as well as clamp voltage at the panelboard line terminals.
2. The unit shall be top or bottom feed according to requirements. A circuit directory shall be located inside the door.
3. The unit shall have removable interior.
4. The main bus shall be (copper) (aluminum) and rated for the load current required.
5. The unit shall include a 200% rated neutral assembly with copper neutral bus.
6. The unit shall be provided with a safety ground bus.
7. The field connections to the panelboard shall be main lug or main breaker.
8. The unit shall be constructed with flush or surface mounted trim and shall be in a NEMA Type I enclosure.

2.3 WIRING DEVICE

A. Devices shall be commercial grade and meet requirements of NEMA WDI "Heavy Duty". Acceptable manufacturers are: Hubbell, Pass & Seymour, Leviton.

B. Switches shall meet 50,000 close-open cycles of operation, and shall be rated for 120/277 volt, AC service. Switches shall be "T" rated.

C. Receptacles shall have grounding terminal and shall be "self-grounding" except when "isolated ground" is noted.

D. Devices shall be ivory color, or color as selected by architect, except "emergency power" devices shall be red or as noted.

E. Plates shall be same manufacturer as devices and shall be nylon color selected by Architect.

2.4 LOW VOLTAGE SWITCHING:

A. Transformers: Energy limiting type approved for Class 2 system.

B. Remote control relays rated 1/2 HP, 125 volts AC: 1-1/2 HP, 250 volts AC; 20 amp tungsten 120 volts AC; and 20 amps 277 volts AC.

C. Provide complete remote control switching system for control of lighting outlets and other equipment as shown, complete with transformers, rectifiers, relays, switches, master selector switches, pilot lights, motor master controls, wall plates, mounting brackets, cabinets, wiring, etc.

D. Remote control switches shall be single pole, double throw, and momentary contact type. One switch shall not control more than 5 relays.

E. Conductors must be identified at terminals. Where single fixtures are controlled, relays shall be mounted in steel cabinets adjacent to panelboard, equipped with suitable terminal strips as required for the connection of low and high voltage leads. In addition to relays required for installation, provide space for 25% additional relays for future circuits.

PART 3 - EXECUTION

3.1 WIRING

A. Convenience outlets shall not be wired on same circuit with other type outlets unless specifically shown. Leave at least 8" of slack in conductors at every outlet box. In duplex receptacles mounted vertically, install with grounding pole above phase poles.

B. Where a switch carries more than 1,440 watts on 120 volt circuit or 3300 watts on 277 volt circuit, provide 20 amp size switch, or larger as required.

C. Provide 20 amp receptacles unless noted otherwise.

D. Receptacles servicing equipment through exposed "pig-tails" shall be "twist-lock" type.

E. Where more than one switch is at one location, gang mount under common plate. Provide separating partitions for switches servicing 277-volt lighting circuits.

F. Connect to live side of circuit, control only the outlet shown, lever in "down" position when "OFF".

G. Secure switches firmly on boxes without depending on plates to draw them up tightly. Where several conductors must be held together, use nylon cable ties.

H. Use shallow outlet boxes only where space conditions require it, and only after Engineer's

approval.

I. Unless otherwise noted, outlets shall be height above floor as follows: Switches up 48" , receptacles up 18".

J. Where ceiling outlets are "aligned", hold the fixture accurately to line.

K. Switches shall be on strike side of door, and 4" from door trim unless otherwise noted.

L. Where several outlets are shown close together to serve a particular piece of furniture or equipment, group closely as directed.

M. Devices shall not be mounted back back. A minimum, of two feet (2') shall separate devices on opposite sides of any wall.

3.2 BRANCH CIRCUITS

A. Multi-wire, 120-volt circuits on a common neutral and in one conduit can be used without change in wire size up to 3 on 120-208V, 3 Phase wye service and 2 circuits on 120-240V, 3 phase, and delta service. Where it will be of advantage, provided the wire is increased one size and two neutrals are used 6 circuits on 120-208V, 3 phase, wye are acceptable in one conduit and 4 on 120-240V, 3 phase, delta.

3.3 WIRING IN AIR HANDLING SPACES

A. In connection with wiring in ducts, plenum and other air handling spaces, note N.E.C. 300-22.

END OF SECTION 16400

PART 1 - GENERAL

1.1 WORK DESCRIPTION

A. Provide all labor, equipment, materials, etc. required to complete installation as specified herein and/or shown on drawings.

B. Ground circuits to limit excessive voltage from lightning, line surges, or unintentional contact with higher voltage and to limit the voltage to ground during normal operation.

C. Ground conductive materials enclosing electric conductors or equipment or forming part of such equipment, to prevent voltage above ground on these enclosures.

PART 2 - PRODUCTS

2.1 All grounding conductors shall be copper.

2.2 All grounding clamps, connectors, etc. shall be heavy-duty type.

PART 3 - EXECUTION

3.1 GROUNDING SYSTEM

A. The following items shall be grounded:

1. Electric service and secondary of all transformers, except isolating type.
2. Conduits and other conductor enclosures.
3. Neutral conductor
4. Panelboards
5. Grounding connection of convenience outlets, etc.

Note particularly NEC Art. 250 concerning grounding of all exposed non-current carrying metal parts of motors, lamps, appliances, fixtures, cabinets, cases and conduits.

B. In general, when RGS or IMC conduit is used, the conduit system can be used as the ground conductor. In certain areas, ground conductors are required, and are so noted.

C. Use a ground conductor whenever EMT, non-metallic conduit, flexible conduit, or surface raceways are used.

D. The cold water pipe shall be the primary electrode, using a grounding clamp. In addition, drive two 3/4" diameter, 8' long copper weld rods as a second grounding and connect to same ground point as water pipe ground. The ground conductor shall be No. 4/0 AWG bare copper, medium drawn, stranded or as required to conform to National Electrical Code.

E. Make an approved ground connection to the main panel housing and connect to the neutral. Extend the ground bus conductor to this point.

F. Use grounding clips and bonding jumpers to ground devices where RGS or IMC conduit are used.

G. Use a ground wire to bond the conduit to the load when:

1. The load is subject to vibration
2. Flexible conduit is used
3. Surface raceways are used.

H. For transformer grounding, install a line looped to and connecting the secondary of all transformers.

I. Ground the secondary neutral of each dry type transformer and each individual panelboard enclosure with NEC sized ground wire.

J. Building structure shall be grounded as noted and/or as shown on drawings.

K. Switchgear for service over 600 volts shall have ground bus grounded at 5' intervals with a minimum of 2 ground rods 3/4" x 10'.

L. Provide one No. 6 TW copper wire in 1/2" conduit from the main telephone board and fire alarm control panel to the street side of the domestic water service (street side of main shut-off valve).

END OF SECTION 16450

PART 1 - GENERAL

1.1 WORK DESCRIPTION

A. Provide all labor, equipment, materials, etc. required to complete installation as specified herein and/or shown or scheduled on drawings.

PART 2 - PRODUCTS

2.1 Provide switchboard with all accessories per drawing schedule.

2.2 Switchboard shall consist of enclosed metal structure of vertical panel sections incorporating circuit breakers and/or fusible switches and other associated equipment. All sections shall be same depth and height, except service sections containing main disconnect means may be deep. All sections shall align across the back. Internal components shall be serviceable from front. All screwed-on front covers and top enclosing plate shall be 12 gauge steel and removable. Provide sides with louvers for proper ventilation. The busing shall be tin-plated copper or aluminum of sufficient cross-sectional area to continuously conduct rated current with a maximum temperature rise of 65 degrees C. above an ambient temperature of 40 degrees C. Provide barriers to isolate service bus bars and terminals from the remainder of the switchboard.

2.3 Each protective device shall clearly identify the ampere rating without the removal of any switchboard part. Each device shall be identified as to use with engraved nameplate.

2.4 Service Section Air Circuit Breaker shall be manually operated accessible from the front, with ventilated front cover.

2.5 Service Section Fusible Bolted Pressure Contact Switches shall be front connected, front accessible, bolted pressure contact type with provision for NEMA Class L fuses.

2.6 All service sections shall be provided with service equipment labels.

2.7 Distribution Section, molded Case Circuit Breakers shall be accessible from the front.

2.8 Combination circuit breaker type motor starters shall consist of: A-C magnetic starters with reset button in cover and combined with molded case circuit breakers. The external handle of the starter so that it is impossible to open the starter door unless the breaker is in the "Off" position. Unit shall be front connected and front accessible.

2.9 Provide transformers, meters, transfer switches, etc. to read both voltage and amperage for each phase. Meter indication shall be approximately a 65% scale deflection for normal voltage. All meters shall have accuracy to within plus/minus l%. If electronic meter is specified, it shall be equal to Siemens 4300 Digital Meter.

2.10 Provide space and bus for future feeders as shown.

2.11 Provide one complete set of spare fuses for each size of fuse listed in the switchboard schedule. Fuses are to be mounted behind locked doors in the switchboard with marking on the outside to indicate their location.

2.12 Provide space as required by Utility for power meters, CTS, etc.

2.13 Ground fault protection; service entrance and/or main feeders: a ground sensor encircling all phase conductors including neutral in a 4-wire system connected to a solid state ground relay which initiates tripping of the main circuit interrupting device. Ground protection shall be adjustable from 200 to 1200 primary amperes and time-current characteristic shall provide 6-cycle operation at about ten times setting. Relay output shall operate from 120V AC source.

2.14 Gutter covers shall be hinged where access to the gutter shall be accomplished by removing two screws and swinging the covers open without removing the covers. Screw mounted covers where the removal of the entire gutter cover must be done to gain access to the wiring gutter will no be accepted.

2.15 Integrated Surge Protective Devices

A. References:

1. ANSI/IEEE C62.41 - IEEE Guide for Surge Voltages in Low Voltage AC Power Circuits
2. ANSI/IEEE C62.45-IEEE Guide for Surge Suppressor Testing
3. FIPS Pub 94 (1983) - Guide on Electrical Power for ADP Installation
4. National Electric Code - Article 280-1, 2, 4, 12, 21, 25
5. National Fire Protection Association - NFPA-20, NFPA-70, NFPA-75, NFPA-78.
6. NEMA LS-1 - Low Voltage Surge Protective Devices
7. UL 1283 - Electromagnetic Interference Filters
8. UL 1449 - Transient Voltage Surge Suppressor

B. Service Entrance Switchboards:

1. Integral Surge Suppressor:

a. SPD shall be Listed and Component Recognized in accordance with UL 1449 and UL 1283.
b. SPD shall be installed by and shipped from the electrical distribution equipment manufacturer's factory.
c. SPD shall be tested with the Category C3 high exposure waveform (20kV-1.2/50, us, 10kA-8/20, us) per ANSI/IEEE C62.41-1991.
d. SPD shall be a self-contained module design. Each suppression element shall be MOV based. Each phase of the surge current diversion module shall be fused with

200 KAIC surge rated fuses.

e. SPD shall provide surge current diversion paths between each phase conductor and the neutral conductor, between each phase conductor and the ground and between the neutral conductor and ground. For delta configured systems, the SPD shall have components connected between each phase conductor and between each phase conductor and ground.

f. SPD shall incorporate copper bus bars for the surge current path. Small gauge round wiring or plug-in connections shall not be used in the path for surge current diversion. Surge current diversion module shall be bolted directly to the bus bars of the distribution equipment for reliable low impedance connections.

g. UL approved disconnect switch shall be provided as means of disconnect.

h. SPD shall meet or exceed the following criteria:

1) Maximum surge current capability (single pulse rated) shall be (200kA) (300kA) (400kA) per phase. In accordance with NEMA LS 1 Standard.

2) Endurance testing. Capable of protecting against and surviving 5,000 ANSI/IEEE C6.41 Category C3 transients without failure or degradation of UL 1449 Suppression Voltage Rating by more that 10%.

3) UL 1449 Listed and Recognized Component Suppression Voltage Ratings shall not exceed the following:

Voltage	L-N	L-G	N-G
208Y/120	400V	400V	400V
480Y/277	800V	800V	800V

4) The ANSI/IEEE C62.41-1991 Category C3 let through voltages shall not exceed the following:

Voltage	L-N	L-G	N-G
208Y/120	590V	590V	4590
480Y/277	920V	920V	920V

i. SPD shall be designed to withstand a maximum continuous operating voltage (MOV) of not less than 115% of nominal RMS voltage.

j. SPD shall have a minimum EMI/RFI filtering of - 50dB at 100kHz at an insertion ratio of 50:1 using MIL STD. 22A methodology. In accordance with NEMA LS 1 Standard.

k. SPD shall be equipped with onboard visual and audible diagnostic monitoring. Indicator lights shall provide full time visual diagnostic monitoring of the operational status of each phase of the surge current diversion module. An amber indicator light will indicate reduced suppression capability. A red indicator light will indicate total loss of suppression capability. A green indicator light will indicate fully operational suppression capability. Audible diagnostic monitoring shall be by way of audible alarm. This alarm shall activate upon a fault condition. An alarm on/off switch shall be provided to silence the alarm. An alarm push to test switch shall be provided. The SPD diagnostic monitoring devices shall be

mounted on the front of the switchboard enclosure. The diagnostic monitoring circuits shall continually monitor the operational status of the surge current diversion module. A diagnostic system press to test switch shall be provided. A set of Form C dry contacts shall be provided for remote annunciation. No other test equipment shall be required for SPD monitoring or testing before or after installation.

l. SPD shall have a response time no greater that 1/2 nanosecond for any of the individual protection modes.

m. SPD shall have a warranty for a period of five years, incorporating unlimited replacements of suppressor parts if they are destroyed by transients during the warranty period. Warranty will be the responsibility of the electrical distribution equipment manufacturer.

n. SPD shall be equipped with the following optional items:

1) Transient event surge counter shall be located on the front cover of the switchboard. The counter shall be equipped with a manual reset and a battery to retain memory upon loss of AC power.

2) Remote monitor panel with indicating lights and audible alarm for mounting in a removed location.

Key Bid Specification Items

UL 1449, 1283, and 891 Listed
EMI/RFI Active Filtering
UL Suppression of 400V/800V
All Modes of Protection L-N, L-L, L-G, N-G
Surge Capacity of 150kA or 200kA per phase

L-N = 75kA	100kA
L-G = 75kA	100kA

Category C3 Tested

PART 3 - EXECUTION

3.1 The switchboard shall be installed on a 4" housekeeping concrete pad.

3.2 All service entrance conductors shall be of equal length with any excess conductor neatly coiled in the switchboard enclosure if required.

3.3 Submit for approval complete and specific shop drawings.

END OF SECTION 16470

PART 1 - GENERAL

1.1 WORK DESCRIPTION

A. Provide labor, material, equipment and services necessary to provide all interior lighting fixtures, necessary hangers and lamps. Fixtures include all interior fixtures plus all exterior fixtures mounted to exterior wall or to structures connected directly to building.

B. Fluorescent fixtures to be designed in such a manner that all electrical components may be replaced without disturbing fixture in or on ceiling.

C. Ballasts shall have overall power factor of more than 90%. Ballasts noise shall be inaudible in a room ambient of 35 DB.

PART 2 - PRODUCTS

2.1 Provide lighting fixtures indicated by type on lighting fixture schedule on Drawing.

2.2 Recessed fluorescent fixtures shown with acrylic lenses to be furnished with 0.125 minimum thickness acrylic lens.

2.3 Fluorescent ballasts to be electronic energy saving, high-power factor and bear ETL and CBN labels for Class "P" protection and shall be rated for 110/125-volt operation unless noted otherwise.

2.4 Provide one ballast per fixture unless otherwise noted on plans for multi-level switching.

2.5 Provide all fluorescent, high intensity discharge and incandescent lamps as indicated below.

2.6 FLUORESCENT LAMPS

A. Fluorescent lamps to be T8, SPX-41, unless noted otherwise.

2.7 EXIT LIGHTS

A. Exit lights shall have LED lamps, nickel cadmium battery, charger, and 120/277V electronic circuitry. Directional arrows per drawings.

2.8 FLUORESCENT EMERGENCY BATTERIES

A. Emergency illumination shall be provided by using a standard fluorescent fixture equipped with fluorescent emergency ballast. Supply and install for each designated fixture, a fluorescent emergency ballast consisting of a special high temperature nickel cadmium battery, charger, and electronic circuitry contained in one (1) compact steel case.

B. A test switch, installation hardware and a charging indicator light, to monitor the charger and battery, shall be provided.

C. The battery unit shall be installed within the fixture ballast channel or outside the channel requiring an external mounting kit. Every emergency ballast shall be capable of fully automatic operation of one (1) 2' through 8' lamp, or two (2) 2' through 4' lamps in the emergency mode at reduced illumination. Emergency illumination shall be a minimum of 650 lumens for ninety (90) minutes.

PART 3 - EXECUTION

3.1 Recessed fixtures in dropped ceiling areas to be connected using Greenfield and No. 14 AF wire. Greenfield to be connected to fixture and cover of outlet box. Each piece of Greenfield to have installed in it a separate insulated green grounding conductor not smaller than No. 14 AWG for grounding continuity between fixture and conduit system. Grounding conductor to be mechanically connected in a permanent and effective manner to fixture and conduit system and to be electrically continuous. No conduit shall enter a recessed fixture directly as this would prevent removal of fixture without disturbing balance of circuit.

3.2 Joints in fixture wiring to be made using wire nuts, pre-insulated Scotch locks, Ideal No. 30-410 crimps and No. 30-415 wrap caps, or other approved mechanical means of connection.

3.3 Adjustable type to be adjusted by the Contractor to illuminate intended area to satisfaction of Owner.

3.4 Any adjustable outside area lights or lights mounted on building to be adjusted at night by the Contractor to satisfaction of Owner.

3.5 Surface or recessed fixtures in or on plastered or dry wall ceiling to be supported from pieces of support channel spanning across main support channels and shall not depend on ceilings for support. Fixtures in plastered ceilings to have plaster frames.

3.6 Coordinate with ceiling tradesman and Contractor in order that proper fixtures are furnished to match ceiling suspension system being installed.

3.7 Coordinate fixture locations to clear diffusers, ductwork, piping, etc.

3.8 Maintain integrity of parabolic lensed fixtures by leaving the protective wrapping or seal on until final inspection.

3.9 Maintain integrity of enclosures on all enclosed and gasketed fixtures. Minimize number of enclosure penetrations and make such penetrations water and dust tight with appropriate gasketing and fittings.

3.10 Submit for approval prior to purchasing fixtures complete fixture lists of fixtures proposed to be used. Include cuts of both specified fixture and proposed equivalent features if fixtures other than those specified are submitted.

3.11 If requested by Architect, submit a sample fixture, which will be returned after inspection by Architect. Architect reserves right to accept any fixture as approved equivalent.

END OF SECTION 16500

PART 1 - GENERAL

1.1 Provide labor, materials, equipment and services necessary for installation of all exterior lighting fixtures, lamps, poles, pole bases etc. for area lighting.

1.2 Refer to details and arrangements shown on drawings.

1.3 Provide anchor bolts, conduit stub-ups to pole bases, concrete bases, etc. as required for poles and luminaries and types of arrangements indicated.

1.4 Provide exterior lighting fixtures and poles indicated by type on lighting fixture schedule on drawings.

1.5 Fixture manufacturer to furnish sufficient amount of paint (matching fixtures being furnished) for adequate field painting of prime painted poles being furnished.

PART 2 - PRODUCTS

2.1 Fixtures, poles, etc. to be suitable for exterior use, shall be UL listed, and to be of standard design.

PART 3 - EXECUTION

3.1 Install parking luminaries and poles on concrete bases. Provide all anchor bolts and bolt hole circle templates. Adjust luminaries to correct tilt and lamp all fixtures.

3.2 Adjust or rotate site lighting at night to maximize light utilization in intended areas.

3.3 Effectively ground all luminaries to poles and all poles to equipment grounding conductor or to separate 3/4" diameter x 8' copper weld ground rod driven at base of each pole.

3.4 Submit for approval prior to purchasing fixtures complete shop drawings and brochures including photometric for each type of exterior lighting system specified. Shop drawings and brochures to be specific and to include all pertinent data and accessories. If substitute fixtures are proposed include cuts of both specified fixture and proposed equipment fixtures if requested by Engineer. Submit a sample fixture, which will be returned after inspection by Engineer. Engineer reserves right to accept any fixture as an approved equivalent.

END OF SECTION 16540

PART 1 - GENERAL

1.1 SUMMARY

A. This Section covers fire alarm systems, including initiating devices, notification appliances, controls, and supervisory devices.

B. Work covered by this section includes the furnishing of labor, equipment, and materials for installation of the fire alarm system as indicated on the drawings and specifications.

C. The Fire Alarm System shall consist of all necessary hardware equipment and software programming to perform the following functions:

1. Fire alarm and detection operations

2. Control and monitoring of elevators, smoke control equipment, door hold-open devices, fire suppression systems, emergency power systems, and other equipment as indicated in the drawings and specifications.

3. One-way supervised automatic voice alarm operations.

1.2 ACCEPTABLE MANUFACTURERS

A. Manufacturers: The equipment and service described in this specification are those supplied and supported by Simplex and represent the base bid for the equipment.

1. Subject to compliance with requirements, provide alternate products by one of the following:

a. Simplex
b. Cerberus Pyrotronics
c. Edwards Systems Technology
d. Notifier

B. Being listed as an acceptable Manufacturer in no way relieves obligation to provide all equipment and features in accordance with these specifications.

C. The Manufacturer shall be a nationally recognized company specializing in fire alarm and detection systems. This organization shall employ factory trained and NICET certified technicians, and shall maintain a service organization within 100 miles of this project location. The Manufacturer and service organization shall have a minimum of 10 years experience in the fire protective signaling systems industry.

1.3 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

B. The work covered by this section is to be coordinated with related work as specified elsewhere in the specifications.

C. The system and all associated operations shall be in accordance with the following:

1. NFPA 72, National Fire Alarm Code
2. NFPA 70, National Electrical Code
3. NFPA 101, Life Safety
4. Local Jurisdictional Adopted Codes and Standards
5. ADA Accessibility Guidelines

1.4 SYSTEM DESCRIPTION

A. General: Provide a complete, non-coded, addressable, microprocessor-based fire alarm system with initiating devices, notification appliances, and monitoring and control devices as indicated on the drawings and as specified herein.

B. History Logs: The system shall provide a means to recall alarms and trouble conditions in chronological order for the purpose of recreating an event history. A separate alarm and trouble log shall be provided.

C. Recording of Events: Record all alarm, supervisory, and trouble events by means of system printer. The printout shall include the type of signal (alarm, supervisory, or trouble) the device identification, date and time of the occurrence.

D. Wiring/Signal Transmission:

1. Transmission shall be addressable signal transmission, dedicated to fire alarm service only.

2. System connections for initiating (signaling) circuits and notification appliance circuits shall be Class B.

E. Required Functions: The following are required system functions and operating features:

1. Transmission to Remote Central Station: Automatically route alarm, supervisory, and trouble signals to a remote central station service transmitter provided under another contract.

2. Annunciation: Operation of alarm and supervisory initiating devices shall be annunciated

at the FACP [and the remote annunciator,] indicating the location and type of device.

3. General Alarm: A system general alarm shall include:

   a. Indication of alarm condition at the FACP and the annunciator(s).
   b. Identification of the device that is the source of the alarm at the FACP and the annunciator(s).
   c. Operation of audible and visual notification devices throughout the building until silenced at FACP.
   d. Closing doors normally held open by magnetic door holders.
   e. Unlocking designated doors.
   f. Shutting down supply and return fans serving zone where alarm is initiated.
   g. Notifying the local fire department.
   h. Initiation of elevator recall in accordance with ASME/ANSI A17.1, when specified sensors are activated.

4. Supervisory Operations: Upon activation of a supervisory device such as fire pump power failure, low air pressure switch, and tamper switch, the system shall operate as follows:

   a. Activate the system supervisory service audible signal and illuminate the LED at the control unit and the graphic annunciator.
   b. Pressing the Supervisory Acknowledge Key will silence the supervisory audible signal while maintaining the Supervisory LED "on" indicating off-normal condition.
   c. Record the event in the FACP historical log.
   d. Transmission of supervisory signal to remote central station.

5. Drill: A manual evacuation (drill) switch shall be provided to operate the notification appliances without causing other control circuits to be activated.

6. Walk Test: The system shall have the capacity of 8 programmable pass code protected one person testing groups, such that only a portion of the

system need be disabled during testing. The actuation of the "enable one person test" program at the control unit shall activate the "One Person Testing" mode of the system as follows:

   a. Control relay functions associated to one of the 8 testing groups shall be bypassed.
   b. The control unit shall indicate a trouble condition.
   c. The alarm activation of any initiation device in the testing group shall cause the audible notification appliances to sound a voice announcement to identify the device.

d. The unit shall automatically reset it after signaling is complete.

F. Analog Smoke Sensors:

1. Monitoring: FACP shall individually monitor sensors for calibration, sensitivity, and alarm condition, and shall individually adjust for sensitivity. The control unit shall determine the condition of each sensor by comparing the sensor value to the stored values.

2. Environmental Compensation: The FACP shall maintain a moving average of the sensor's smoke chamber value to automatically compensate for dust, dirt, and other conditions that could affect detection operations.

3. Programmable Sensitivity: Photoelectric Smoke Sensors shall have 7 sensitivity levels ranging from 0.2% to 3.7%, programmed and monitored from the FACP.

4. Sensitivity Testing Reports: The FACP shall provide sensor reports that meet NFPA 72 calibrated test method requirements

5. The FACP shall automatically indicate when an individual sensor needs cleaning. The system shall provide a means to indicate that a sensor requires cleaning. When a sensor's average value reaches a predetermined value, (3) progressive levels of reporting are provided.

6. The FACP shall continuously perform an automatic self-test on each sensor, which will check sensor electronics and ensure the accuracy of the values being transmitted.

G. Fire Suppression Monitoring:

1. Water flow: Activation of a water flow switch shall initiate general alarm operations.

2. Sprinkler valve tamper switch: The activation of any valve tamper switch shall activate system supervisory operations.

H. Audible Alarm Notification: By voice evacuation and tone signals on loudspeakers in areas as indicated on drawings.

1. Automatic Voice Evacuation Sequence:

a. The audio alarm signal shall consist of an alarm tone for a maximum of five seconds followed by an automatic digital voice message. At the end of the voice message, the alarm tone shall resume. This sequence shall sound continuously until the "Alarm Silence" switch is activated.
b. All audio operations shall be activated by the system software so that any required future changes can be facilitated by authorized personnel without any component

rewiring or hardware additions.

I. Manual Voice Paging

1. The system shall be configured to allow voice paging.

2. The control panel operator shall be able to make announcements via the push-to-talk paging microphone over the pre-selected speakers.

3. Facility for total building paging shall be accomplished by the means of an "All Call" switch.

J. Power Requirements

1. The control unit shall receive power via a dedicated circuit.

2. The system shall be provided with sufficient battery capacity to operate the entire system upon loss of normal power in a normal supervisory mode for a period of 24 hours with 5 minutes of alarm at the end of this period. The system shall automatically transfer to battery standby upon power failure

3. The system batteries shall be supervised so that a low battery condition or disconnection of the battery shall be indicated at the control unit.

4. Loss of primary power shall sound a trouble signal at the FACP. FACP shall indicate when the system is operating on an alternate power supply.

1.5 SUBMITTALS

A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.

1. Product data sheets for system components highlighted to indicate the specific products, features, or functions required to meet this specification. Alternate or as-equal products submitted under this contract must provide a detailed line-by-line comparison of how the submitted product meets, exceeds, or does not comply with this specification.

1.6 QUALITY ASSURANCE

A. Each and all items of the Fire Alarm System shall be listed as a product of a single fire alarm system manufacturer under the appropriate category by Underwriters Laboratories, Inc. (UL), and shall bear the "UL" label.

PART 2 - PRODUCTS

2.1 FIRE ALARM CONTROL PANEL (FACP)

A. General: Comply with UL 864, "Control Units for Fire-Protective Signaling Systems."

B. The following FACP hardware shall be provided:

1. 1000 Addressable point capacity (inputs or outputs).

2. 2000 points of annunciation where one (1) point of annunciation equals:

a. LED or 1 switch on an LED/switch module.
b. 1 LED driver output on a graphic driver or 1 switch input on a graphic switch input module.

3. The FACP shall support up to five (5) RS-232-C ports.

4. Remote Unit Interface: supervised serial communication channel for control and monitoring of remotely located annunciators, transponders, and I/O panels.

5. Point Reporting Digital Alarm Comm Transmitter.

C. Alphanumeric Display and System Controls: Panel shall include an 80 character LCD display to indicate alarm, supervisory, and component status messages and shall include a keypad for use in entering and executing control commands.

D. Voice Alarm: Provide an emergency communication system, integral with the FACP, including voice alarm system components, microphones, amplifiers, and tone generators. Features include:

1. Single alarm channel permit transmission of announcements to zones or floors automatically or by use of the central control microphone. Annunciator indicates the status of the various voice alarm speaker zones.

E. Distributed Module Operation: FACP shall be capable of allowing remote location of the following modules; interface of such modules shall be through a Style 4 (Class B) supervised serial communications channel:

1. Amplifiers, voice and telephone control circuits
2. Addressable Signaling Line Circuits
3. Initiating Device Circuits
4. Notification Appliance Circuits
5. Auxiliary Control Circuits
6. Graphic Annunciator LED/Switch Control Modules

2.2 ADDRESSABLE MANUAL PULL STATIONS

A. Description: Addressable Single-action type, red LEXAN or metal, and finished in red with molded, raised-letter operating instructions of contrasting color. Station will mechanically latch upon operation and remain so until manually reset by opening with a key.

2.3 SMOKE SENSORS

A. General: Comply with UL 268, "Smoke Detectors for Fire Protective Signaling Systems." Include the following features:

1. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore normal operation.

2. Each sensor shall be scanned by the Control Unit for its type identification to prevent inadvertent substitution of another sensor type. Upon detection of a “wrong device”, the control unit shall operate with the installed device at the default alarm settings for that sensor, but shall indicate a “Wrong Device” trouble condition.

3. Addressability: Sensors include a communication transmitter and receiver in the mounting base having a unique identification and capability for status reporting to the FACP. Sensor address shall be located in base to eliminate false addressing when replacing sensors.

B. Type: Smoke sensors shall be of the photoelectric type. Where acceptable per manufacturer specifications, ionization type sensors may be used.

C. Duct Smoke Sensor: Photoelectric type, with sampling tube of design and dimensions as recommended by the manufacturer for the specific duct size and installation conditions where applied. Sensor includes relay as required for fan shutdown.

1. The Duct Housing shall provide a supervised relay driver circuit for driving up to 15 relays with a single “Form C” contact rated at 7A@ 28VDC or 10A@ 120VAC. This auxiliary relay output shall be fully programmable.

2. Compact Duct Housing shall have a transparent cover to monitor for the presence of smoke. Cover shall secure to housing by means of four (4) captive fastening screws.

3. Duct Housing shall provide two (2) Test Ports for measuring airflow and for testing. These ports will allow aerosol injection in order to test the activation of the duct smoke sensor.

4. Duct Housing shall provide a magnetic test area and Red sensor status LED.

5. Each duct sensor shall have a Remote Test Station with an alarm LED and test switch.]

2.4 HEAT SENSORS

A. Thermal Sensor: Combination fixed-temperature and rate-of-rise unit with plug-in base and alarm indication lamp; 135-deg F fixed-temperature setting except as indicated.

B. Sensor fixed temperature sensing shall be programmable to operate at 135-deg F or 155-deg F.

C. Sensor shall have the capability to be programmed as a utility monitoring device to monitor for temperature extremes in the range from 32-deg F to 155-deg F.

2.5 STANDARD ALARM-NOTIFICATION APPLIANCES

A. Visible/Only: Strobe shall be listed to UL 1971. The V/O shall consist of a xenon flash tube and associated lens/reflector system. The V/O enclosure shall mount directly to standard single gang, double gang or 4" square electrical box, without the use of special adapters or trim rings Audible/Visible: Combination Audible/Visible (A/V) Notification Appliances shall be listed to UL 1971 and UL 464. The strobe light shall consist of a xenon flash tube and associated lens/reflector system.

B. Speaker: Speaker notification appliances shall be listed to UL 1480.

1. The speaker shall operate on a standard 25VRMS or 70.7VRMS NAC using twisted/shielded wire.

2. The following taps are available: 0.25W, 0.50W, 1.0W and 2.0W. At the 1.0W tap, the speaker has minimum UL rated sound pressure level of 84dBA at 10 feet.

3. The speaker installs directly to a 4" square, 1 1/2 in. deep electrical box with 1 1/2" extension.

2.6 REMOTE CRTS AND PRINTERS

A. Fire Alarm Control Unit shall be capable of operating remote CRT's and/or printers; output shall be ASCII from an RS-232-C connection with an adjustable baud rate.

B. Each RS-232-C port shall be capable of supporting and supervising a remote Printer; the FACP shall support as many as two (2) remote CRT displays or four (4) printers. The Fire Alarm Control Panel shall support up to five (5) RS-232-C ports.

2.7 REMOTE LCD ANNUNCIATOR

A. Provide a Remote LCD Annunciator with the same "look and feel" as the FACP operator interface. The Remote LCD Annunciator shall use the same Primary Acknowledge, Silence, and Reset Keys, Status LEDs and LCD Display and the FACP.

B. Annunciator shall have super-twist LCD display with two lines of 40 characters each. Annunciator shall be provided with four (4) programmable control switches and associated LEDs.

C. Operator keys shall be key switch enabled to prevent unauthorized use. The key shall only be removable in the disabled position. Acknowledge, Silence and Reset operation shall be the same as the FACP.]

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Install system components and all associated devices in accordance with applicable NFPA Standards and manufacturer's recommendations.

B. Installation personnel shall be supervised by persons who are qualified and experienced in the installation, inspection, and testing of fire alarm systems. Examples of qualified personnel shall include, but not be limited to, the following:

1. Factory trained and certified personnel.

2. National Institute of Certification in Engineering Technologies (NICET) fire alarm level II certified personnel.

3. Personnel licensed or certified by state or local authority.

3.2 EQUIPMENT INSTALLATION

A. Furnish and install a complete Fire Alarm System as described herein and as shown on the plans. Include sufficient control unit(s), annunciator(s), manual stations, automatic fire detectors, smoke detectors, audible and visible notification appliances, wiring, terminations, electrical boxes, and all other necessary material for a complete operating system.

3.3 WIRING INSTALLATION

A. System Wiring: Wire and cable shall be a type listed for its intended use by an approval agency acceptable to the Authority Having Jurisdiction (AH and shall be installed in accordance with the appropriate articles from the current approved edition of NFPA 70: National Electric Code (NEC).

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Services: Provide services of a factory-authorized service representative to supervise the field assembly and connection of components and the pre-testing, testing, and

adjustment of the system.

B. Service personnel shall be qualified and experienced in the inspection, testing, and maintenance of fire alarm systems. Examples of qualified personnel shall be permitted to include, but shall not be limited to, individuals with the following qualifications:

1. Factory trained and certified.

2. National Institute for Certification in Engineering Technologies (NICET) fire alarm certified.

3. International Municipal Signal Association (IMSA) fire alarm certified.

4. Certified by a state or local authority.

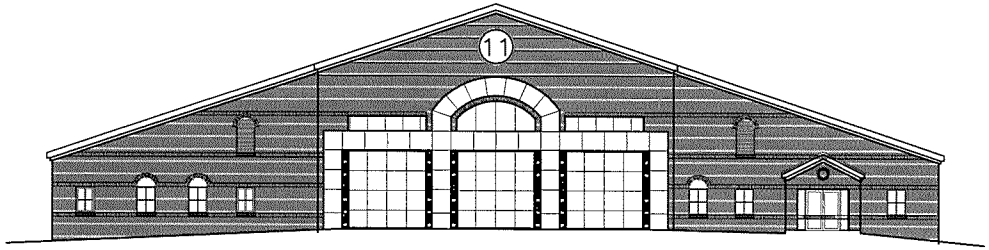
5. Trained and qualified personnel employed by an organization listed by a national testing laboratory for the servicing of fire alarm systems.

C. Minimum System Tests: Test the system according to the procedures outlined in NFPA 72.

3.5 TRAINING

A. Provide the services of a factory-authorized service representative to demonstrate the system and train Owner's maintenance personnel.

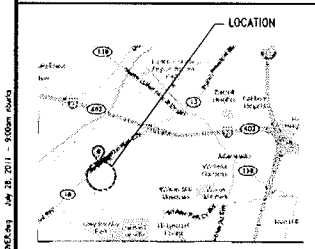
END OF SECTION 16721



Fulton County Fire Department
FIRE STATION # 11

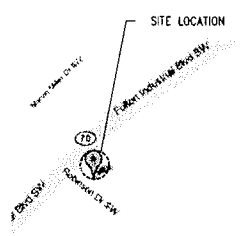
4760 Fulton Industrial Boulevard
ATLANTA, GEORGIA 30336

VICINITY MAPS



COUNTY AREA

NORTH

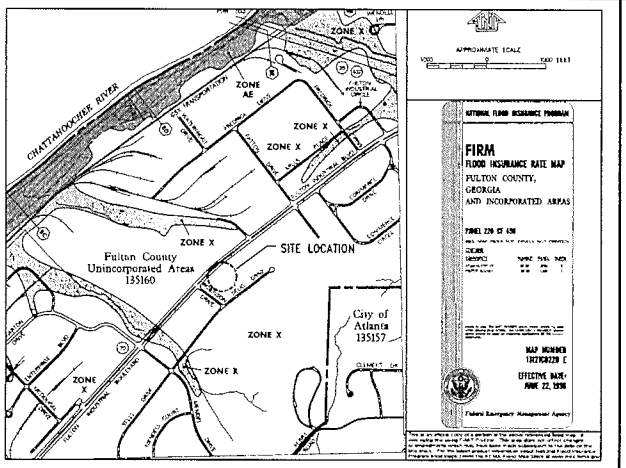


LOCAL AREA

NORTH

LAND LOT 57, 14TH FF DISTRICT

FLOOD INSURANCE RATE MAP



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STATE OF GEORGIA
CHARLES W. RAINE
NO. 14,151
REGISTERED ARCHITECT

SHEET INDEX:

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DR	
CHK	
APVD	

NO.	DATE	REVISION	BY	APVD

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VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

Fulton County Fire Department
FIRE STATION No. 11
4760 Fulton Industrial Blvd.
Atlanta, Georgia 30336

GENERAL

COVER SHEET

SHEET	1 OF 69
DWG NO.	G1.0
DATE	JULY 15, 2011
PROJ NO.	10ATL02-55

RELEASED FOR BID

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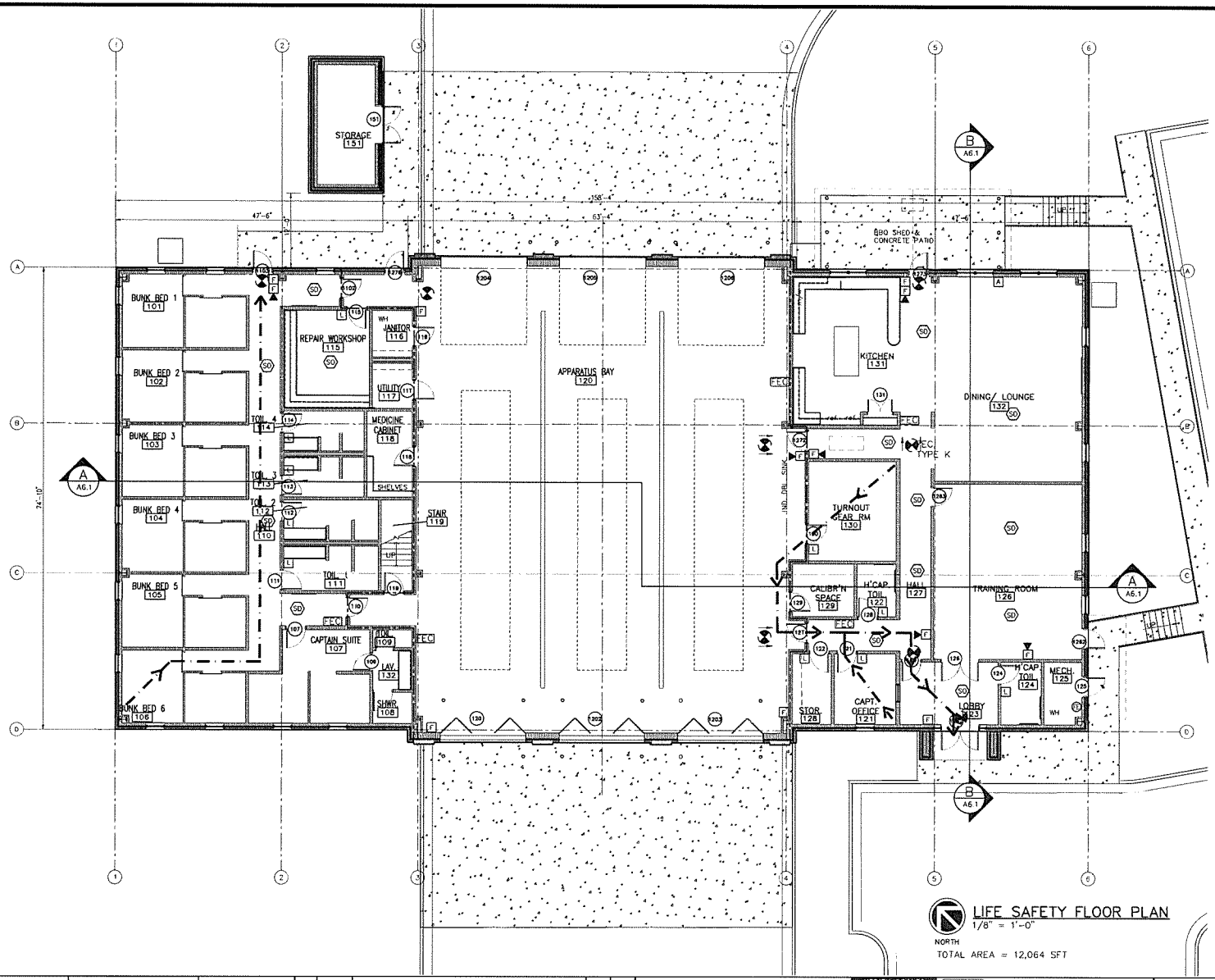

LEGEND

- EXIT PATH
- EXIT SIGN DIRECTION OF EXIT
- 1-HOUR RATED WALL
- SMOKE WALL
- FIRE EXTINGUISHER
- EMERGENCY STATION
- FIRE PULL STATION, CONVENTIONAL TYPE
- PHOTOELECTRIC SMOKE DETECTOR, CONVENTIONAL TYPE
- HORN/STROBE, SOUND & LIGHT LEVEL AS REQUIRED
- PHOTOELECTRIC DUCT SMOKE DETECTOR, CONVENTIONAL TYPE
- FACP FIRE ALARM CONTROL PANEL
- FAAP FIRE ALARM ANNUNCIATOR PANEL
- STROBE, LIGHT LEVEL AS REQUIRED
- HORN, SOUND LEVEL AS REQUIRED
- DC SECURITY ALARM DOOR CONTACT
- M SECURITY ALARM MOTION DETECTOR
- FEC FIRE EXTINGUISHER CABINET
- FE FIRE EXTINGUISHER

LIFE SAFETY FLOOR PLAN

1/8" = 1'-0"

NORTH

TOTAL AREA = 12,064 SFT

STATE OF GEORGIA — CHARLES W. RAINE — NO. 025 — REGISTERED ARCHITECT

KHAFRA ENGINEERING CONSULTANTS, INC.
225 PEACHTREE STREET, SUITE 1600
ATLANTA, GEORGIA 30303
404-525-2120 FAX 404-522-7441

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DR	RKGA
CHK	JTRY
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Fulton County Fire Department
FIRE STATION No. 11
4760 Fulton Industrial Blvd.
Atlanta, Georgia 30336

GENERAL

LIFE SAFETY PLAN

SHEET 2 OF 69
DWG NO. G2.0
DATE JULY 15, 2011
PROJ NO. 10ATL02-55

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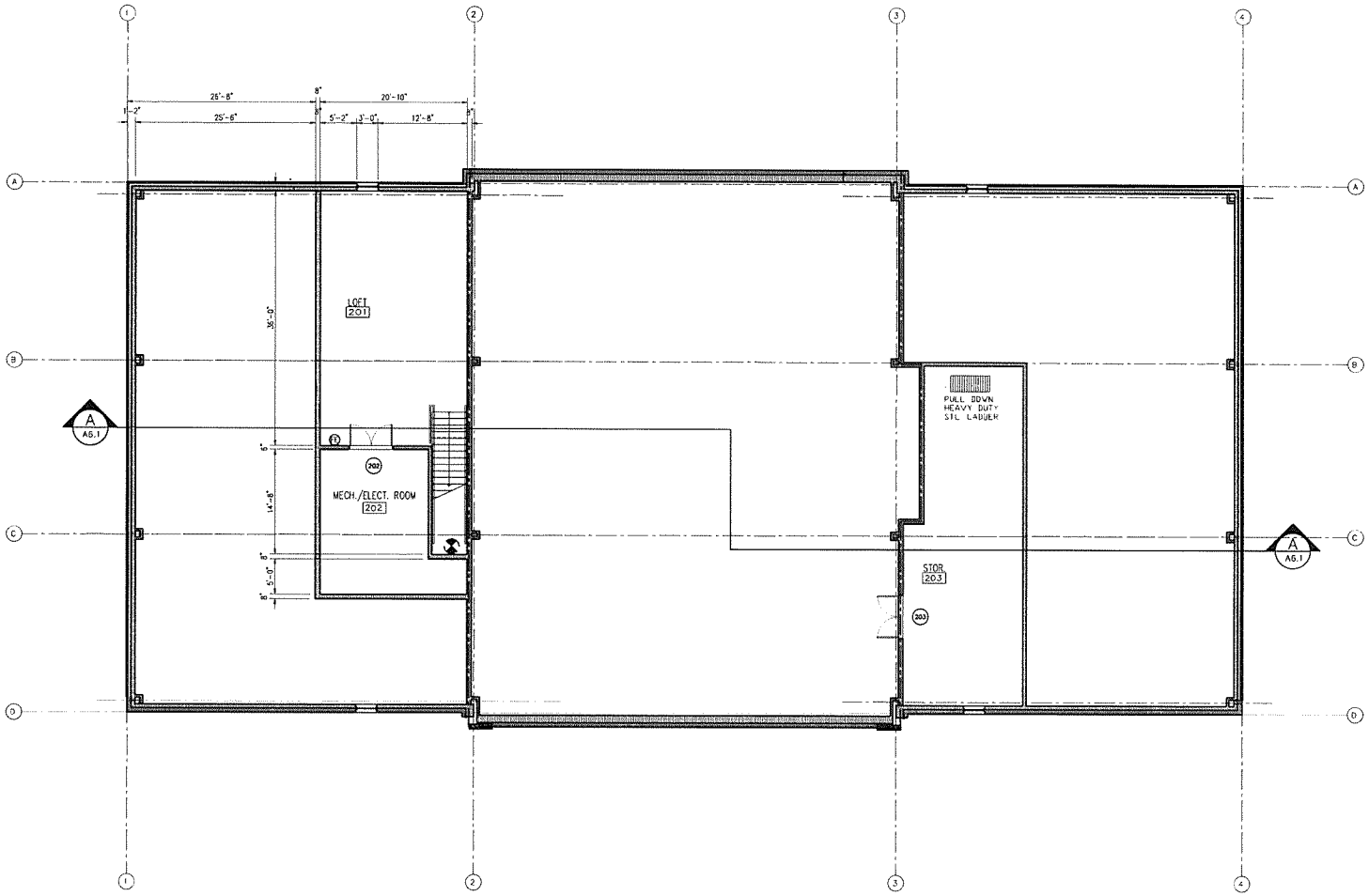

LEGEND

- EXIT PATH
- EXIT SIGN DIRECTION OF EXIT
- 1-HOUR RATED WALL
- SMOKE WALL
- FE — FIRE EXTINGUISHER
- EM — EMERGENCY STATION
- F — FIRE PULL STATION, CONVENTIONAL TYPE
- SD — PHOTOELECTRIC SMOKE DETECTOR, CONVENTIONAL TYPE
- F — HORN/STROBE, SOUND & LIGHT LEVEL AS REQUIRED
- DD — PHOTOELECTRIC DUCT SMOKE DETECTOR, CONVENTIONAL TYPE.
- FACP — FIRE ALARM CONTROL PANEL
- FAAP — FIRE ALARM ANNUNCIATOR PANEL.
- F — STROBE, LIGHT LEVEL AS REQUIRED
- F — HORN, SOUND LEVEL AS REQUIRED
- DC — SECURITY ALARM DOOR CONTACT
- M — SECURITY ALARM MOTION DETECTOR
- FEC — FIRE EXTINGUISHER CABINET
- FE — FIRE EXTINGUISHER

NORTH

LIFE SAFETY LOFT PLAN
1/8" = 1'-0"

STATE OF GEORGIA
CHARLES W. RAINE
CERTIFICATE NO. 5363
REGISTERED ARCHITECT

KHAFRA ENGINEERING CONSULTANTS, INC.
225 PEACHTREE STREET, SUITE 1600
ATLANTA, GEORGIA 30303
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APVD	XXXX

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Fulton County Fire Department
FIRE STATION No. 11
4760 Fulton Industrial Blvd.
Atlanta, Georgia 30336

GENERAL

LIFE SAFETY LOFT PLAN

SHEET 3 OF 69
DWG NO. G2.1
DATE JULY 15, 2011
PROJ NO. 10ATL02-S5

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GENERAL ABBREVIATIONS:

ASPH	ASPHALT DRIVEWAY
ARV	AIR RELEASE VALVE
BV	BUTTERFLY VALVE
BSIGN	BUSINESS SIGN
CL	CENTERLINE
CMP	CORRUGATED METAL PIPE
CONC	CONCRETE DRIVEWAY
DIP	DUCTILE IRON PIPE
E/S	EACH SIDE
ELM	ELM TREE
EMO	ELECTRIC MOTOR OPERATOR
EOC	EDGE OF CONCRETE
FH	FIRE HYDRANT
G	GAS LINE
GM	GAS METER
GV	GATE VALVE
GRAV	GRAVEL DRIVEWAY
LF	LINEAR FOOT
LP	LIGHT POLE
MB	MAILBOX
MCI	CABLE
OAK	OAK TREE
OH	OVERHEAD
PINE	PINE TREE
POWER	BURIED POWER
RCP	REINFORCED CONCRETE PIPE
R.J.	RESTRAINED JOINT
R/W	RIGHT OF WAY
SF	SQUARE FOOT
SMH	SANITARY MANHOLE
STA	STATION
VERT	VERTICAL
WM	WATER METER, WATER MAIN
WV	WATER VALVE
W	WATER

SURVEY FOR FULTON COUNTY FIRE DEPARTMENT FIRE STATION #11 WAS PERFORMED BY:

B&E JACKSON
230 PEACHTREE STREET
SUITE 1800
ATLANTA, GA. 30303
PHONE: (404) 577-4914
FAX: (404) 577-4419

USGS MAP
MABLETON QUADRANGLE

LEGEND

EXISTING		NEW
PMH	POWER MANHOLE	
SGMH	SIGNAL MANHOLE	
WV	WATER VALVE	
WM	WATER METER	
SS	SANITARY SEWER MANHOLE	
	DROP INLET	
	CATCH BASIN	
	TRAFFIC SIGN	
	POWER POLE	
	GUY WIRE	
	WEIR INLET	
	HEADWALL	
	LIGHT POLE	
	MAIL BOX	
OB-12	TEMPORARY SURVEY CONTROL	
	CURB AND GUTTER	
	HEADER CURB	
	EDGE OF PAVEMENT	
	GUARDRAIL	
R/W	RIGHT OF WAY	
	LAND LOT LINE	

FULTON COUNTY MONUMENT DESCRIPTION

F 356 GPS
LATITUDE: 334500N, LONGITUDE: 0843305W, ELEVATION: 254.4M FULTON COUNTY
N1367495.008, E2182698.467, ELEVATION 838.187

STATION IS EXISTING FULTON COUNTY SURVEY MONUMENT STAMPED -APRT04- LOCATED IN SOUTHERN FULTON COUNTY, GEORGIA, 0.5 MI (0.80 KM) NORTH OF UTOY BOULDER PARK AND ABOUT 2 MI (3.22 KM) SOUTHWEST OF ADAMSVILLE.

TO REACH STATION FROM INTERSECTION OF INTERSTATE HIGHWAY 20 WEST AND GA HIGHWAY 70 EXIT 14 (FULTON INDUSTRIAL BOULEVARD), GO SOUTHWEST ON GA HIGHWAY 70 FOR 1.0 MI TO STATION IN CENTER OF MEDIAN OF HIGHWAY 70. STATION ENCASED IN PROTECTIVE BOX WITH ACCESS COVER FLUSH WITH GROUND.

STATION IS 8.8 FT (2.68 M) SOUTHEAST OF BACK CURB SOUTHBOUND GA HIGHWAY 70, 9.7 FT (2.96 M) NORTHWEST OF BACK CURB NORTHBOUND GA HIGHWAY 70, 1 FT (0.30 N) NORTHWEST OF A WITNESS POST.

F 456 AZIMUTH MARK
Latitude: 334500N, Longitude: 0843300W, Elevation: 254M FULTON COUNTY
N1365924.905, e2181152.449, Elevation 818.568

MARK IS AZIMUTH MARK FOR GPS STATION F 356 LOCATED IN SOUTHERN FULTON COUNTY, GEORGIA, ABOUT 0.5 MI (0.80 KM) NORTH OF UTOY BOULDER PARK, AND ABOUT 2 MI (3.22 KM) SOUTHWEST OF ADAMSVILLE.

TO REACH MARK FROM INTERSECTION OF INTERSTATE HIGHWAY 20 WEST AND GA HIGHWAY 70 EXIT 14 (FULTON INDUSTRIAL BOULEVARD), GO SOUTHWEST ON GA HIGHWAY 70 FOR 0.5 MI (0.80 KM) TO MARK IN CENTER OF MEDIAN IN FRONT OF WCI CONSUMER PARTS AND SERVICE CO. MARK ENCASED IN PROTECTIVE BOX WITH ACCESS COVER FLUSH WITH GROUND.

MARK IS 7.7 FT (2.35 M) SOUTHEAST OF BACK OF CURB SOUTHBOUND GA HIGHWAY 70, 8.4 FT (2.56 M) NORTHWEST OF BACK OF CURB NORTHBOUND GA HIGHWAY 70, 1.3 FT (0.40 M) NORTHWEST OF A WITNESS POST.

F 458 AZIMUTH MARK
LATITUDE: 334400N, LONGITUDE: 0843200W, ELEVATION: 260M, FULTON COUNTY
N1358247.995, E2182175.542, ELEVATION 835.146

MARK IS AZIMUTH MARK FOR GPS STATION F 358 LOCATED IN SOUTHERN FULTON COUNTY, GEORGIA, 2.5 MI (4.02 KM) NORTHWEST OF INTERSECTION OF INTERSTATE HIGHWAY 285 AND STATE ROAD 154, 2.5 MI (4.02 KM) SOUTHEAST OF INTERSECTION OF COBB, DOUGLAS, FULTON COUNTY LINES.

TO REACH MARK FROM INTERSECTION OF CASCADE ROAD (S.R. 154) AND NEW HOPE ROAD, GO WEST ON STATE ROUTE 154 FOR 0.11 MI (0.18 KM) TO MARK ON LEFT OR SOUTH SIDE OF ROAD. MARK IS ENCASED IN PROTECTIVE BOX WITH ACCESS COVER FLUSH WITH GROUND, 1.8 FT (0.55 M) NORTH OF A WITNESS POST.

UTILITIES-NOTE OF CAUTION:

ONLY UTILITY SURFACE FEATURES SHOWN IN THESE PLANS HAVE BEEN FIELD LOCATED. THE LOCATION OF UNDERGROUND UTILITIES SHOWN HEREIN COMES FROM SOURCES WHICH MAY NOT BE RELIABLE AND ALL UNDERGROUND UTILITIES WHICH EXIST WITHIN THE PROJECT AREA MAY NOT HAVE BEEN SHOWN. THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING ALL UNDERGROUND UTILITIES WITHIN THE AREA OF THE PROJECT SITE PRIOR TO CONSTRUCTION ACTIVITIES AND SHALL BE RESPONSIBLE FOR THE COST OF LOSS OF SERVICES AND REPAIRS FOR ANY UTILITY DAMAGE CAUSED DURING CONSTRUCTION. THE CONTRACTOR SHALL REQUEST UTILITY STAKING THROUGH THE UTILITY PROTECTION CENTER AT (770) 623-4332, FAX (770) 623-1847, BEEPER (770) 629-0567, AND MOBILE (404) 375-6206.

WASTEWATER SYSTEM NOTES:

1. ALL WASTEWATER PIPE CONSTRUCTION SHOWN ON THESE PLANS MUST CONFORM TO FULTON COUNTY'S STANDARDS AND SPECIFICATIONS INCLUDING THE SANITARY SEWER REGULATION.
2. AS-BUILT DRAWINGS AND MAINTENANCE BOND(S) MUST BE SUBMITTED PRIOR TO INSPECTION AND ACCEPTANCE.
3. NEOPRENE COUPLINGS WITH STAINLESS STEEL BANDS AND SHEAR RINGS ARE REQUIRED FOR JOINING DIFFERENT TYPES OF SANITARY SEWER PIPES.
4. LOW PRESSURE AIR TESTING IS REQUIRED FOR ALL WASTEWATER PIPE SYSTEMS. THIS TEST MUST MEET ALL REQUIREMENTS AS OUTLINED IN ASTM C-828-80 OR CURRENT REVISION. A FULTON COUNTY INSPECTOR MUST BE PRESENT DURING TESTING.
5. COMPACTION OF BACKFILL MATERIAL OF ALL TRENCHES SHALL BE COMPACTED TO 95% OF THE STANDARD PROCTOR DENSITY. BACKFILL MATERIAL SHALL BE FREE FROM ROOTS, STUMPS, OR OTHER FOREIGN DEBRIS, AND SHALL BE PLACED AT OR NEAR OPTIMUM MOISTURE. CORRECTION OF ANY TRENCH SETTLEMENT WITHIN A YEAR FROM THE DATE OF APPROVAL WILL BE THE RESPONSIBILITY OF THE CONTRACTOR.
6. CONTRACTOR SHALL FIELD VERIFY LOCATION AND INVERT OF WASTEWATER PIPES FOR CONNECTION TO EXISTING WASTEWATER SYSTEMS.
7. EIGHT INCH (8-IH) OR LARGER PIPE LINES SHALL BE TV INSPECTED. A VHS TAPE OR CD AND WRITTEN INSPECTION LOG CERTIFIED BY A GEORGIA REGISTERED ENGINEER SHALL BE PROVIDED WHEN AS-BUILT DRAWINGS ARE SUBMITTED.
8. ALL WASTEWATER PIPE IN THIS PROJECT SHALL BE DUCTILE IRON PIPE (DIP).
9. POOLS SHALL NOT DRAIN INTO WASTEWATER PIPE SYSTEMS.
10. FOR ALL PROJECTS UTILIZING INDIVIDUAL ONSITE WASTE WATER SYSTEMS DESIGN AND PROVISIONS SHALL BE IN CONFORMANCE WITH FULTON COUNTY HEALTH DEPARTMENT REGULATIONS.
11. MAXIMUM DISTANCE BETWEEN MANHOLES IS 400 FEET.
12. USF 7635 SEWER VALVE BOX AND COVER REQUIRED FOR CLEANOUTS IN PAVED AREAS.
13. SANITARY SEWER LATERALS SHOULD BE MARKED WITH 4"X4" POST WITH MIN. 4' ABOVE GROUND. THE TOP 1' SHOULD BE PAINTED GREEN. EACH LATERAL IS TO BE BROUGHT TO THE GROUND SURFACE IN ACCORDANCE WITH FC STANDARD 909.
14. NOTIFY INSPECTOR 24-HOURS PRIOR TO CONSTRUCTION.

GENERAL NOTES:

1. ALL PIPING WITHIN THE PUBLIC RIGHT-OF-WAY SHALL BE INSTALLED USING OPEN CUT UNLESS NOTED OTHERWISE.
2. USE FULTON COUNTY STANDARD DETAILS AND SPECIFICATIONS.
3. AS-BUILT DRAWINGS ARE TO BE APPROVED BY COUNTY INSPECTOR. ALL APPLICABLE BONDS REQUIRED PRIOR TO ACCEPTANCE.
4. FIELD SURVEY WAS CONDUCTED BY B&E JACKSON IN MARCH 2011. OTHER INFORMATION WAS BASED ON FULTON COUNTY GIS AND AS-BUILT RECORDS.
5. THE CONTRACTOR SHALL PROVIDE, AND MAINTAIN THROUGHOUT CONSTRUCTION, OFF-STREET PARKING FOR ITS CREW AS WELL AS FOR COUNTY REPRESENTATIVES.
6. ALL FILL AREAS MUST BE COMPACTED TO MINIMUM 95% STANDARD PROCTOR. A REPORT FROM A GEOTECHNICAL ENGINEER MAY BE REQUIRED BY THE INSPECTOR FOR ALL FILL AREAS WITHIN THE RIGHT-OF-WAY.
7. SILT BARRIERS ARE TO BE PLACED AS SHOWN AND/OR AS DIRECTED BY THE PROJECT ENGINEER AND/OR INSPECTOR.
8. WATER SERVICE FOR THIS AREA IS BEING PROVIDED BY FULTON COUNTY.
9. UPON REQUEST FROM ANY AGENT OR THE DIRECTOR OF ENVIRONMENT AND COMMUNITY DEVELOPMENT: A WRITTEN BI-WEEKLY REPORT SHALL BE SUBMITTED TO THE ASSISTANT DIRECTOR OF ENVIRONMENT AND COMMUNITY DEVELOPMENT, FROM THE COMMENCEMENT OF THE PROJECT, TO THE COMPLETION OF AND CONSTRUCTION. THIS REPORT SHALL BE THE RESPONSIBILITY OF THE OWNER OR DEVELOPER AND SHALL BE PREPARED BY A REGISTERED ENGINEER. THE REPORT SHALL INDICATE THE PROGRESS OF THE WORK, AND THE EFFECTIVENESS OF THE EROSION CONTROL DEVICES. (NOTE: FAILURE TO SUBMIT THIS REPORT SHALL BE CONSIDERED A VIOLATION OF THE CONDITIONS OF THE PERMIT.)
10. CONTRACTOR SHALL LOCATE ALL EXISTING UTILITIES PRIOR TO CONSTRUCTION. LOCATION OF EXISTING UTILITIES SHOWN ON THE DRAWINGS ARE ONLY APPROXIMATE. CONTRACTOR SHALL VERIFY EXACT LOCATIONS.

LANDSCAPE AND TREE PROTECTION NOTES:

1. PROVISIONS FOR THE PROTECTION ON THE SITE SHALL BE, AS A MINIMUM, IN CONFORMANCE WITH THE REQUIREMENTS OF THE LATEST EDITION OF THE FULTON COUNTY TREE PRESERVATION ORDINANCE AND ADMINISTRATIVE GUIDELINES PERTAINING TO TREE PROTECTION.
2. CONTACT THE DEPARTMENT OF ENVIRONMENT AND COMMUNITY DEVELOPMENT AT (404) 730-7531 OR 7532 TO ARRANGE A PRE-CONSTRUCTION MEETING WITH THE COUNTY ARBORIST PRIOR TO ANY LAND DISTURBANCE.
3. ALL TREE PROTECTION MEASURES SHALL BE INSTALLED PRIOR TO GRADING.
4. UNDISTURBED BUFFERS SHALL BE REPLANTED TO BUFFER STANDARDS WHERE SPARSELY VEGETATED OR WHERE DISTURBED AT APPROVED UTILITY CROSSINGS. REPLANTING IS SUBJECT TO COUNTY ARBORIST APPROVAL.

NOTE TO THE CONTRACTOR AND PUBLIC WORKS INSPECTOR:

SOME NOTES INCLUDED HEREIN ARE PROVIDED FOR PERMITTING PURPOSES AS REQUIRED BY THE DEPARTMENT OF ENVIRONMENT AND COMMUNITY DEVELOPMENT (DECD). ITEMS THAT DO NOT APPLY TO THIS PROJECT ARE PROVIDED FOR INFORMATIONAL USE ONLY. ANY DISCREPANCY BETWEEN THE ABOVE NOTES AND THE CONTRACT DOCUMENTS SHALL BE REFERRED TO THE ENGINEER FOR CLARIFICATION.

GEORGIA REGISTERED No. 33285 PROFESSIONAL ENGINEER MERIDETH K. POOLE

GSWCC NO. 37897

KHAFRA ENGINEERING CONSULTANTS, INC.
225 PEACHTREE STREET, SUITE 1600
ATLANTA, GEORGIA 30303
404-525-2120 FAX 404-522-7941

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DR	MKPL/RWYC
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APVD	VTBS

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FULTON COUNTY

Fulton County Fire Department
FIRE STATION No. 11
4760 Fulton Industrial Blvd.
Atlanta, Georgia 30336

CIVIL
NOTES ABBREVIATIONS & LEGENDS

SHEET	4 OF 69
DWG NO.	C0.1
DATE	JULY 15, 2011
PROJ NO.	10ATL02-55

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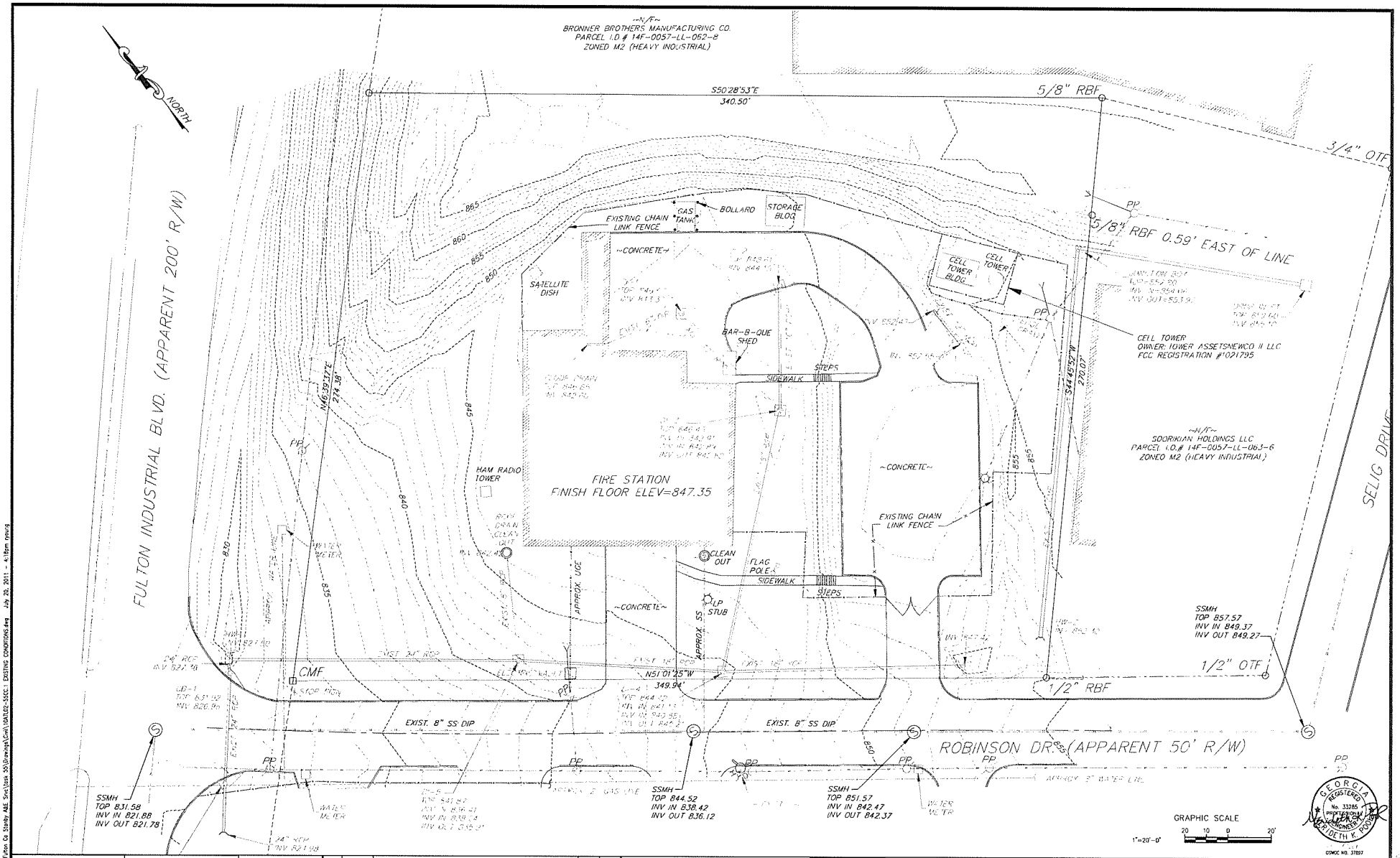

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ATLANTA, GEORGIA 30303
404-525-2120 FAX 404-522-7941

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Atlanta, Georgia 30336

CIVIL

EXISTING CONDITIONS

GEORGIA REGISTERED PROFESSIONAL ENGINEER No. 33285 MEREDETH K. POOLE

GSWCC NO. 37897

SHEET	5 OF 69
DWG NO.	C1.1
DATE	JULY 15, 2011
PROJ NO.	10ATL02-55

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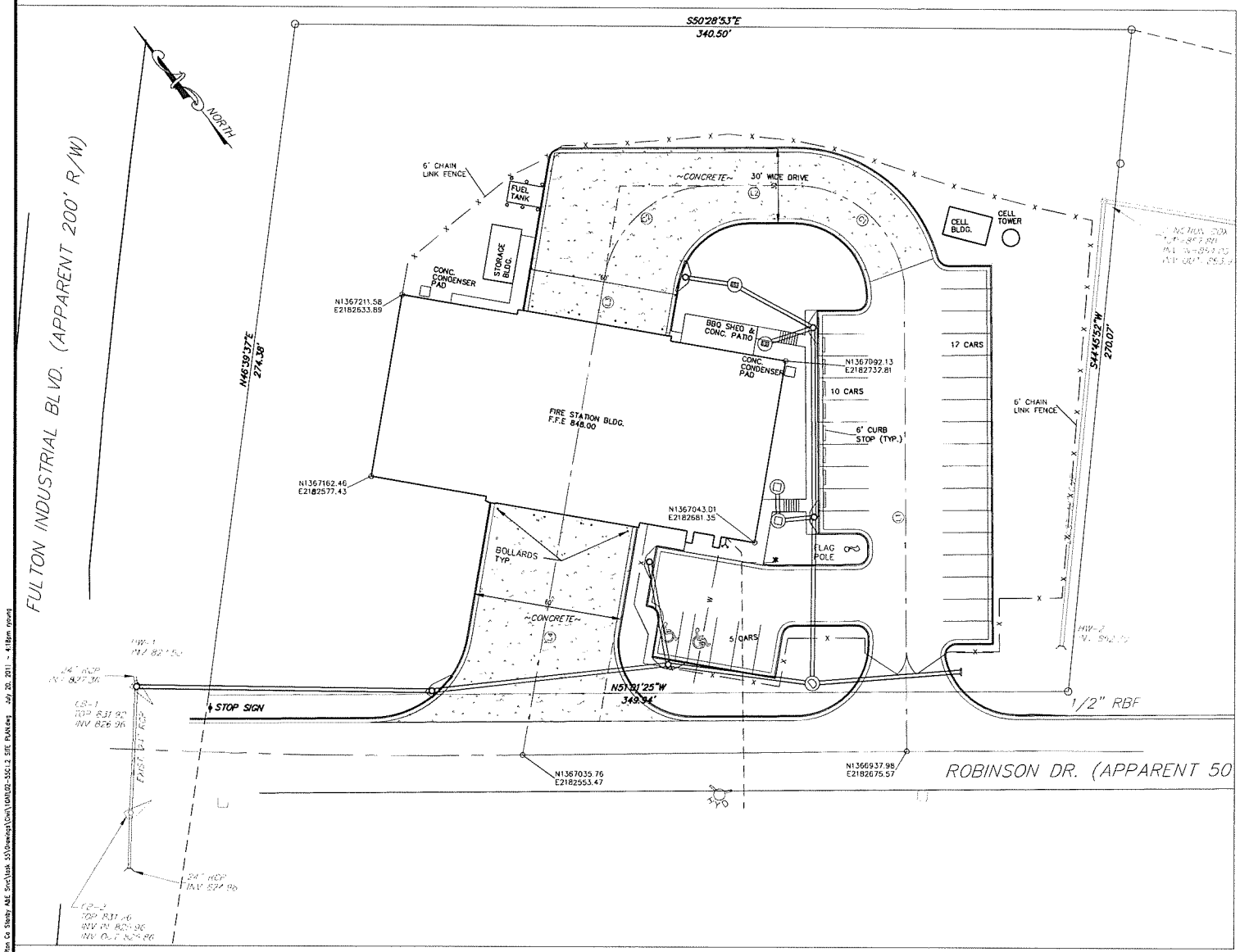

Curve Table: Alignments					
Curve #	Radius	Length	Chord Direction	Start Point	End Point
C1	45.00	65.41	N9° 23' 13.78"W	(2182795.28,1367085.95)	(2182785.53,1367144.95)
C2	45.00	62.83	S88° 58' 34.83"W	(2187759.70,1367165.84)	(2182731.86,1367164.81)

Line Table: Alignments				
Line #	Length	Direction	Start Point	End Point
L1	190.33	N38° 58' 34.83"E	(2182675.57,1366937.98)	(2182795.28,1367085.95)
L2	33.23	N51° 01' 25.17"W	(2182785.53,1367144.95)	(2182759.70,1367165.84)
L3	18.62	S48° 58' 34.83"W	(2182701.86,1367164.81)	(2182687.81,1367152.59)
L4	99.28	S48° 59' 53.97"W	(2182628.40,1367100.90)	(2182553.47,1367035.76)

GRAPHIC SCALE
1"=20'-0"
20 10 0 20'

GEORGIA REGISTERED PROFESSIONAL ENGINEER No. 33285 GRIDETH K. POOLE
CONOC NO. 37697

KHAFRA ENGINEERING CONSULTANTS, INC.
225 PEACHTREE STREET, SUITE 1600
ATLANTA, GEORGIA 30303
404-525-2120 FAX 404-522-7844

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Atlanta, Georgia 30336

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SITE PLAN

SHEET 6 OF 69
DWG NO. C1.2
DATE JULY 15, 2011
PROJ NO. 10ATL02-55

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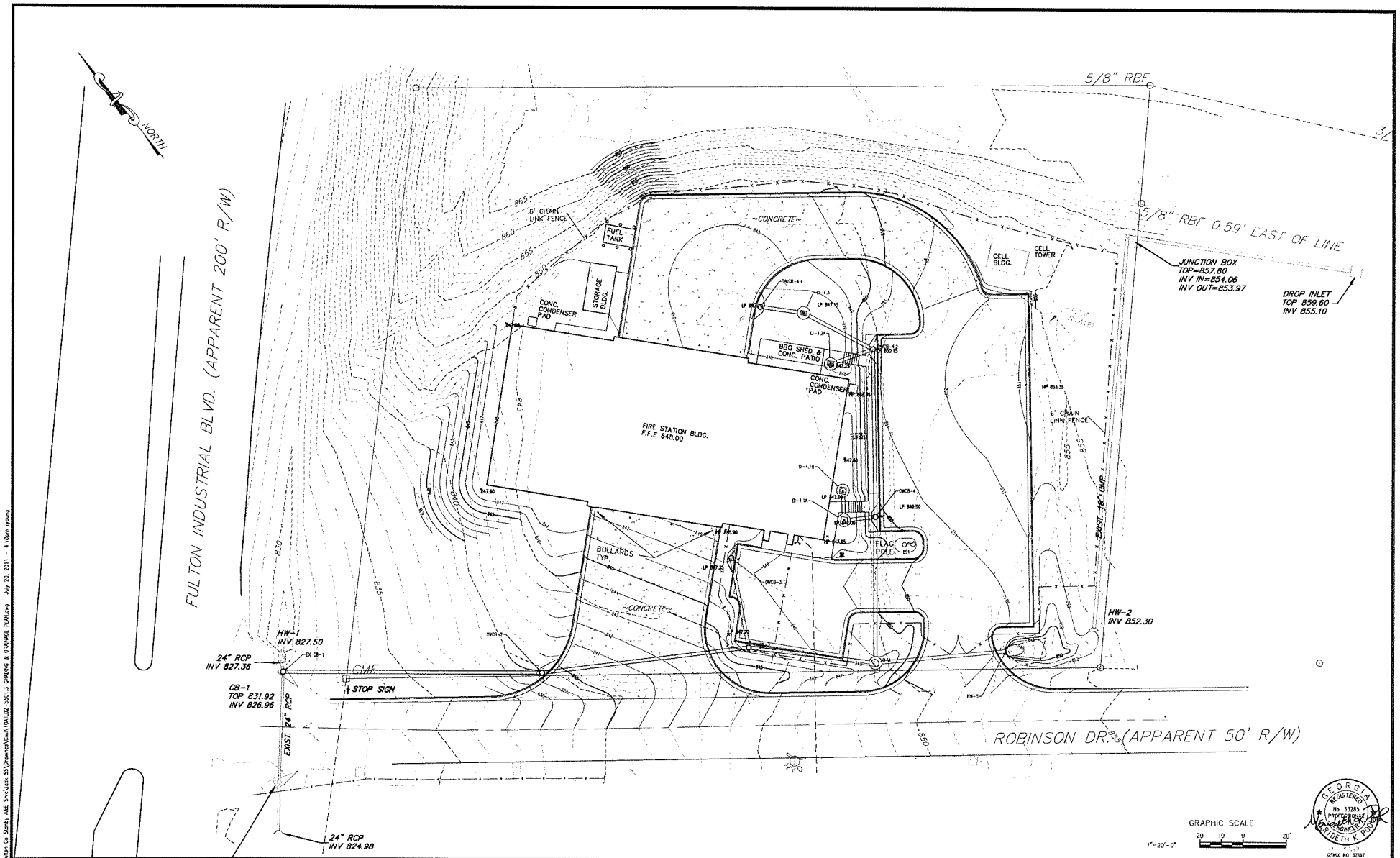

GEORGIA REGISTERED No. 33285 PROFESSIONAL ENGINEER MEREDETH K. PORTER

GCWCC NO. 37897

KHAFRA ENGINEERING CONSULTANTS, INC. 275 PEACHTREE STREET, SUITE 1600 ATLANTA, GEORGIA 30303 404-525-2170 FAX 404-522-7941	DSGN MKPL				
	DR MKPL/RWYG				
	CHK KEFR				
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FIRE STATION No. 11
4760 Fulton Industrial Blvd.
Atlanta, Georgia 30336

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GRADING & DRAINAGE PLAN

SHEET	7 OF 69
DWG NO.	C1.3
DATE	JULY 15, 2011
PROJ NO.	10ATL02-55

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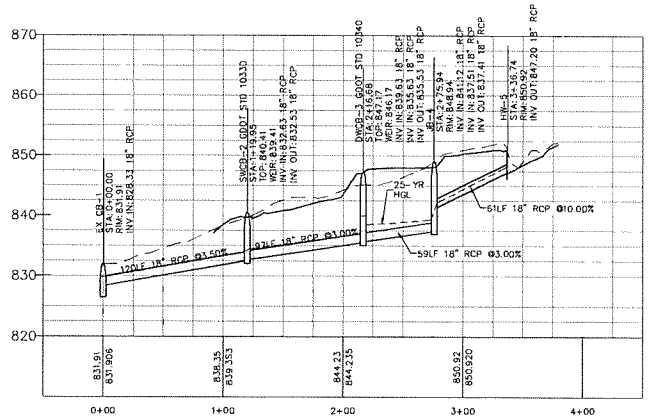
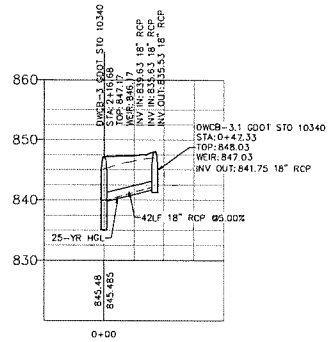
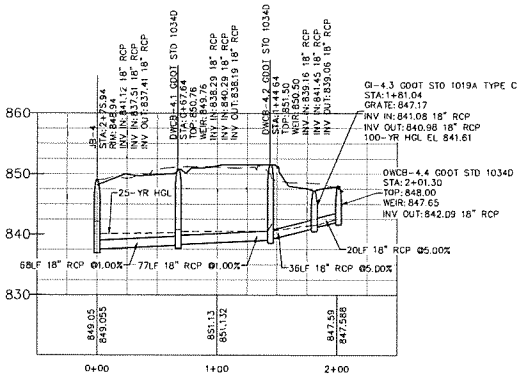


Storm Line A PROFILE



Storm Line A-3 PROFILE



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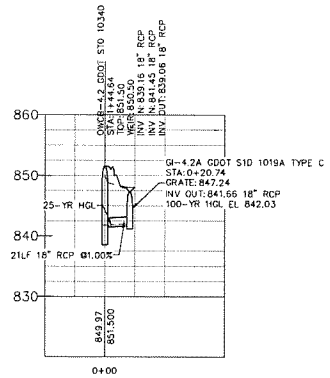

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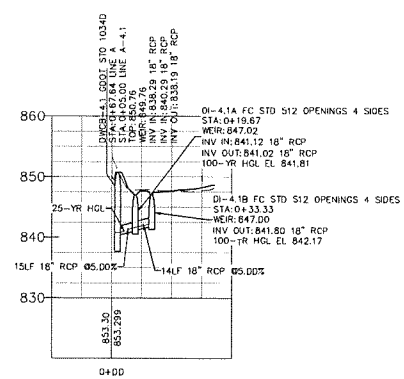

Storm Line A-4.1 PROFILE

GEORGIA REGISTERED No. 33285 PROFESSIONAL ENGINEER MEREDETH K. POOLE

GDWCC NO. 37897

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235 PEACHTREE STREET, SUITE 1600
ATLANTA, GEORGIA 30303
404-525-2120 FAX 404-522-7941

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Fulton County Fire Department
FIRE STATION No. 11
4760 Fulton Industrial Blvd.
Atlanta, Georgia 30336

CIVIL
STORM DRAINAGE PROFILES

SHEET	8 OF 69
DWG NO.	C1.4
DATE	JULY 15, 2011
PROJ NO.	10ATL02-55

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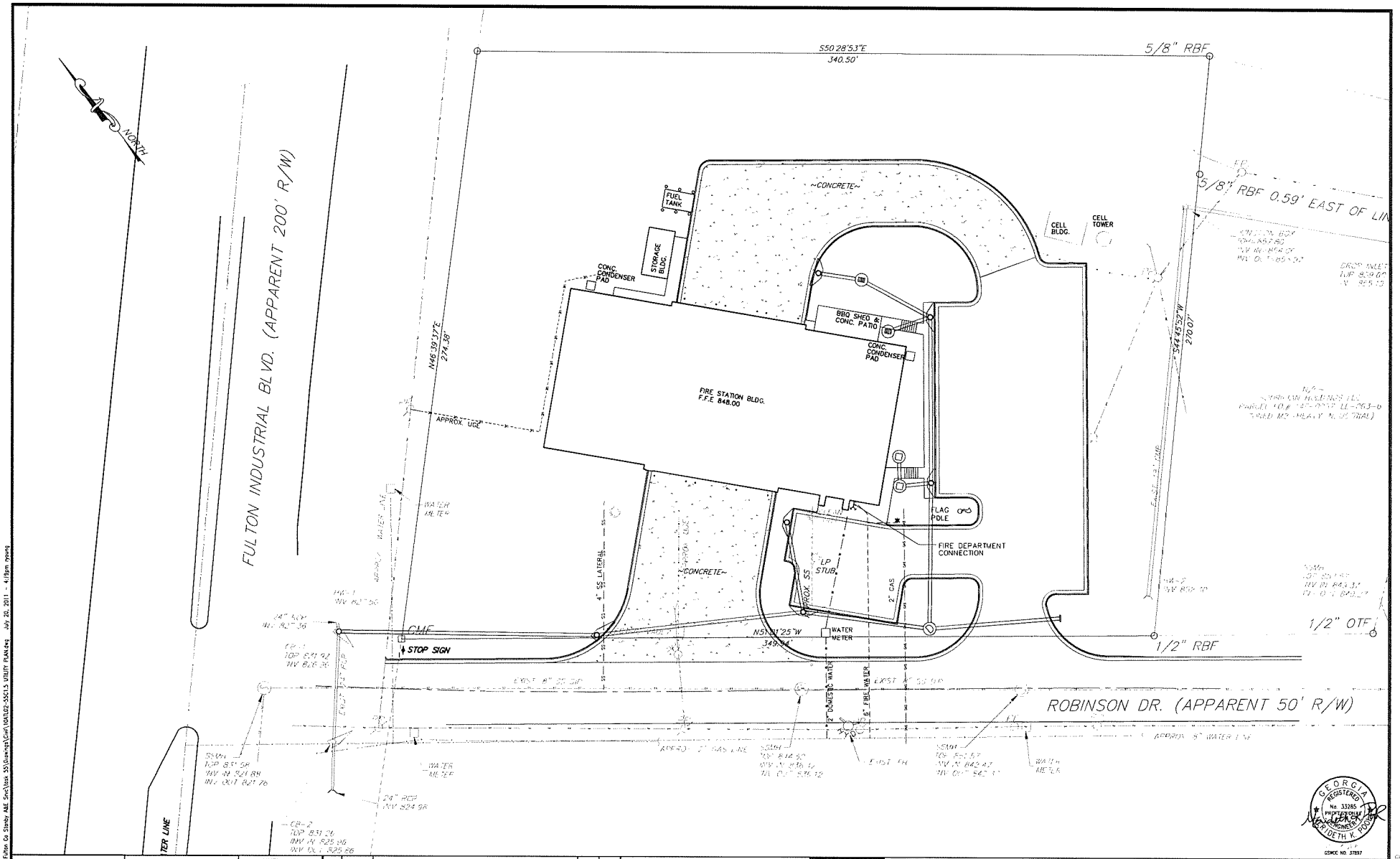

GEORGIA REGISTERED No. 33285 PROFESSIONAL ENGINEER KEITH K. KEFER

GSWCC NO. 37897

KHAFRA ENGINEERING CONSULTANTS, INC. 225 PEACHTREE STREET, SUITE 1600 ATLANTA, GEORGIA 30303 404-525-2120 FAX 404-522-7944	DSGN MKPL				
	DR MKPL				
	CHK KEFR				
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Atlanta, Georgia 30336

CIVIL

UTILITY PLAN

SHEET	9 OF 69
DWG NO.	C1.5
DATE	JULY 15, 2011
PROJ NO.	10ATL02-55

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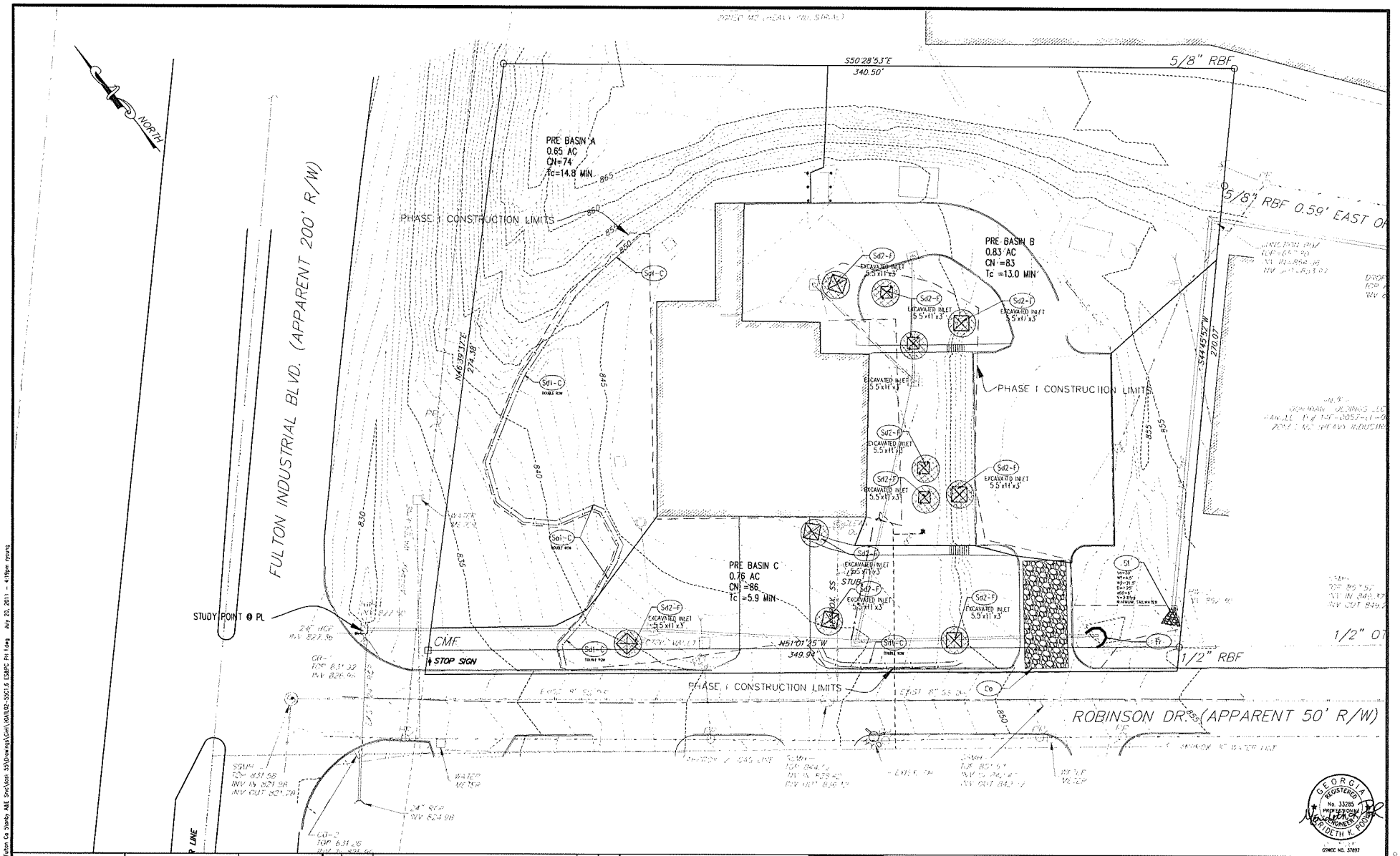

KHAFRA ENGINEERING CONSULTANTS, INC. 225 PEACHTREE STREET, SUITE 1600 ATLANTA, GEORGIA 30303 404-525-2120 FAX 404-522-7941	DSGN MKPL				
	DR MKPL/RWYG				
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FULTON COUNTY

Fulton County Fire Department
FIRE STATION No. 11
4760 Fulton Industrial Blvd.
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CIVIL
EROSION, SEDIMENTATION AND POLLUTION CONTROL PLAN, PHASE I

GEORGIA REGISTERED No. 33285 PROFESSIONAL ENGINEER MEREDETH K. ROBERTS
GSPEC NO. 37897

SHEET	10 OF 69
DWG NO.	C1.6
DATE	JULY 15, 2011
PROJ NO.	10ATL02-55

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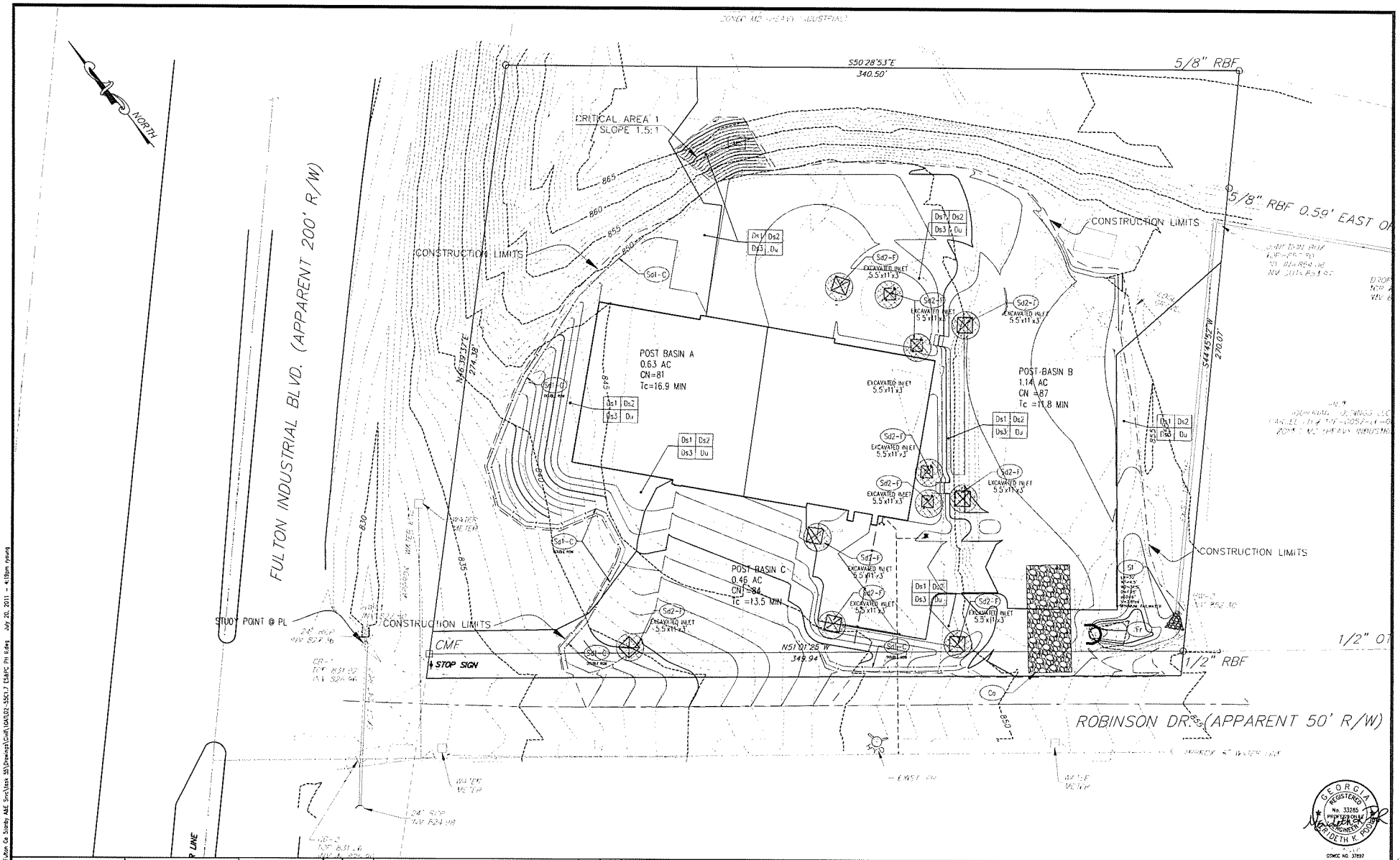

KHAFRA ENGINEERING CONSULTANTS, INC
225 PEACHWILL STREET, SUITE 1600
ATLANTA, GEORGIA 30303
404-525-2120 FAX 404-522-7941

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FIRE STATION No. 11
4760 Fulton Industrial Blvd.
Atlanta, Georgia 30336

CIVIL
EROSION, SEDIMENTATION AND POLLUTION CONTROL PLAN, PHASE II

SHEET	11 OF 69
DWG NO.	C1.7
DATE	JULY 15, 2011
PROJ NO.	10ATL02-55

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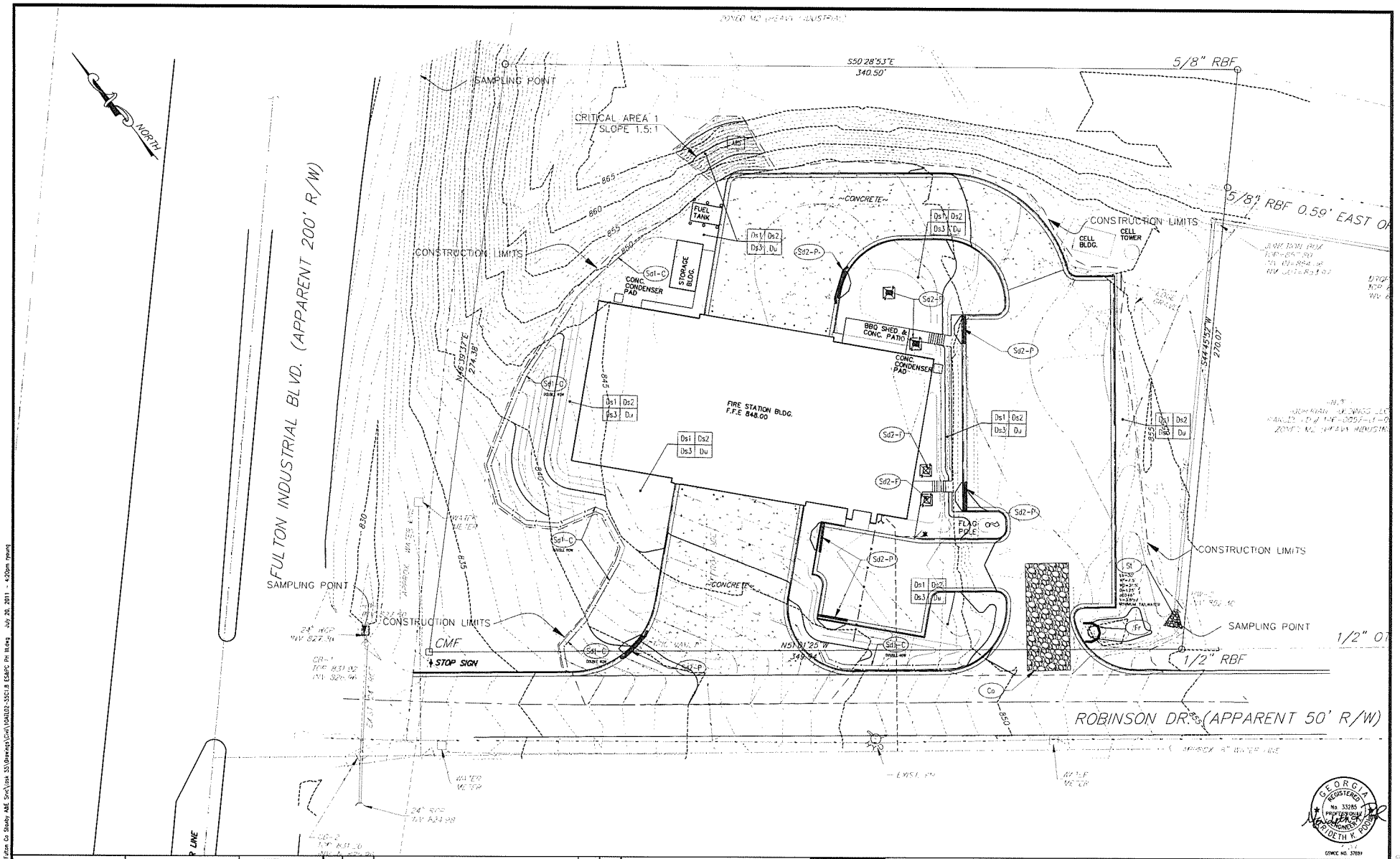

KHAFRA ENGINEERING CONSULTANTS, INC
225 PEACHTREE STREET, SUITE 1600
ATLANTA, GEORGIA 30303
404-525-2120 FAX 404-522-9941

DSGN	MKPL
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CIVIL
EROSION, SEDIMENTATION AND POLLUTION CONTROL PLAN, PHASE III

SHEET	12 OF 69
DWG NO.	C1.8
DATE	JULY 15, 2011
PROJ NO.	10ATL02-55

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GENERAL ES&PC NOTES:

OWNER/DEVELOPER:
FULTON COUNTY FIRE AND RESCUE
LARRY FEW, FIRE CHIEF
5440 FULTON INDUSTRIAL BLVD.
ATLANTA, GA 30336
(404) 612-5600

24-HOUR EROSION CONTROL CONTACT:
KHAFRA ENGINEERING CONSULTANTS
MERIDETH POOL, P.E.
(706) 722-4920

SITE ACREAGE: 2.14± AC

DISTURBED ACREAGE: 1.1± AC

THE PROJECT SITE IS LOCATED IN LAND LOT 57, 14TH FF DISTRICT OF FULTON COUNTY, GEORGIA. PARCEL NUMBER 14F-0057-LL-030-5.

THERE ARE NO ON-SITE WETLANDS. THERE ARE NO STATE WATERS WITHIN 200' OF THIS PROJECT. THERE ARE NO AREAS OF IMPACT ON THE UNDISTURBED BUFFERS OF STATE WATERS. THE RECEIVING WATERS FOR THIS PROJECT IS THE CHATTAHOOCHEE RIVER, AND IS NOT LISTED ON THE 305(b)/303(d) LIST.

THERE ARE CRITICAL AREAS FOR THIS PROJECT, ALONG THE REAR PROPERTY LINE. THE CRITICAL AREA IS A CUT SLOPE OF 1.5:1 AND IS DESIGNATED ON THE PHASE II PLAN.

THE PRE-CONSTRUCTION ESTIMATE OF THE RUNOFF COEFFICIENT FOR THIS SITE IS C=0.76. THE POST-CONSTRUCTION ESTIMATE OF THE RUNOFF COEFFICIENT FOR THIS SITE IS C=0.81.

THERE ARE NO OFFSITE DRAINAGE AREAS THAT CONTRIBUTE RUNOFF THROUGH THE PROJECT. THE OFFSITE DRAINAGE CONTRIBUTES RUNOFF TO THE PROJECT VIA THE STORM DRAINAGE SYSTEM OF THE PROJECT.

PROJECT DESCRIPTION:
THE CURRENT USE OF THE PROPERTY IS A FIRE STATION. A LARGE PORTION OF THE PROPERTY IS COVERED WITH IMPERVIOUS SURFACES. THE PROPERTY IS BOUNDED BY FULTON INDUSTRIAL BOULEVARD TO THE WEST, ROBINSON DRIVE TO THE SOUTH, AND LIGHT INDUSTRIAL PROPERTIES TO THE NORTH AND EAST. WATER FROM THIS SITE FLOWS DIRECTLY INTO FULTON COUNTY'S STORM WATER SYSTEM AS SHEET FLOW OR DISCHARGE FROM EXISTING STORM PIPES. FROM THE FULTON COUNTY SYSTEM, FLOW IS DISCHARGED TO A TRIBUTARY OF THE CHATTAHOOCHEE RIVER, WHICH SUPPORTS WARM WATER FISHERIES. THERE ARE NO ANTICIPATED IMPACTS TO ANY DOWNSTREAM OR NEIGHBORING AREAS AS A RESULT OF THIS DEVELOPMENT. THIS PROJECT CONSISTS OF THE REPLACEMENT OF THE EXISTING FIRE STATION WITH A NEW FIRE STATION FACILITY, INCLUDING REPLACEMENT OF ALL SERVICE CONNECTIONS AND STORM WATER PIPES.

SOILS INFORMATION:
ALL SOILS FOR THIS SITE AND THE AREA IMMEDIATELY ADJACENT TO THE SITE HAVE BEEN IDENTIFIED BY THE NRCS AS Ub - URBAN LAND.

THE ESCAPE OF SEDIMENT FROM THE SITE SHALL BE PREVENTED BY THE INSTALLATION OF EROSION AND SEDIMENT CONTROL MEASURES AND PRACTICES PRIOR TO, OR CONCURRENT WITH, LAND DISTURBING ACTIVITIES.

EROSION CONTROL MEASURES WILL BE MAINTAINED AT ALL TIMES. IF FULL IMPLEMENTATION OF THE APPROVED PLAN DOES NOT PROVIDE FOR EFFECTIVE EROSION CONTROL, ADDITIONAL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE IMPLEMENTED TO CONTROL OR TREAT THE SEDIMENT SOURCE.

ANY DISTURBED AREA LEFT EXPOSED FOR A PERIOD GREATER THAN 14 DAYS SHALL BE STABILIZED WITH MULCH OR TEMPORARY SEEDING.

NON-EXEMPT ACTIVITIES SHALL NOT BE CONDUCTED WITHIN THE 25 OR 50-FOOT UNDISTURBED STREAM BUFFERS (AS MEASURED FROM THE POINT OF WRESTED VEGETATION) WITHOUT FIRST ACQUIRING THE NECESSARY VARIANCES AND PERMITS.

ANY AMENDMENTS OR REVISIONS TO THE APPROVED ES&PC PLAN WHICH HAVE SIGNIFICANT EFFECT ON BMPs WITH A HYDRAULIC COMPONENT MUST BE CERTIFIED BY THE DESIGN PROFESSIONAL. SUCH REVISIONS OR AMENDMENTS SHALL BE RESUBMITTED TO THE LOCAL ISSUING AUTHORITY FOR REVIEW.

WASTE DISPOSAL: SOLID MATERIALS, INCLUDING BUILDING MATERIALS, WILL NOT BE DISCHARGED TO WATERS OF THE STATE, EXCEPT AS AUTHORIZED BY A SECTION 404 PERMIT.

SOIL DISTURBING ACTIVITIES INCLUDE:
- INSTALLING A STABILIZED CONSTRUCTION EXIT, PERIMETER AND OTHER EROSION AND SEDIMENT CONTROLS
- CLEARING AND GRUBBING
- EXCAVATION OF THE FOUNDATION
- GRADING AND EXCAVATION FOR UTILITIES
- PREPARATION FOR FINAL PLANTING AND SEEDING
- COMPLETION OF ON-SITE STABILIZATION

EROSION AND SEDIMENT CONTROLS
ALL PERIMETER SILT FENCES AND CONSTRUCTION EXITS SHALL BE IN PLACE PRIOR TO ANY LAND DISTURBING ACTIVITIES

EXISTING VEGETATION SHALL BE LEFT IN PLACE UNTIL SUCH TIME THAT LAND DISTURBING ACTIVITIES ARE TO TAKE PLACE UPON THAT PORTION OF THE SITE. WHEN CONSTRUCTION ACTIVITIES HAVE CEASED IN AN AREA, THAT AREA SHALL BE STABILIZED WITHIN 14 DAYS. IF THE AREA IS NOT YET TO FINAL GRADE, IT SHALL BE MULCHED. IF THE AREA IS TO FINAL GRADE AND WILL EVENTUALLY CONTAIN SITE IMPROVEMENTS SUCH AS THE STRUCTURES OR SIDEWALKS, IT SHALL BE TEMPORARY SEEDED. AREAS BROUGHT TO FINAL GRADE THAT WILL REMAIN PERVIOUS ARE TO BE PERMANENTLY SEEDED. ALLOWABLE EXCEPTIONS FROM THE NPDES GENERAL PERMIT GAR 100001, ARE NOTED BELOW.

"(a). Where the initiation of stabilization measures by the 14th day after construction activity temporarily or permanently cease is precluded by snow cover or other adverse weather conditions, stabilization measures shall be initiated as soon as practicable."

"(b). Where construction activity will resume on a portion of the site within 21 days from when activities ceased, (e.g., the total time period that construction activity is temporarily ceased is less than 21 days) then stabilization measures do not have to be initiated on that portion of site by the 14th day after construction activity temporarily ceased."

DUST CONTROL NOTE:
LIMIT BLOWING DUST CAUSED BY CONSTRUCTION OPERATIONS BY APPLYING WATER OR EMPLOYING OTHER APPROPRIATE MEANS OR METHODS TO MAINTAIN DUST CONTROL, SUBJECT TO THE APPROVAL OF THE OWNER. AS A MINIMUM, THIS MAY REQUIRE THE USE OF A WATER WAGON TWICE A DAY TO SUPPRESS DUSTY CONDITIONS.

OFFSITE VEHICLE TRACKING:
A STABILIZED CONSTRUCTION EXIT HAS BEEN PROVIDED TO HELP REDUCE VEHICLE TRACKING OF SEDIMENT. SEE EROSION CONTROL DETAILS SHEET FOR CONSTRUCTION EXIT LOCATION AND DETAILS. THE PAVED STREET ADJACENT TO THE SITE EXIT WILL BE INSPECTED DAILY FOR TRACKING OF MUD, DIRT OR ROCK. DUMP TRUCKS HAULING MATERIAL FROM THE CONSTRUCTION SITE WILL BE COVERED WITH A TARPAULIN.

STORM WATER POLLUTANTS:
THE PRIMARY POLLUTANTS GENERATED ON THIS SITE ARE FROM THE ROOF AND PAVED AREAS OF THE FIRE STATION. THE ROOF RUNOFF IS SHEET FLOW ACROSS THE LAWN ALLOWING NATURAL FILTRATION. WHERE A SUFFICIENT LENGTH OF FLOW CANNOT BE ACHIEVED FOR NATURAL FILTRATION, ROOF RUNOFF IS DIRECTED TO VEGETATED SWALES WITH SLIGHT SLOPES TO INCREASE THE TIME AVAILABLE FOR POLLUTANT REMOVAL. THESE MEASURES WILL DECREASE THE PEAK FLOWS TO THE EXISTING FULTON COUNTY STORM WATER CONVEYANCE SYSTEM AND WILL REDUCE THE VOLUME OF POLLUTANTS THAT ENTER THE SYSTEM AFTER DEVELOPMENT WHEN COMPARED TO THE PRE DEVELOPMENT POLLUTANT LOAD.

SPILL PREVENTION CONTROL AND COUNTERMEASURES

PRACTICES SUCH AS GOOD HOUSEKEEPING, PROPER HANDLING OF HAZARDOUS PRODUCTS AND PROPER SPILL CONTROL PRACTICES WILL BE FOLLOWED TO REDUCE THE RISK OF SPILLS AND REDUCE THE RISK OF SPILLS FROM DISCHARGING INTO STORMWATER RUNOFF

GOOD HOUSEKEEPING
- QUANTITIES OF PRODUCTS STORE ONSITE WILL BE LIMITED TO THE AMOUNT NEEDED FOR THE JOB.
- PRODUCTS AND MATERIALS WILL BE STORED IN A NEAT, ORDERLY MANNER IN APPROPRIATE CONTAINERS PROTECTED FROM RAINFALL, WHERE POSSIBLE.
- PRODUCTS WILL BE KEPT IN THEIR ORIGINAL CONTAINERS WITH MANUFACTURER LABELS LEGIBLE AND VISIBLE.
- PRODUCT MIXING, DISPOSAL AND DISPOSAL OF PRODUCT CONTAINERS WILL BE ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS.
- THE CONTRACTOR WILL INSPECT SUCH MATERIALS TO ENSURE PROPER USE, STORAGE AND DISPOSAL.

PRODUCT SPECIFIC PRACTICES
PETROLEUM BASED PRODUCTS - CONTAINERS FOR PRODUCTS SUCH AS FUELS, LUBRICANTS AND TARS WILL BE INSPECTED DAILY FOR LEAKS AND SPILLS. THIS INCLUDES ON-SITE VEHICLE AND MACHINERY DAILY INSPECTIONS AND REGULAR PREVENTATIVE MAINTENANCE OF SUCH EQUIPMENT. EQUIPMENT MAINTENANCE AREAS WILL BE LOCATED AWAY FROM STATE WATER, NATURAL DRAINS AND STORM WATER DRAINAGE INLETS. IN ADDITION, TEMPORARY FUELING TANKS SHALL HAVE A SECONDARY CONTAINMENT LINER TO PREVENT/MINIMIZE SITE CONTAMINATION. DISCHARGE OF OILS, FUELS AND LUBRICANTS IS PROHIBITED. PROPER DISPOSAL METHODS WILL INCLUDE COLLECTION IN A SUITABLE CONTAINER AND DISPOSAL AS REQUIRED BY LOCAL AND STATE REGULATIONS.

PAINTS/FINISHES/SOLVENTS - ALL PRODUCTS WILL BE STORED IN TIGHTLY SEALED ORIGINAL CONTAINERS WHEN NOT IN USE. EXCESS PRODUCT WILL NOT BE DISCHARGED TO THE STORM WATER COLLECTION SYSTEM. EXCESS PRODUCT, MATERIALS USED WITH THESE PRODUCTS AND PRODUCT CONTAINERS WILL BE DISPOSED OF ACCORDING TO MANUFACTURER'S SPECIFICATIONS AND RECOMMENDATIONS.

CONCRETE TRUCK WASHING - NO CONCRETE TRUCKS WILL BE ALLOWED TO WASH OUT OR DISCHARGE SURPLUS CONCRETE OR DRUM WASH WATER ONSITE.

FERTILIZER/HERBICIDES - THESE PRODUCTS WILL BE APPLIED AT RATES THAT DO NOT EXCEED THE MANUFACTURER'S SPECIFICATIONS OR ABOVE THE GUIDELINES SET FORTH IN THE CROP ESTABLISHMENT OR IN THE GSWCC MANUAL FOR EROSION AND SEDIMENT CONTROL IN GEORGIA. ANY STORAGE OF THESE MATERIALS WILL BE UNDER ROOF IN SEALED CONTAINERS.

BUILDING MATERIALS - NO BUILDING OR CONSTRUCTION MATERIALS WILL BURIED OR DISPOSED OF ONSITE. ALL SUCH MATERIAL WILL BE DISPOSED OF IN PROPER WASTE DISPOSAL PROCEDURES.

SOIL CLEANUP AND CONTROL PRACTICES
- LOCAL, STATE, AND MANUFACTURER'S RECOMMENDED METHODS FOR SPILL CLEANUP WILL BE CLEARLY POSTED AND PROCEDURES WILL BE MADE AVAILABLE TO SITE PERSONNEL.
- MATERIAL AND EQUIPMENT NECESSARY FOR SPILL CLEANUP WILL BE KEPT IN THE MATERIAL STORAGE AREAS. TYPICAL MATERIALS AD EQUIPMENT INCLUDES, BUT IS NOT LIMITED TO, BROOMS, DUSTPANS, MOPS, RAGS, GLOVES, GOGGLES, CAT LITTER, SAND, SAWDUST, AND PROPERLY LABELED PLASTIC AND METAL WASTE CONTAINERS.
- SPILL PREVENTION PRACTICES AND PROCEDURES WILL BE REVIEWED AFTER A SPILL AND ADJUSTED AS NECESSARY TO PREVENT FUTURE SPILLS.
- ALL SPILLS WILL BE CLEANED UP IMMEDIATELY UPON DISCOVERY. ALL SPILLS WILL BE REPORTED AS REQUIRED BY LOCAL, STATE, AND FEDERAL REGULATIONS.
- **FOR SPILLS THAT IMPACT SURFACE WATER (LEAVE A SHEEN ON SURFACE WATER), THE NATIONAL RESPONSE CENTER (NRC) WILL BE CONTACTED WITHIN 24 HOURS AT 1-800-426-2675.**
- **FOR SPILLS OF AN UNKNOWN AMOUNT, THE NATIONAL CENTER (NRC) WILL BE CONTACTED WITHIN 24 HOURS AT 1-800-426-2675.**
- **FOR SPILLS GREATER THAN 25 GALLONS AND NO SURFACE WATER IMPACTS, THE GEORGIA EPD WILL BE CONTACTED WITHIN 24 HOURS.**
- **FOR SPILLS LESS THAN 25 GALLONS AND NO SURFACE WATER IMPACTS, THE SPILL WILL BE CLEANED UP AND LOCAL AGENCIES WILL BE CONTACTED AS REQUIRED.**
- THE CONTRACTOR SHALL NOTIFY THE LICENSED PROFESSIONAL WHO PREPARED THIS PLAN IF MORE THAN 1320 GALLONS OF PETROLEUM IS STORED ONSITE (THIS INCLUDES CAPACITIES OF EQUIPMENT) OR IF ANY ONE PIECE OF EQUIPMENT HAS A CAPACITY GREATER THAN 660 GALLONS. THE CONTRACTOR WILL NEED A SPILL PREVENTION CONTAINMENT AND COUNTERMEASURES PLAN PREPARED BY THAT LICENSED PROFESSIONAL.

WASTE MATERIALS
ALL WASTE MATERIALS WILL BE COLLECTED AND STORED IN A SECURELY LIDDED METAL DUMPSTER. THE DUMPSTER WILL MEET ALL SOLID WASTE MANAGEMENT REGULATIONS. ALL TRASH AND CONSTRUCTION DEBRIS FROM THE SITE WILL BE DEPOSITED IN THE DUMPSTER. THE DUMPSTER WILL BE EMPTIED A MINIMUM OF ONCE PER WEEK, OR MORE OFTEN IF NECESSARY AND TRASH WILL BE HAULED AS REQUIRED BY LOCAL REGULATIONS. NO CONSTRUCTION WASTE WILL BE BURIED ONSITE.

ALL PERSONNEL WILL BE INSTRUCTED ON PROPER PROCEDURES FOR WASTE DISPOSAL. A NOTICE STATING THESE PRACTICES WILL BE POSTED AT THE JOBSITE AND THE CONTRACTOR WILL BE RESPONSIBLE FOR SEEING THAT THESE PROCEDURES ARE FOLLOWED.

HAZARDOUS WASTES
ALL HAZARDOUS WASTE MATERIALS WILL BE DISPOSED OF IN THE MANNER SPECIFIED BY LOCAL, STATE, AND/OR FEDERAL REGULATIONS AND BY THE MANUFACTURER OF SUCH PRODUCTS. THE JOB SITE SUPERINTENDENT, WHO WILL ALSO BE RESPONSIBLE FOR SEEING THAT THESE PRACTICES ARE FOLLOWED, WILL INSTRUCT SITE PERSONNEL IN THESE PRACTICES. MATERIAL SAFETY DATA SHEETS (MSDS's) FOR EACH SUBSTANCE WITH HAZARDOUS PROPERTIES THAT IS USED ON THE JOB SITE WILL BE OBTAINED AND USED FOR THE PROPER MANAGEMENT OF POTENTIAL WASTES THAT MAY RESULT FROM THESE PRODUCTS. AN MSDS WILL BE POSTED IN THE IMMEDIATE AREA WHERE SUCH PRODUCT IS STORED AND/OR USED AND ANOTHER COPY OF EACH MSDS WILL BE MAINTAINED IN THE ESPCP FILE AT THE JOB SITE CONSTRUCTION TRAILER OFFICE. EACH EMPLOYEE WHO MUST HANDLE A SUBSTANCE WITH HAZARDOUS PROPERTIES WILL BE INSTRUCTED ON THE USE OF MSDS SHEETS AND THE SPECIFIC INFORMATION IN THE APPLICABLE MSDS FOR THE PRODUCT HE/SHE IS USING, PARTICULARLY REGARDING SPILL CONTROL TECHNIQUES.

THE CONTRACTOR WILL IMPLEMENT THE SPILL PREVENTION CONTROL AND COUNTERMEASURES (SPCC) PLAN FOUND WITHIN THIS ESPCP AND WILL TRAIN ALL PERSONNEL IN THE PROPER CLEANUP AND HANDLING OF SPILLED MATERIALS. NO SPILLED HAZARDOUS MATERIALS OR HAZARDOUS WASTES WILL BE ALLOWED TO COME IN CONTACT WITH STORMWATER DISCHARGES. IF SUCH CONTACT OCCURS, THE STORMWATER DISCHARGE WILL BE CONTAINED ON SITE UNTIL APPROPRIATE MEASURES IN COMPLIANCE WITH STATE AND FEDERAL REGULATIONS ARE TAKEN TO DISPOSE OF SUCH CONTAMINATED STORMWATER. IF SHALL BE THE RESPONSIBILITY OF THE JOB SITE SUPERINTENDENT TO PROPERLY TRAIN ALL PERSONNEL IN THE USE OF THE SPCC PLAN.

SANITARY WASTES
A MINIMUM OF ONE PORTABLE SANITARY UNIT WILL BE PROVIDED FOR EVERY TEN (10) WORKERS ON THE SITE. ALL SANITARY WASTE WILL BE COLLECTED FROM THE PORTABLE UNITS A MINIMUM OF ONE TIME PER WEEK BY A LICENSED PORTABLE FACILITY PROVIDER IN COMPLETE COMPLIANCE WITH LOCAL AND STATE REGULATIONS.

ALL SANITARY WASTE UNITS WILL BE LOCATED IN AN AREA WHERE THE LIKELIHOOD OF THE UNIT CONTRIBUTING TO STORM WATER DISCHARGE IS NEGLIGIBLE. ADDITIONAL CONTAINMENT BMP's MUST BE IMPLEMENTED, SUCH AS GRAVEL BAGS OR SPECIALLY DESIGNED PLASTIC SKID CONTAINERS AROUND THE BASE, TO PREVENT WASTES FROM CONTRIBUTING TO STORM WATER DISCHARGES. THE LOCATION OF SANITARY WASTE UNITS MUST BE IDENTIFIED ON THE EROSION CONTROL PLAN BY THE CONTRACTOR ONCE THE LOCATIONS HAVE BEEN IDENTIFIED.

SANITARY SEWER WILL BE PROVIDED BY FULTON COUNTY AT THE COMPLETION OF THIS PROJECT.

INSPECTION AND RECORD KEEPING REQUIREMENTS

A. PERMITTEE REQUIREMENTS

(1). Each day when any type of construction activity has taken place at a primary permittee's site, certified personnel provided by the primary permittee shall inspect: (a) all areas at the primary permittee's site where petroleum products are stored, used, or handled for spills and leaks from vehicles and equipment; (b) all locations at the primary permittee's site where vehicles enter or exit the site for evidence of off-site sediment tracking; and (c) measure rainfall once each 24 hour period at the site. These inspections must be conducted until a Notice of Termination is submitted.

(2). Certified personnel (provided by the primary permittee) shall inspect the following at least once every fourteen (14) calendar days and within 24 hours of the end of a storm that is 0.5 inches rainfall or greater (unless such storm ends after 5:00 PM on any Friday or on any nonworking Saturday, non-working Sunday or any non-working Federal holiday in which case the inspection shall be completed by the end of the next business day and/or working day, whichever occurs first): (a) disturbed areas of the primary permittee's construction site that have not undergone final stabilization; (b) areas used by the primary permittee for storage of materials that are exposed to precipitation that have not undergone final stabilization; and (c) structural control measures. Erosion and sediment control measures identified in the Plan applicable to the primary permittee's site shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving water(s). For areas of a site that have undergone final stabilization, the permittee must comply with Part IV.D.4.a.(3). These inspections must be conducted until a Notice of Termination is submitted.

(3). Certified personnel (provided by the primary permittee) shall inspect at least once per month during the term of this permit (i.e., until a Notice of Termination is received by EPD) the areas of the site that have undergone final stabilization. These areas shall be inspected for evidence of, or the potential for, pollutants entering the drainage system and the receiving water(s). Erosion and sediment control measures identified in the Plan shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving water(s).

(4). Based on the results of each inspection, the site description and the pollution prevention and control measures identified in the Erosion, Sedimentation and Pollution Control Plan, the Plan shall be revised as appropriate not later than seven (7) calendar days following each inspection. Implementation of such changes shall be made as soon as practical but in no case later than seven (7) calendar days following each inspection.

(5). A report of each inspection that includes the name(s) of personnel making each inspection, the date(s) of each inspection, major observations relating to the implementation of the Erosion, Sedimentation and Pollution Control Plan, and actions taken in accordance with Part IV.D.4.a.(4). of the permit shall be made and retained at the site or be readily available at a designated alternate location until the entire site or that portion of a construction project that has been phased has undergone final stabilization and a Notice of Termination is submitted to EPD. Such reports shall identify any incidents of non-compliance. Where the report does not identify any incidents of non-compliance, the report shall contain a certification that the construction site is in compliance with the Erosion, Sedimentation and Pollution Control Plan and this permit. The report shall be signed in accordance with Part V.G. of this permit.

SAMPLING FREQUENCY AND REPORTING RESULTS

d. Sampling Frequency.

(1). The primary permittee must sample in accordance with the Plan at least once for each rainfall event described below. For a qualifying event, samples must be taken within forty-five (45) minutes of:

(a) the accumulation of the minimum amount of rainfall for the qualifying event, if the storm water discharge to a monitored receiving water or from a monitored outfall has begun at or prior to the accumulation, or

(b) the beginning of any storm water discharge to a monitored receiving water or from a monitored outfall, if the discharge begins after the accumulation of the minimum amount of rainfall for the qualifying event.

(2). However, where manual and automatic sampling are impossible (as defined in this permit), or are beyond the permittee's control, the permittee shall take samples as soon as possible, but in no case more than twelve (12) hours after the beginning of the storm water discharge.

(3). Sampling by the permittee shall occur for the following events:

(a). For each area of the site that discharges to a receiving stream, the first rain event that reaches or exceeds 0.5 inch and allows for monitoring during normal business hours* (Monday thru Friday, 8:00 AM to 5:00 PM and Saturday 8:00 AM to 5:00 PM, excluding all non-working federal holidays, when construction activity is being conducted by the Primary permittee) that occurs after all clearing and grubbing operations have been completed in the drainage area of the location selected as the representative sampling location;

(b). In addition to (a) above, for each area of the site that discharges to a receiving stream, the first rain event that reaches or exceeds 0.5 inch and allows for monitoring during normal business hours* that occurs either 90 days after the first sampling event or after all mass grading operations have been completed in the drainage area of the location selected as the representative sampling location, whichever comes first;

(c). At the time of sampling performed pursuant to (a) and (b) above, if BMPs are found to be properly designed, installed and maintained, no further action is required. If BMPs in any area of the site that discharges to a receiving stream are not properly designed, installed and maintained, corrective action shall be defined and implemented within two (2) business days, and turbidity samples shall be taken from discharges from that area of the site for each subsequent rain event that reaches or exceeds 0.5 inch during normal business hours* until the selected turbidity standard is attained, or until post-storm event inspections determine that BMPs are properly designed, installed and maintained; and

(d). Existing construction activities, i.e., those that are occurring on or before the effective date of this permit, that have met the sampling required by (a) above shall sample in accordance with (b). Those existing construction activities that have met the sampling required by (b) above shall not be required to conduct additional sampling other than as required by (c) above.

*Note that the Permittee may choose to meet the requirements of (a) and (b) above by collecting turbidity samples from any rain event that reaches or exceeds 0.5 inch and allows for monitoring at any time of the day or week.

E. Reporting.

1. The applicable permittees are required to submit a summary of the monitoring results to the EPD at the address shown in Part II.C by the fifteenth day of the month following the reporting period. Reporting periods are months during which samples are taken in accordance with this permit. Sampling results shall be in a clearly legible format. Upon written notification, EPD may require the applicable permittee to submit the sampling results on a more frequent basis. Sampling and analysis of any storm water discharge(s) or the receiving water(s) beyond the minimum frequency stated in this permit must be reported in a similar manner to the EPD. The sampling reports must be signed in accordance with Part V.G. Sampling reports must be submitted to EPD until such time as a NOT is submitted in accordance with Part VI.
2. All written correspondence required by this permit shall be submitted by return receipt certified mail (or similar service) to the appropriate District Office of the EPD according to the schedule in Appendix A of this permit. The permittee shall retain a copy of the proof of submittal at the construction site or the proof of submittal shall be readily available at a designated location from commencement of construction until such time as a NOT is submitted in accordance with Part VI.
3. All monitoring results shall include the following information:
   a. the date, exact place, and time of sampling or measurements;
   b. The name(s) of the individual(s) who performed the sampling and measurements;
   c. The date(s) analyses were performed;
   d. The time(s) analyses were initiated;
   e. the name(s) of the individual(s) who performed the analyses;
   f. References and written procedures, when available, for the analytical techniques or methods used;
   g. The results of such analyses, including the bench sheets, instrument readouts, computer disks or tapes, etc., used to determine these results; and
   h. Results which exceed 1000 NTU shall be reported as "exceeds 1000 NTU."

RECORD RETENTION

F. Retention of Records

1. the primary permittee shall retain the following records at the construction site or the records shall be readily available at a designated alternate location from commencement of construction until such time as a NOT is submitted in accordance with Part VI:
   a. A copy of all Notices of Intent submitted to EPD;
   b. A copy of the Erosion, Sedimentation and Pollution Control Plan required by this permit;
   c. The design professional's report of the results of the inspection conducted in accordance with Part IV.A.5. of this permit;
   d. A copy of all monitoring information, results, and reports required by this permit;
   e. A copy of all inspection reports generated in accordance with Part IV.D.4.a. of this permit;
   f. A copy of all violation summaries and violation summary reports generated in accordance with Part III.D.2. of this permit; and
   g. Daily rainfall information collected in accordance with Part IV.D.4.a.(1)(c) of this permit.
2. Copies of all Notices of Intent, Notices of Termination, reports, plans, monitoring reports, monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, Erosion, Sedimentation and Pollution Control Plans, records of all data used to complete the Notice of Intent to be covered by this permit and all other records required by this permit shall be retained by the permittee who either produced or used it for a period of at least three years from the date that the the NOT is submitted in accordance with Part VI of this permit. These records must be maintained at the permittee's primary place of business or at a designated alternative location once the construction activity has ceased at the permitted site. This period may be extended by request of the EPD at any time upon written notification to the permittee.

SAMPLE COLLECTION AND ANALYSIS
All sampling shall be collected by "grab samples" and the analysis of these samples must be conducted in accordance with methodology and test procedures established by 40 CFR Part 136; the guidance document titled "NPDES Storm Water Sampling Guidance Document, EPA 833-B-92-001" and guidance documents that may be prepared by the EPD.

APPENDIX B RATIONALE IS USED FOR ALL OF THE OUTFALL SAMPLING POINTS ON THIS PROJECT. THE NTU VALUE OF 75 CORRESPONDS TO A SURFACE DRAINAGE AREA OF 0-4.99 SQ MI AND A SITE SIZE OF 2.14 ACRES FOR WATERS SUPPORTING WARM WATER FISHERIES.

APPENDIX B

Nephelometric Turbidity Unit (NTU) TABLES

Cold Water (Trout Streams)

Site Size, acres	Surface Water Drainage Area, square miles: 0-4.99	5-9.99	10-24.99	25-49.99	50-99.99	100-249.99	250-499.99	500+
1.00-10	25	50	75	150	300	500	500	500
10.01-25	25	25	50	75	150	200	300	500
25.01-50	25	25	25	50	75	100	200	500
50.01-100	20	25	25	35	50	75	150	300
100.01+	20	20	20	25	25	50	60	100

Warm Water (Supporting Warm Water Fisheries)

Site Size, acres	Surface Water Drainage Area, square miles: 0-4.99	5-9.99	10-24.99	25-49.99	50-99.99	100-249.99	250-499.99	500+
1.00-10	75	150	200	400	750	750	750	750
10.01-25	50	100	100	200	300	500	750	750
25.01-50	50	50	100	100	200	300	750	750
50.01-100	50	50	50	100	100	150	300	500
100.01+	50	50	50	50	50	100	200	100

To use these tables, select the size (acres) of the construction site. Then, select the surface water drainage area (square miles). The NTU matrix value arrived at from the above tables is the one to use in Part III.D.4

CERTIFICATION

"I CERTIFY THAT THE PERMITTEE'S EROSION, SEDIMENTATION AND POLLUTION CONTROL PLAN PROVIDES FOR AN APPROPRIATE AND COMPREHENSIVE SYSTEM OF BEST MANAGEMENT PRACTICES REQUIRED BY GEORGIA WATER QUALITY CONTROL ACT AND THE DOCUMENT "MANUAL FOR EROSION AND SEDIMENT CONTROL IN GEORGIA" (MANUAL) PUBLISHED BY THE STATE SOIL AND WATER CONSERVATION COMMISSION AS OF JANUARY 1 OF THE YEAR IN WHICH THE LAND - DISTURBING ACTIVITY WAS PERMITTED PROVIDES FOR THE SAMPLING OF THE RECEIVING WATER(S) OR THE PRACTICES AND SAMPLING METHODS IS EXPECTED TO MEET THE REQUIREMENTS CONTAINED IN THE GENERAL NPDES PERMIT NO. GAR 100001".

"I CERTIFY UNDER PENALTY OF LAW THAT THIS PLAN WAS PREPARED AFTER A SITE VISIT TO THE LOCATIONS DESCRIBED HEREIN BY MYSELF OR MY AUTHORIZED AGENT, UNDER MY DIRECT SUPERVISION."

"I CERTIFY UNDER PENALTY OF LAW THAT THIS DOCUMENT AND ALL ATTACHMENTS WERE PREPARED UNDER MY DIRECTION OR SUPERVISION IN ACCORDANCE WITH A SYSTEM DESIGNED TO ASSURE THAT CERTIFIED PERSONNEL PROPERLY GATHER AND EVALUATE THE INFORMATION SUBMITTED. BASED UPON MY INQUIRY OF THE PERSON OR PERSONS WHO MANAGE THE SYSTEM, OR THOSE PERSONS DIRECTLY RESPONSIBLE FOR GATHERING THE INFORMATION, THE INFORMATION SUBMITTED IS, TO THE BEST OF MY KNOWLEDGE AND BELIEF, TRUE, ACCURATE, AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT FOR KNOWING VIOLATIONS."

Merideth K Pool (signature) 7/13/11
SIGN DATE

GSWCC Georgia Soil and Water Conservation Commission
Merideth K Pool
Level II Certified Design Professional
Certification Number 0000037897
Issued: 02/27/2010 Expires: 02/27/2013

DESIGN PROFESSIONAL 7-DAY VISIT CERTIFICATION

THE PRIMARY PERMITTEE MUST RETAIN THE DESIGN PROFESSIONAL WHO PREPARED THE EROSION, SEDIMENTATION AND POLLUTION CONTROL PLAN EXCEPT WHEN THE PRIMARY PERMITTEE HAS REQUESTED IN WRITING AND EPD HAS AGREED TO AN ALTERNATE DESIGN PROFESSIONAL, TO INSPECT THE INSTALLATION OF THE INITIAL SEDIMENT STORAGE REQUIREMENTS AND PERIMETER CONTROL BMPs WITHIN SEVEN (7) DAYS AFTER INSTALLATION. THE DESIGN PROFESSIONAL SHALL DETERMINE IF THESE BMPs HAVE BEEN INSTALLED AND ARE BEING MAINTAINED AS DESIGNED. THE DESIGN PROFESSIONAL SHALL REPORT THE RESULTS OF THE INSPECTION TO THE PRIMARY PERMITTEE WITHIN SEVEN (7) DAYS AND THE PERMITTEE MUST CORRECT ALL DEFICIENCIES WITHIN TWO (2) BUSINESS DAYS OF RECEIPT OF THE INSPECTION REPORT FROM THE DESIGN PROFESSIONAL UNLESS WEATHER RELATED SITE CONDITIONS ARE SUCH THAT ADDITIONAL TIME IS REQUIRED.

DATE OF INSPECTION: ____________________

I CERTIFY THAT THE SITE WAS IN SUBSTANTIAL COMPLIANCE WITH THE ES&PC PLAN ON THE DATE OF INSPECTION

____
GSWCC LEVEL II DESIGN PROFESSIONAL CERTIFICATION #

INSPECTION REVEALED THE FOLLOWING DEFICIENCIES FROM THE ES&PC PLAN:

____
____
____
____
____
____

THESE DEFICIENCIES MUST BE ADDRESSED IMMEDIATELY AND A RE-INSPECTION SCHEDULED. WORK SHALL NOT PROCEED ON THE SITE UNTIL DESIGN PROFESSIONAL'S CERTIFICATION IS OBTAINED.

GEORGIA REGISTERED No. 33285 PROFESSIONAL ENGINEER MERIDETH K. POOL
GSWCC NO. 37897

KHAFRA ENGINEERING CONSULTANTS, INC
225 PEACHTREE STREET, SUITE 1500
ATLANTA, GEORGIA 30303
404-525-2120 FAX 404-522-7941

DSGN	MKPL
DR	MKPL
CHK	KEFR
APVD	VTBS

NO.	DATE	REVISION	BY	APVD

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IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

Fulton County Fire Department
FIRE STATION No. 11
4760 Fulton Industrial Blvd.
Atlanta, Georgia 30336

CIVIL
EROSION, SEDIMENTATION & POLLUTION CONTROL NOTES

SHEET	13 OF 69
DWG NO.	C2.1
DATE	JULY 15, 2011
PROJ NO.	1DATL02-55

RELEASED FOR BID

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Ds1 DISTURBED AREA STABILIZATION (WITH MULCHING ONLY)

A temporary cover of plant residues applied to the soil surface for a period of six (6) months or less when seeding is not practical.

- Reduce runoff, erosion, and sedimentation.
- Reduce dust
- Conserve moisture
- Prevent surface compaction and crusting
- Control undesirable vegetation

- Install all other required BMPs first
- Grade site, if possible, to permit the use of equipment for applying and anchoring mulch
- Loosen compacted soil, if possible, to a depth of three (3) inches
- Apply straw or hay uniformly, as shown in Table 1, by hand or mechanical equipment, and anchor by pressing into soil or using netting

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- Mulch on slopes greater than 3% should be anchored with emulsified asphalt (Grade AE-5 or SS-1) or other suitable tackifier
- Wood waste on slopes flatter than 3:1 do not need anchoring
- Mulch shall be applied to all disturbed areas left inactive for fourteen days.

Table 1. Mulching Application Requirements

Material	Rate	Depth
Straw or hay	-	2" to 4"
Wood waste, chips, sawdust, bark	-	2" to 3"
Cutback asphalt	1200 gal/acre 1/4 gal/sq yd or See manufacturer's recommendations	—
Polyethylene film	Secure with soil, anchors, weights	—
Geotextiles, jute matting netting, etc	See manufacturer's recommendations	—

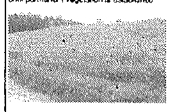
- Add mulch as needed to maintain the suggested depth
- If organic mulch is to be left and incorporated into the soil, apply 20-30 pounds of Nitrogen in addition to the fertilizer required for vegetation

- [Mb] Erosion Control Matting and Blankets

11

Ds2 DISTURBED AREA STABILIZATION (WITH TEMPORARY SEEDING)

A temporary vegetative cover with fast growing seedings for up to a 12-month period or until permanent vegetation is established



- Reduce runoff, erosion, and sedimentation
- Improve wildlife habitat
- Improve aesthetics
- Improve tilth and organic matter

- Install all E&SC measures prior to applying temporary vegetation
- Grading or shaping are not required if slopes can be planted with a hydroseeder or by hand-seeding
- Seedbed preparation is not required if soil is loose and not sealed by rain

12

- When the soil is sealed or crusted, it should be pitted, trenched or scarified to provide a place for seed to lodge and germinate
- Agricultural lime is not required.
- Fertilize low fertility soils prior to or during planting at the rate of 500-700 pounds per acre of 10-10-10 fertilizer or equivalent (12-18 pounds/1000 square feet)
- It is imperative that you check the tag on the bag of seed to verify the type and germination of the seed to be planted

Figure 1. Typical Tag on Bag of Seed

- Apply seed by hand, cyclone seeder, drill or hydro-seeder. Seed planted with a drill should be planted 1/4"-1/2" deep. Refer to Pure Live Seed (PLS) in the Glossary
- Apply in accordance with specifications on the E&SC plan. If information is not available, select a temporary cover from Table 1
- Temporary cover shall be applied to all disturbed areas left idle for fourteen days. (If an area is left idle for 6 months, permanent cover shall be applied.)

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- Re-seed areas where an adequate stand of temporary vegetation fails to emerge or where a poor stand exists.

- [Mb] Erosion Control Matting and Blankets
- [Ds1] Disturbed Area Stabilization (With mulching only)
- [Pm] Polyacrylamide (PAM)

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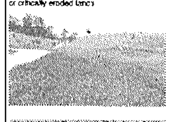
Ds3 DISTURBED AREA STABILIZATION (WITH PERMANENT SEEDING)

A permanent vegetative cover using grasses, trees, shrubs or legumes on highly erodible or critically eroded lands



- Reduce runoff and erosion
- Improve wildlife habitat
- Improve aesthetics
- Improve tilth and organic matter
- Reduce downstream complaints
- Reduce likelihood of legal action
- Reduce likelihood of work stoppage due to legal action
- Increase "good neighbor" benefits

- Use conventional planting methods if possible
- Apply according to approved plan, if shown, or refer to Table 1

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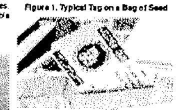
- Check the tag on the bag of seed to verify the type and germination of the seed to be planted and the date of the test.

Figure 1. Typical Tag on a Bag of Seed



- Scarify pit or trench sealed or crusted soil
- Fertilize based on soil tests or as shown in Table 2
- Apply agricultural lime as prescribed by soil tests or at a rate of 1 to 2 tons per acre.
- Apply seed by hand, cyclone seeder, drill or hydro-seeder. Seed planted with a drill should be planted 1/4"-1/2" deep
- Straw or hay mulch shall be applied at a rate of 2 or 2.5 tons per acre.
- Irrigation should be used to supplement rainfall but not to the extent to cause erosion

19

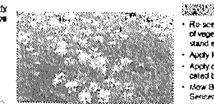


Figure 2. Crown Vetch

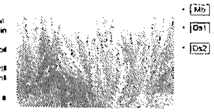


Figure 3. Sericea Lespedeza

26

- Re-seed areas where an adequate stand of vegetation fails to emerge or where a poor stand exists
- Apply fertilizer per Table 2
- Apply one ton of agricultural lime or as indicated by soil test every 4-6 years
- Mow Bermuda and Bahia as desired. Mow Sericea Lespedeza only after frost to ensure seeds are mature
- Maintain 6" or more of top growth

- [Mb] Erosion Control Matting and Blankets
- [Ds1] Disturbed Area Stabilization (With mulching only)
- [Ds2] Disturbed Area Stabilization (With temporary seeding)

27

Ds2 Table 1. Some Temporary Plant Species, Seeding Rates and Planting Dates

Species	Rates Per 1,000 sq. ft.	Rates per Acre	Planting Dates by Region M-L	P	C
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table 1. Some Temporary Plant Species, Seeding Rates and Planting Dates (continued)

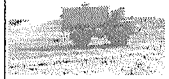
Species	Rates Per 1,000 sq. ft.	Rates per Acre	Planting Dates by Region M-L	P	C
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Ds2 Table 2. Fertilizer Requirements for Temporary Vegetation

Types of Species	Planting Year	Fertilizer (N-P-K)	Rate (lbs/acre)	N Top Dressing Rate (lbs/acre)
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Du DUST CONTROL ON DISTURBED AREAS

Controlling surface and air movement of dust on land-disturbing activities



- Prevent the movement of dust from exposed soil surfaces
- Prevent the movement of airborne substances that may be harmful to health

- Apply according to approved plan, if shown
- Mulch disturbed areas and tackify with resins such as asphalt, Curasol or Terratack according to manufacturer's recommendations
- Stabilize disturbed areas with temporary or permanent vegetation
- Irrigate disturbed areas until surface is wet
- Cover surfaces with crushed stone or gravel

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- Apply calcium chloride at a rate to keep surfaces moist
- Apply spray-on adhesives to mineral soils (not muck soils) as described in Table 1.

Table 1. Spray-On Adhesive Application Requirements

Adhesive	Water Dilution	Nozzle Type	Application (Gal./Acre)
Anionic asphalt emulsion	7:1*	Coarse spray	1,200
Latex emulsion	12.5:1*	Fine spray	235
Resin-in-water emulsion	4:1*	Fine spray	300

*Use manufacturer's recommendations when available

- Prohibit traffic on surface after spraying
- Supplement surface covering as needed

- [Ds1] Disturbed Area Stabilization (With mulching only)
- [Ds2] Disturbed Area Stabilization (With temporary seeding)
- [Ds3] Disturbed Area Stabilization (With permanent seeding)
- [Ds4] Disturbed Area Stabilization (With sodding)
- [Tk] Tackifiers and Binders

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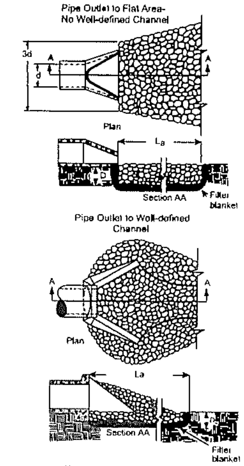
Ds3 Table 1. Some Permanent Plant Species, Seeding Rates, and Planting Dates (and continued parts)

Species	Rates per Acre	Rates per 1,000 sq. ft.	Planting Dates by Region M-L	P	C	Remarks
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Ds3 Table 2. Fertilizer Requirements for Temporary Vegetation

Types of Species	Planting Year	Fertilizer (N-P-K)	Rate (lbs/acre)	N Top Dressing Rate (lbs/acre)
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

RIP-RAP OUTLET PROTECTION (St)



Notes

1. L_a is the length of the riprap apron.
2. D = 1.5 times the maximum stone diameter but not less than 6".
3. In a well-defined channel extend the apron up the channel banks to an elevation of 6" above the maximum tailwater depth or to the top of the bank, whichever is less.
4. A filter blanket or filter fabric should be installed between the riprap and soil foundation.

RIP-RAP OUTLET PROTECTION
N.T.S.

KHAFRA ENGINEERING CONSULTANTS, INC.
225 PEACHTREE STREET, SUITE 1600
ATLANTA, GEORGIA 30303
404-525-2120 FAX 404-522-7941

DSGN	MKPL
DR	MKPL
CHK	KEFR
APVD	VTBS

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Atlanta, Georgia 30336

CIVIL
EROSION, SEDIMENTATION & POLLUTION CONTROL DETAILS

SHEET 14 OF 69
DWG NO. C2.2
DATE JULY 15, 2011
PROJ NO. 10ATL02-35

GEORGIA REGISTERED PROFESSIONAL ENGINEER No. 33285 MERIDETH K. POOL

RELEASED FOR BID

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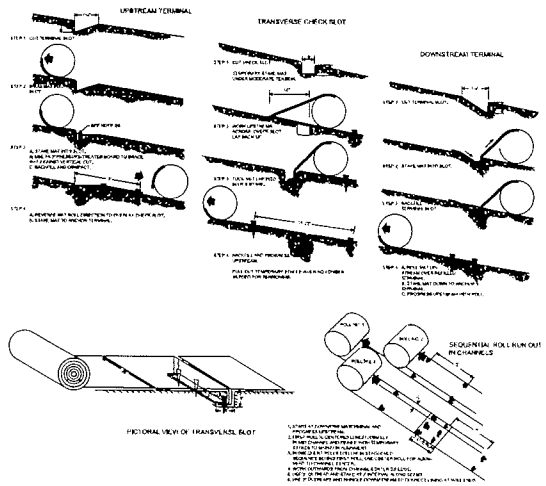
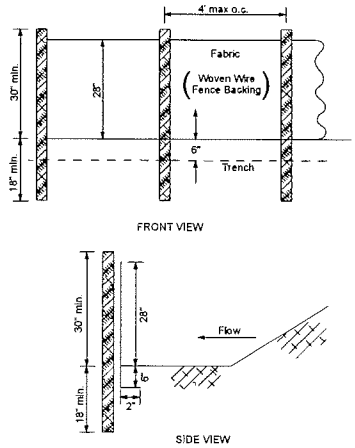


Figure 6-7.1 - Typical Installation Guidelines for Matting and Blankets

EROSION CONTROL MATTING AND BLANKETS (Mb)

NTS

TABLE 6-20.5	
TYPE FENCE	C
Tensile Strength (Lbs. Min.) (1) (ASTM D-4632)	Warp - 250 Fill - 180
Elongation (% Min.) (ASTM D-4632)	40
AOS (Apparent Opening Size) (Max. Sieve Size) (ASTM D-4751)	#30
Flow Rate (Gal/Min/Sq. Ft.) (D4491-87)	70
Ultraviolet Stability (2) (ASTM D-4632 after 300 hours weathering in accordance with ASTM D-4355)	80
Bursting Strength (PSI Min.) (ASTM D-3786 Diaphragm Bursting Strength Tester)	175
Minimum Fabric Width (inches)	36



MAINTENANCE NOTES:
- Inspect barriers at the end of each working day, or after each rain, and repair or clean as necessary.
- Remove sediment from barrier when two-thirds full.
- Dispose of sediment so that it will not enter the barrier again and stabilize it with vegetation.
- Replace filter fabric when deteriorated.
- Design life of a synthetic silt fence is approximately 6 months.
- Maintain until the project is vegetated or otherwise stabilized.
- Remove barriers and accumulated sediment and stabilize the exposed area when the project is stabilized.

NOTE:
Use 36" O.O.T. approved fabric.
Use steel posts.- only

SILT FENCE - TYPE C

POST SIZE TABLE 6-20.3			
	Minimum Length	Type of Post	Size of Post
Type C	4'	STEEL	1.3lb/ft min

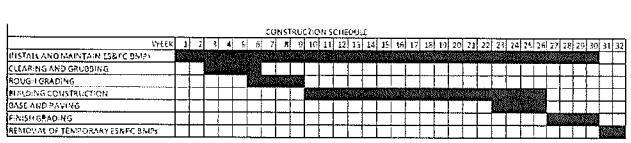
SILT FENCE TYPE "C" (Sd1-C)

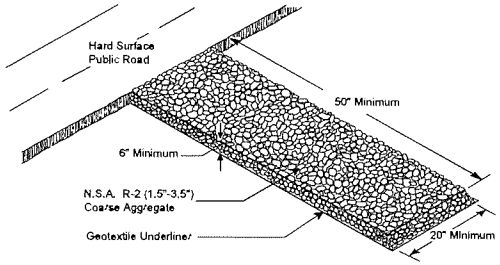
N.T.S.

EROSION CONTROL LEGEND

Co	Construction Exit	Co	Ds1	Disturbed Area Stabilization with Mulching Only	Ds1
Sd1	Sediment Barriers (Temporary Silt Fence)	Sd1-C	Ds2	Disturbed Area Stabilization with Temporary Seeding	Ds2
Sd2-Ex	Sediment Barriers (Excavated Inlets)	Sd2-Ex	Ds3	Disturbed Area Stabilization with Permanent Vegetation	Ds3
Sd2-F	Sediment Barriers (Filter Fabric with Supporting Frame)	Sd2-F	Du	Dust Control	Du
Sd2-P	Sediment Barriers (Pigs-in-Blankets)	Sd2-P	Mb	Erosion Control Matting and Blankets	Mb
Sl	RIP-RAP OUTLET PROTECTION	Sl	Mb	Erosion Control Matting and Blankets	Mb

CONSTRUCTION SCHEDULE





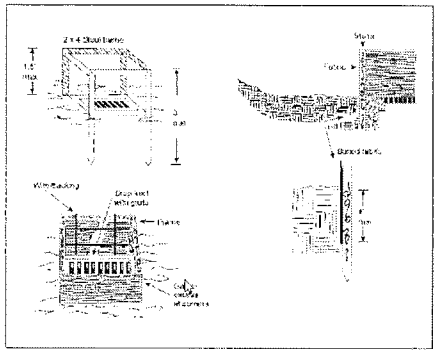
NOTES:

1. STONE WILL BE IN ACCORDANCE WITH NATIONAL STONE ASSOCIATION R-2 (1.5 TO 3.5 INCH STONE).
2. THE GRAVEL PAD SHALL HAVE A MINIMUM THICKNESS OF 6 INCHES.
3. MINIMUM SIZE 20'x50'
4. INSTALL GEOTEXTILE UNDERLINER PRIOR PLACEMENT OF STONE.
5. IF NECESSARY, INCLUDE WASHING
6. MAY REQUIRE PERIODIC TOP DRESSING WITH 1.5 - 3.5 INCH STONE, AS CONDITIONS DEMAND.
7. MAINTAIN IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOW OF MUD ONTO PUBLIC ROAD OR PRIVATE PROPERTY.

MAINTENANCE NOTES:
- Periodically dress with 1.5"-3.5" stone.
- Maintain in a condition that will prevent tracking or flow of mud onto public rights-of-way.
- Immediately remove mud and debris tracked or spilled onto roadways.

CRUSHED STONE CONSTRUCTION EXIT (Co)

N.T.S.



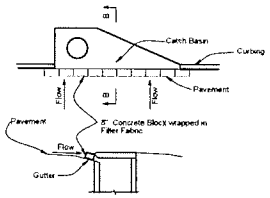
FILTER FABRIC SEDIMENT TRAP (Sd2-F)

N.T.S.

(Sd2-Ex)

EXCAVATED INLET SEDIMENT TRAP		
DRAINAGE AREA	0.2	AC
REQUIRED SEDIMENT STORAGE		
67 CY/AC * DRAINAGE AREA =	8.7	CY
	350.9	CF
ASSUME EXCAVATION DEPTH		
MINIMUM 1.5'	3	FT
ASSUME SIDE SLOPES		
NO STEEPER THAN 2:1	2 : 1	
REQUIRED SURFACE AREA		
Sample = REQUIRED STORAGE/DEPTH		
Sample =	60.3	SF
ASSUME SHAPE (2:1 L to W ratio)		
RECTANGULAR SHAPE		
L =	11	FT
W =	5.5	FT

Sediment storage provided: (L x W x D)
11'x5.5'x3'=181.5CF=6.72CY PER Sd2-Ex



SECTION B-B

NOTE
INSTALL FILTER AFTER ANY ASPHALT PAVEMENT INSTALLATION.

6-144 Figure 6-21.5 GaSWCC (Amended-2000)

"PIGS IN BLANKET" SEDIMENT TRAP (Sd2-P)

N.T.S.

GEORGIA REGISTERED No. 33285 PROFESSIONAL ENGINEER MEREDETH K. POOLE

GSWCC NO. 37887

KHAFRA ENGINEERING CONSULTANTS, INC.
225 PEACHTREE STREET, SUITE 1600
ATLANTA, GEORGIA 30303
404-523-2120 FAX 404-522-7941

DSGN	MKPL
DR	MKPL
CHK	KEPR
APVD	VTBS

NO.	DATE	REVISION	BY	APVD

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Fulton County Fire Department
FIRE STATION No. 11
4760 Fulton Industrial Blvd.
Atlanta, Georgia 30336

CIVIL
EROSION SEDIMENTION & POLLUTION CONTROL

SHEET 15 OF 69
DWG NO. C2.3
DATE JULY 15, 2011
PROJ NO. (DATL02-55)

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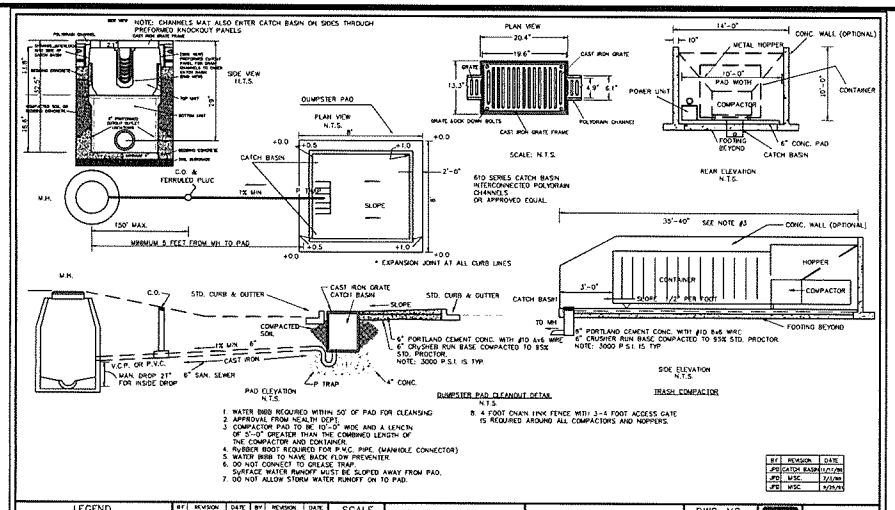


1. WATER BIBB REQUIRED WITHIN 50' OF PAD FOR CLEANSING
2. APPROVAL FROM HEALTH DEPT.
3. COMPACTOR PAD TO BE 10'-0" WIDE AND A LENGTH OF 5'-0" GREATER THAN THE COMBINED LENGTH OF THE COMPACTOR AND CONTAINER
4. RUBBER BOOT REQUIRED FOR P.V.C. PIPE. (MANHOLE CONNECTOR)
5. WATER BIBB TO HAVE BACK FLOW PREVENTER
6. DO NOT CONNECT TO GREASE TRAP. SURFACE WATER RUNOFF MUST BE SLOPED AWAY FROM PAD.
7. DO NOT ALLOW STORM WATER RUNOFF ON TO PAD.
8. A FOOT CHAIN LINK FENCE WITH 3-4 FOOT ACCESS GATE IS REQUIRED AROUND ALL COMPACTORS AND HOPPERS.

REV	REVISION	DATE
JPB	CATCH BASIN	11/17/99
JPB	MSC	7/1/99
JPB	MSC	9/29/99

LEGEND

TRASH COMPACTOR AND DUMPSTER PAD DETAILS

REV	REVISION	DATE	BY	REVISION	DATE
				ADAD	9/11/99

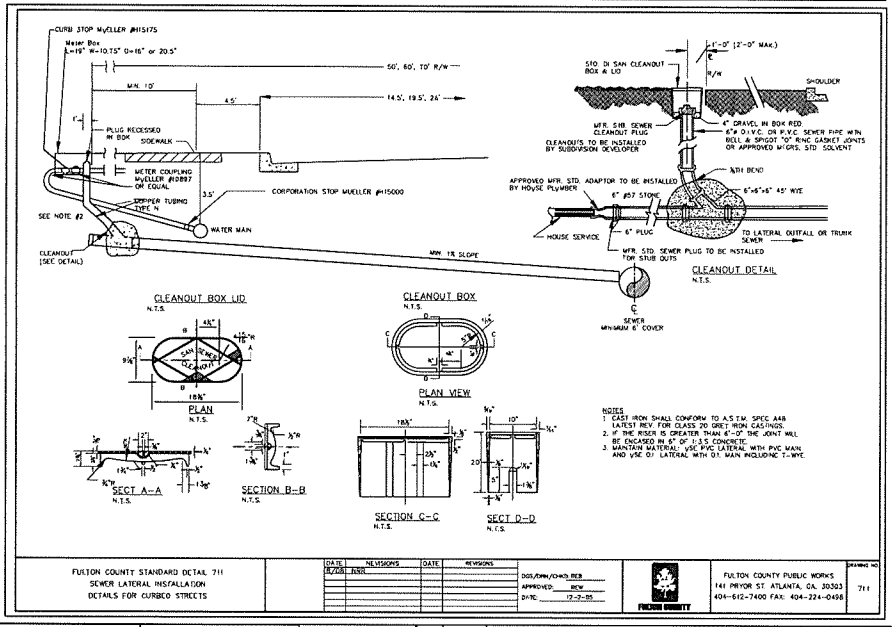
SCALE 1" = ____

DSG/DRN/CHKD: ____
APPROVED: C.N. OLSEN
DATE: ____

FULTON COUNTY PUBLIC WORKS
141 PRYOR ST. ATLANTA, GA. 30303
404-730-7400 FAX: 730-6325

DWG. NO. 670

SHEET: ____ OF: ____



NOTES
1. CAST IRON SHALL CONFORM TO A.S.T.M. SPEC. A48 LATEST REV. FOR CLASS 20 GREY IRON CASTINGS.
2. IF THE RISER IS GREATER THAN 6'-0" THE JOINT WILL BE ENCASED IN 6" OF 1:3:5 CONCRETE.
3. MAINTAIN MATERIAL: VSC PVC LATERAL WITH PVC MAIN AND VSC OF LATERAL WITH D.I. MAIN INCLUDING T-WYE

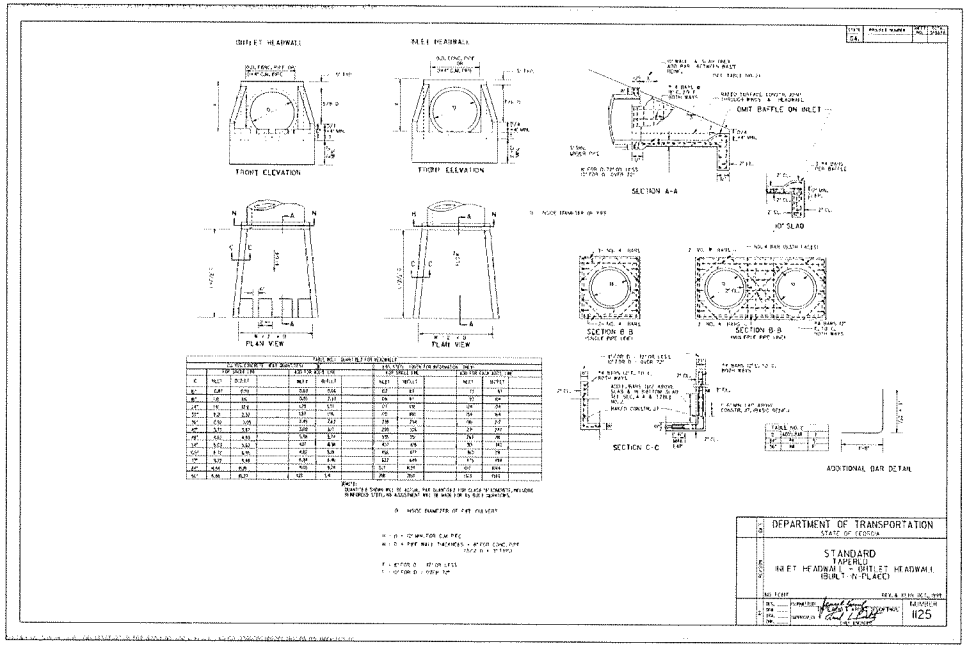
FULTON COUNTY STANDARD DETAIL 711
SEWER LATERAL INSTALLATION
DETAILS FOR CURBED STREETS

DATE	REVISIONS	DATE	REVISIONS
8/20/01	NNR		

DSG/DRN/CHKD: REB
APPROVED: BCW
DATE: 12-2-85

FULTON COUNTY PUBLIC WORKS
141 PRYOR ST. ATLANTA, GA. 30303
404-612-7400 FAX: 404-224-0498

DRAWING NO. 711



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225 PEACHTREE STREET, SUITE 1600
ATLANTA, GEORGIA 30303
404-525-2120 FAX 404-522-7941

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DR	MKPL/RWYG
CHK	KEFR
APVD	VTBS

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Atlanta, Georgia 30336

CIVIL
CIVIL DETAILS

SHEET	16 OF 69
DWG NO.	C2.4
DATE	JULY 15, 2011
PROJ NO.	10ATL02-55

GEORGIA REGISTERED PROFESSIONAL ENGINEER No. 33285 LEE R. CHAMBERS
GEORGIA REG. 33285

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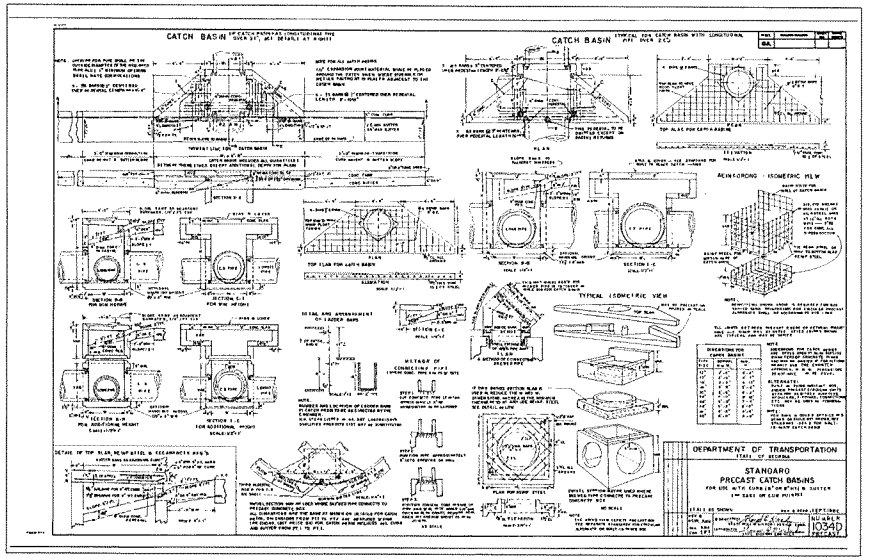

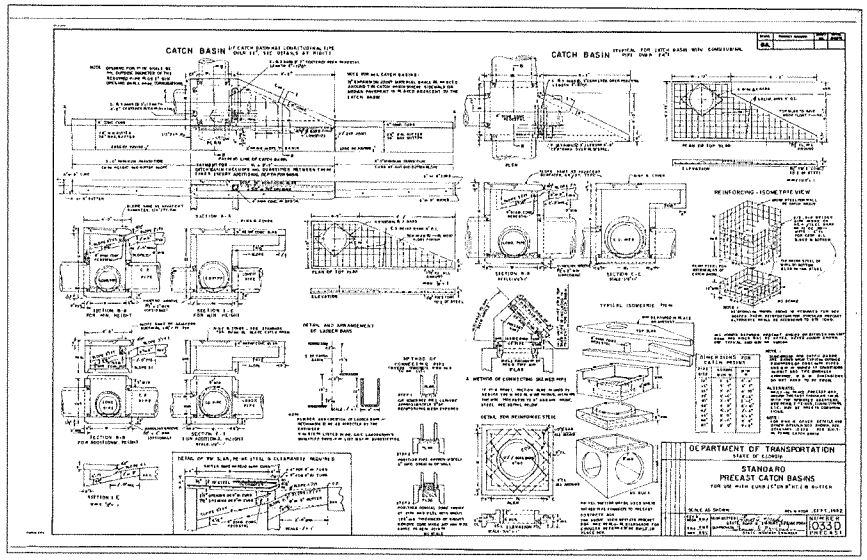

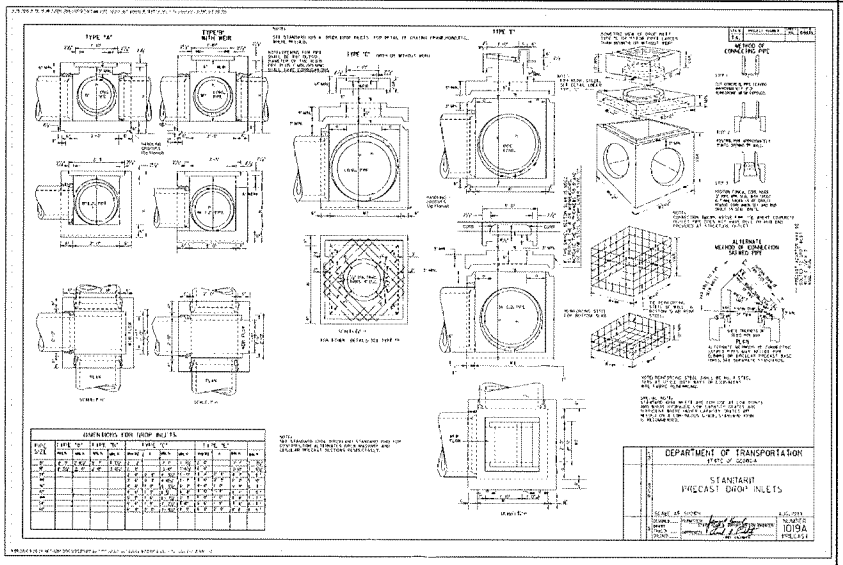

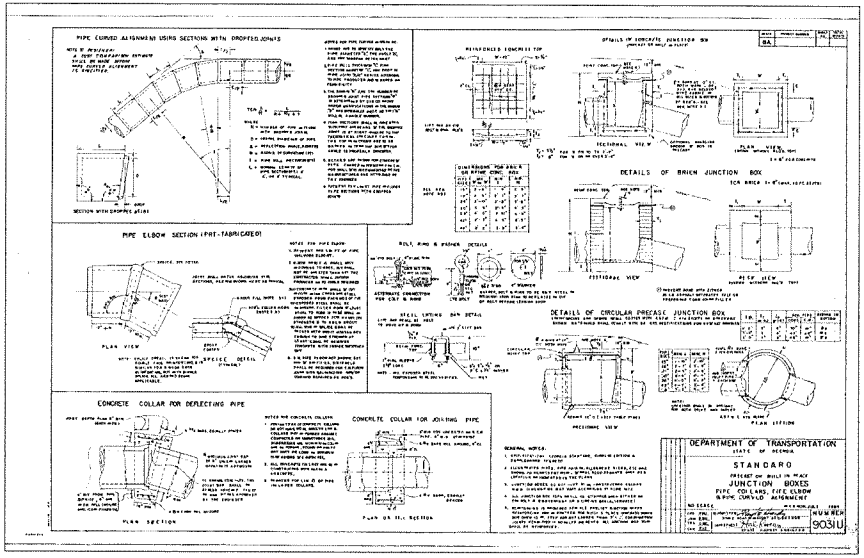

GEORGIA REGISTERED No. 33285 PROFESSIONAL ENGINEER KENNETH K. FOWLER

GSWCC NO. 37691

KHAFRA ENGINEERING CONSULTANTS, INC
225 PEACHTREE STREET, SUITE 1600
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404-525-2120 FAX 404-522-7941

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DR	MKPL/RWYG
CHK	KEFR
APVD	VTBS

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4760 Fulton Industrial Blvd.
Atlanta, Georgia 30336

CIVIL
CIVIL DETAILS

SHEET	17 OF 69
DWG NO.	C2.5
DATE	JULY 15, 2011
PROJ NO.	10ATL02-55

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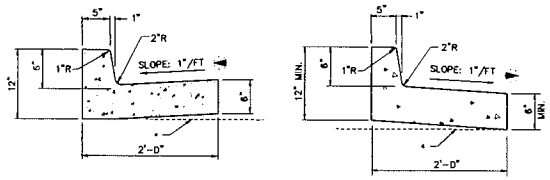


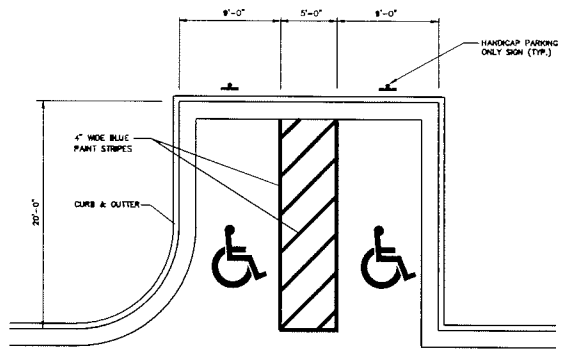
NOTE:

1. NOT FOR USE IN THE PUBLIC RIGHT-OF-WAY.
2. EXPANSION JOINTS REQUIRED AT ALL STRUCTURES AND CURB RETURNS.
3. ◄► DENOTES SLOPE OF GUTTER
   - ◄ -EAST OF DRIVEWAY "A", "C", "D"
   - ► -WEST OF DRIVEWAY "A", "C", "D"

*AT CONTRACTOR'S OPTION, THE GUTTER THICKNESS MAY BE INCREASED TO MAKE BOTTOM OF GUTTER PARALLEL WITH PAVING OF BASE COURSE, BUT THE THICKNESS SHALL NOT BE LESS THAN THE SPECIFIED 6" AT ANY POINT.

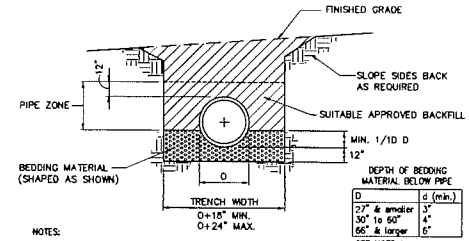
CONCRETE CURB & GUTTER(PRIVATE ROAD)

NTS



HANDICAP PARKING

NTS



DEPTH OF BEDDING MATERIAL BELOW PIPE

D	d (min.)
27" & smaller	3"
30" to 60"	4"
66" & larger	6"

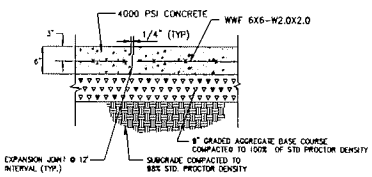
SEE NOTE 1

NOTES:

1. FOR CLASS "A" BEDDINGS, USE "d" AS DEPTH OF CONCRETE BELOW PIPE UNLESS OTHWISE INDICATED BY SOIL OR DESIGN CONDITIONS.
2. FOR CLASS "B" AND "C" BEDDINGS, SUBGRADES SHOULD BE EXCAVATED OR OVER EXCAVATED, IF NECESSARY, SO A UNIFORM FOUNDATION FREE OF PROTRUDING ROCKS MAY BE PROVIDED.

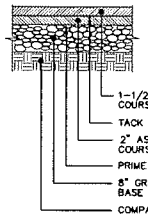
PIPE BEDDING DETAIL

NTS



PORTLAND CEMENT PAVEMENT

N.T.S.



NOTE:
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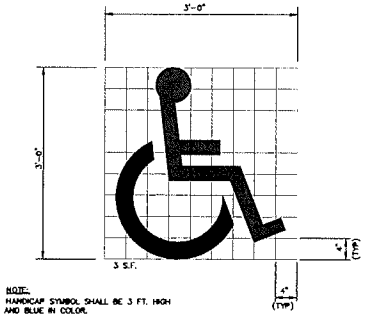
ASPHALT PAVEMENT

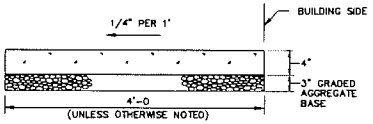
NTS



NOTE:
HANDICAP SYMBOL SHALL BE 3 FT. HIGH AND BLUE IN COLOR.

HANDICAPPED PAVEMENT SYMBOL

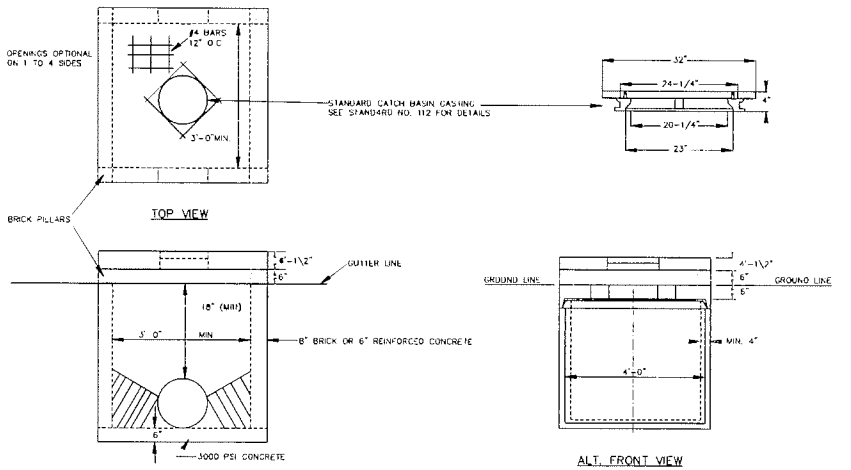
NTS



1. SIDEWALK TO BE SCRIBED IN SQUARES EQUAL TO WALK WIDTH, BUT NOT TO EXCEED 10'.
2. CONCRETE TO BE 3000 PSI MINIMUM.
3. INSTALL EXPANSION JOINTS ACROSS THE SIDEWALK AT EACH DRIVEWAY AND NOT MORE THAN 50' APART.
4. PREFORMED BITUMINOUS EXPANSION MATERIAL SHALL BE PLACED BETWEEN ALL FIXED OBJECTS (EXCEPT CURB) AND THE NEW CONCRETE SIDEWALK.
5. NOT FOR USE IN THE PUBLIC RIGHT-OF-WAY.

CONCRETE SIDEWALK

NTS
(USE OUTSIDE OF C.D.A. RIGHT-OF-WAY)



NOTE:
BRICK OR MASONRY INVERT REQUIRED (ROMLOCK), OR CONCRETE

NOTE:
FOR DETAILS ON ROUND TO SQUARE ADAPTER, SEE FILE NO. 507

FULTON COUNTY STANDARD DETAIL 512 DROP INLETS (WEIR TYPE)	DATE / REVISIONS / DATE / REVISIONS	DGS/DRN/DSNR: CMS APPROVED: REW DATE: 12-2-06		FULTON COUNTY PUBLIC WORKS 141 PRYOR ST. ATLANTA, GA. 30303 404-612-7400 FAX: 404-224-0498	DRAWING NO. 512

DROP INLET

NOTES:

1. FOR ALL INLETS SPECIFIED AS 'FC STD 512', OPENINGS ARE TO BE ON ALL FOUR (4) SIDES.

GEORGIA REGISTERED No. 33285 PROFESSIONAL ENGINEER JEDETH K. POOLE
CONOC NO. 37867

KHAFRA ENGINEERING CONSULTANTS, INC
235 PEACHTREE STREET, SUITE 1600
ATLANTA, GEORGIA 30303
404-573-7120 FAX 404-522-7941

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Atlanta, Georgia 30336

CIVIL
CIVIL DETAILS

SHEET	18 OF 69
DWG NO.	C2.6
DATE	JULY 15, 2011
PROJ NO.	10ATLD2-55

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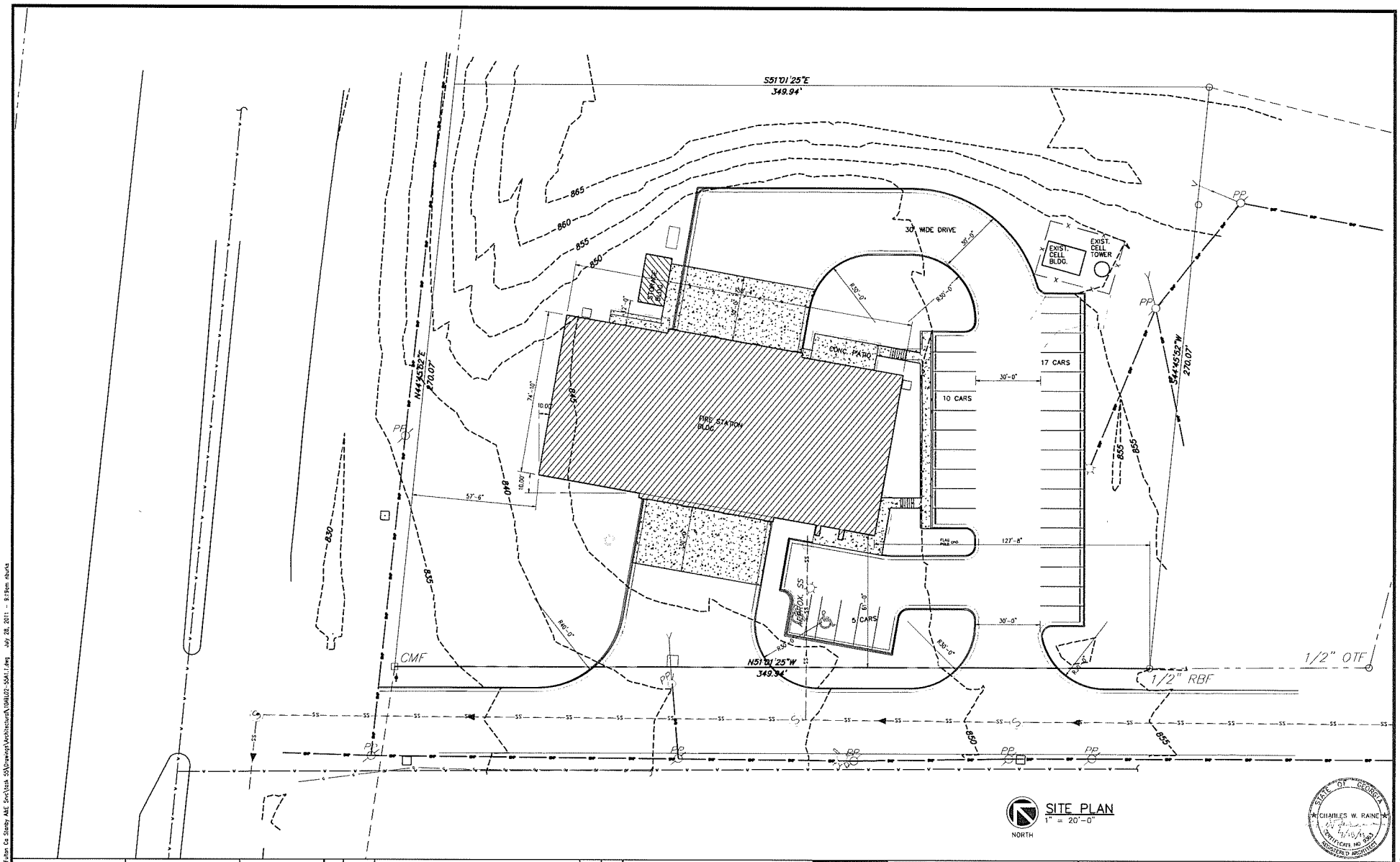

SITE PLAN
1" = 20'-0"
NORTH

STATE OF GEORGIA
CHARLES W. RAINE
CERTIFICATE NO. 3363
REGISTERED ARCHITECT

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KHAFRA ENGINEERING CONSULTANTS, INC.
225 PEACHTREE STREET, SUITE 1600
ATLANTA, GEORGIA 30303
404-523-2120 FAX 404-522-7941

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DR	RKGA
CHK	XXXX
APVD	XXXX

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FIRE STATION No. 11
4760 Fulton Industrial Blvd.
Atlanta, Georgia 30336

ARCHITECTURAL
SITE PLAN

SHEET 19 OF 69
DWG NO. A1.1
DATE JULY 15, 2011
PROJ NO. 10ATL02-55

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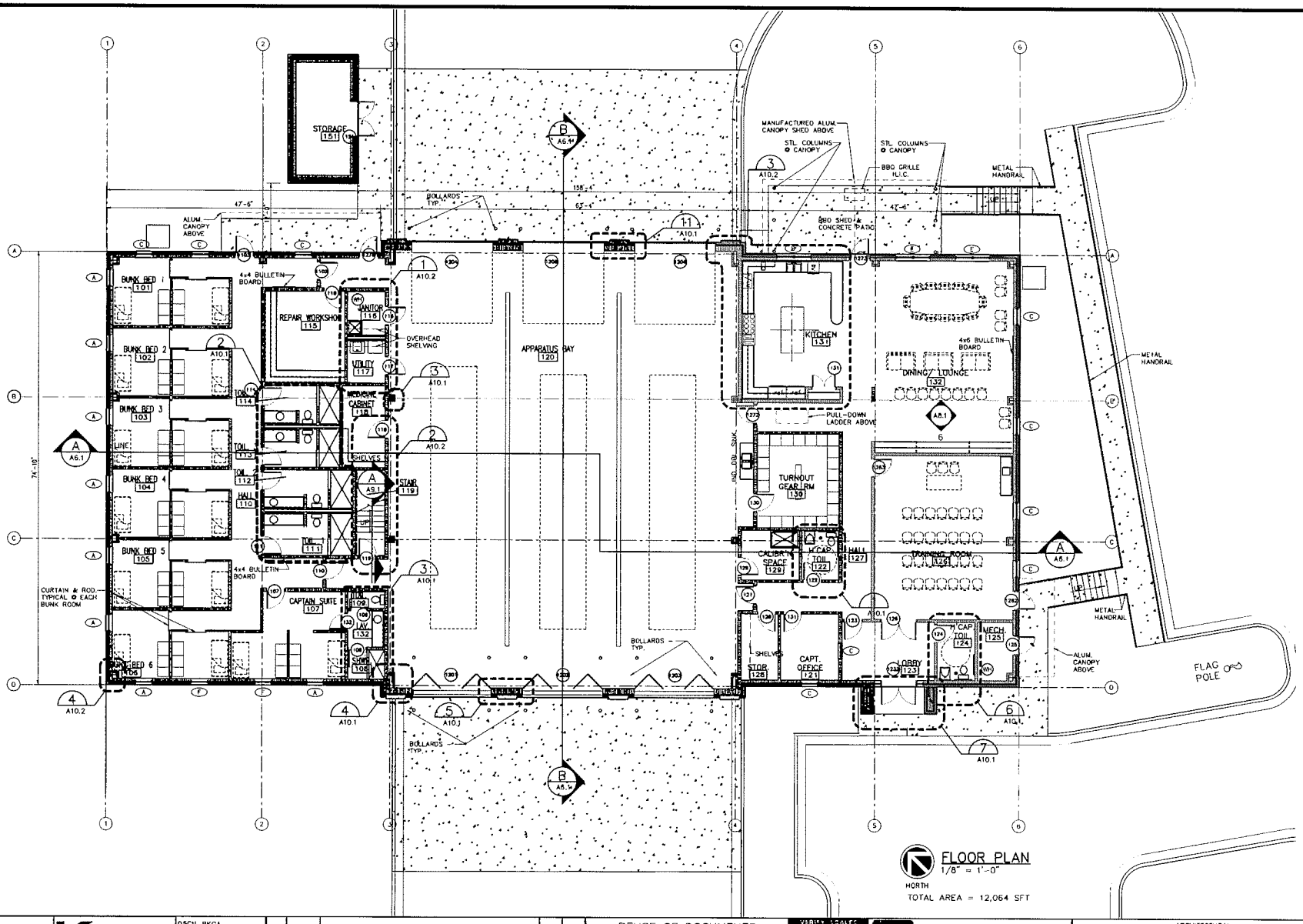

FLOOR PLAN

1/8" = 1'-0"

TOTAL AREA = 12,064 SFT

STATE OF GEORGIA
CHARLES W. RAINE
CERTIFICATE NO. 5140
REGISTERED ARCHITECT

KHAFRA ENGINEERING CONSULTANTS, INC.
325 PEACHTREE STREET, SUITE 1800
ATLANTA, GEORGIA 30303
404-523-2120 FAX 404-522-7911

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ARCHITECTURAL

FLOOR PLAN

SHEET 20 OF 69
DWG NO. A2.1
DATE JULY 15, 2011
PROJ NO. 10ATL02-55

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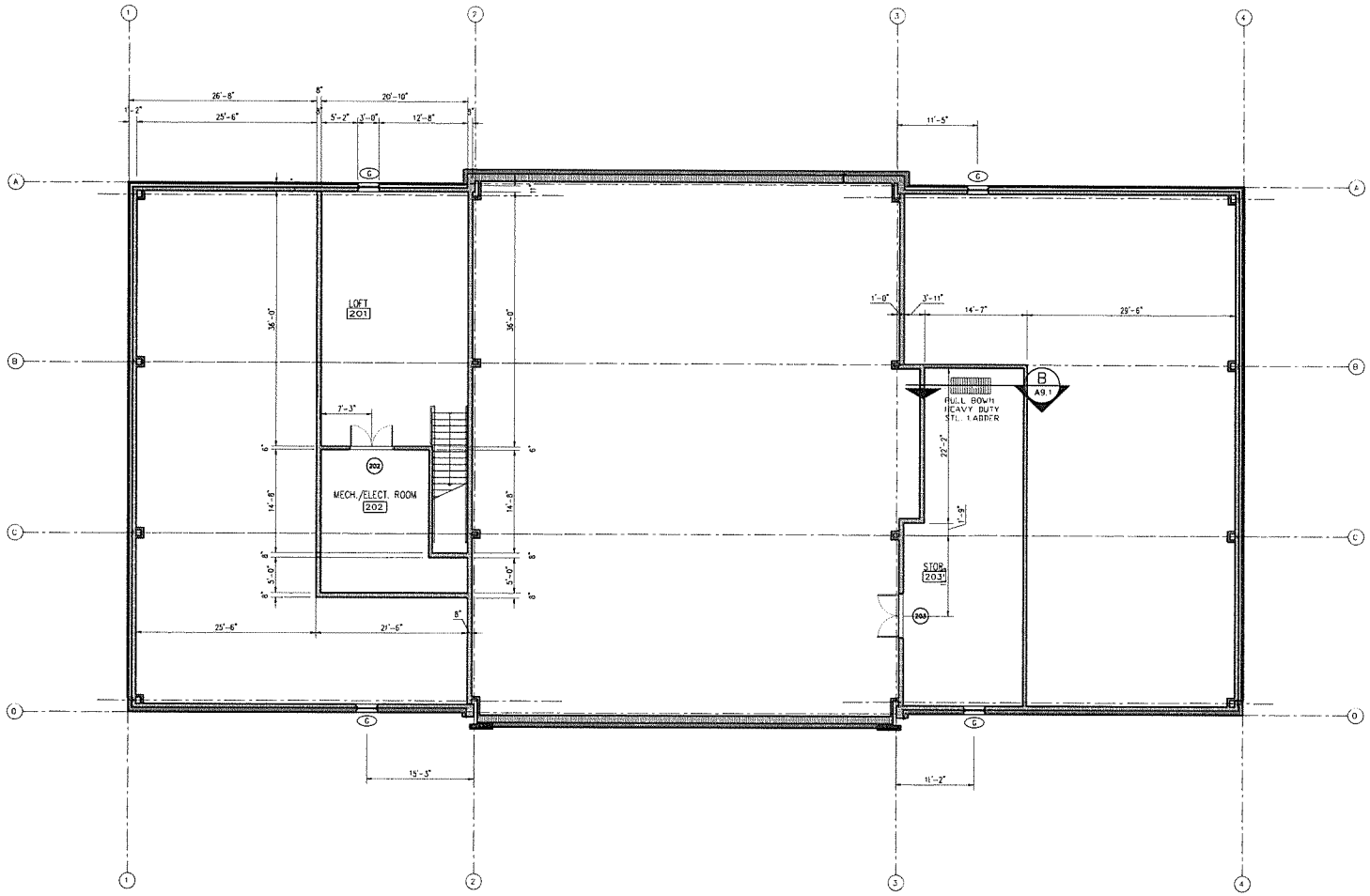

NORTH

LOFT PLAN
1/8" = 1'-0"

STATE OF GEORGIA
CHARLES W. RAINE
CERTIFICATE NO. 5061
REGISTERED ARCHITECT

KHAFRA ENGINEERING CONSULTANTS, INC.
225 PEACHTREE STREET, SUITE 1600
ATLANTA, GEORGIA 30303
404-525-2170 FAX 404-522-7941

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Atlanta, Georgia 30338

ARCHITECTURAL
LOFT PLAN

SHEET 21 OF 69
DWG NO. A2.2
DATE JULY 15, 2011
PROJ NO. 10ATL02-55

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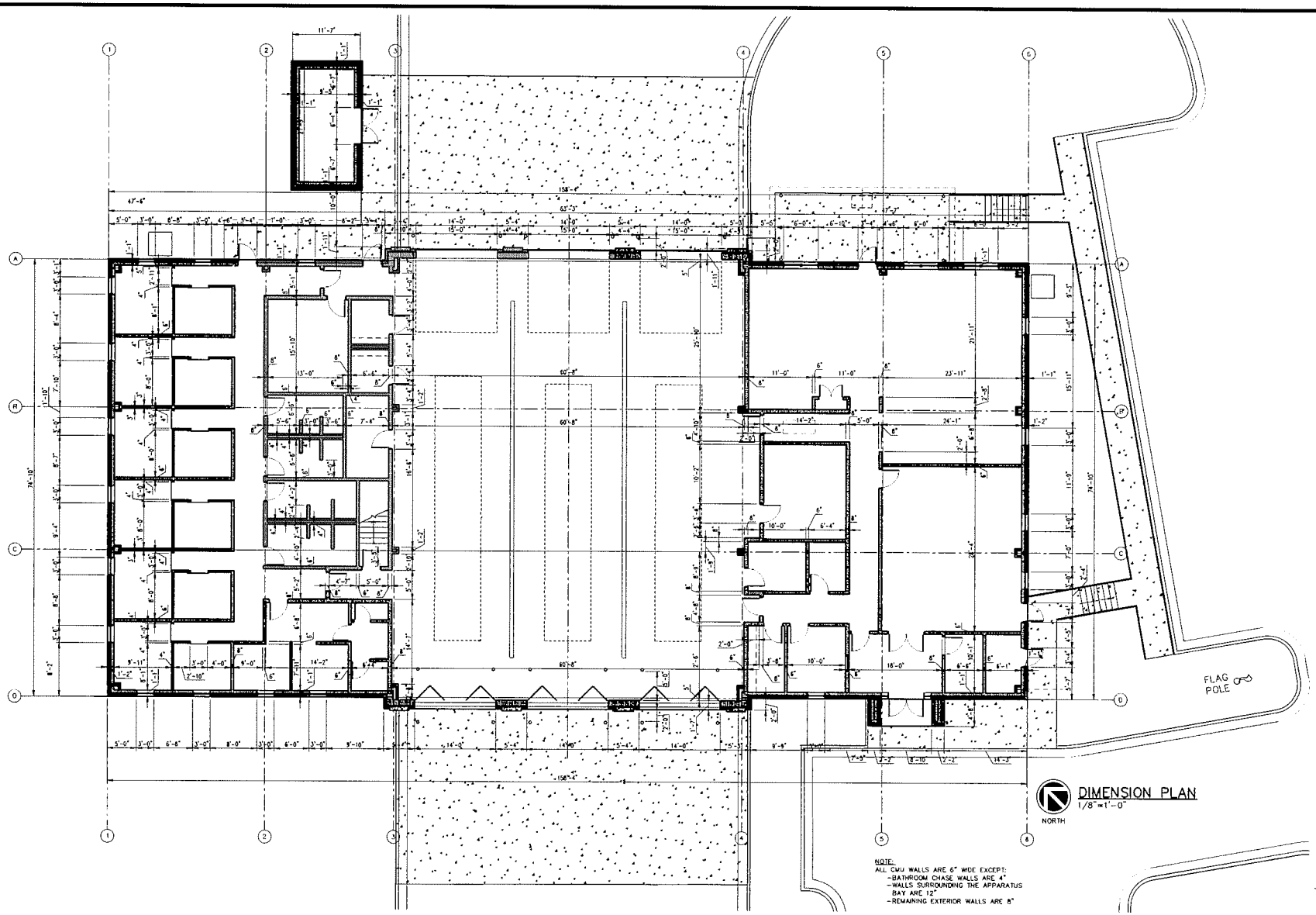

DIMENSION PLAN
1/8"=1'-0"

NOTE:
ALL CMU WALLS ARE 6" WIDE EXCEPT:
- BATHROOM CHASE WALLS ARE 4"
- WALLS SURROUNDING THE APPARATUS BAY ARE 12"
- REMAINING EXTERIOR WALLS ARE 8"

STATE OF GEORGIA
CHARLES W. RAINE
CERTIFICATE NO. 5363
REGISTERED ARCHITECT

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DIMENSION PLAN

SHEET 22 OF 69
DWG NO. A2.3
DATE JULY 15, 2011
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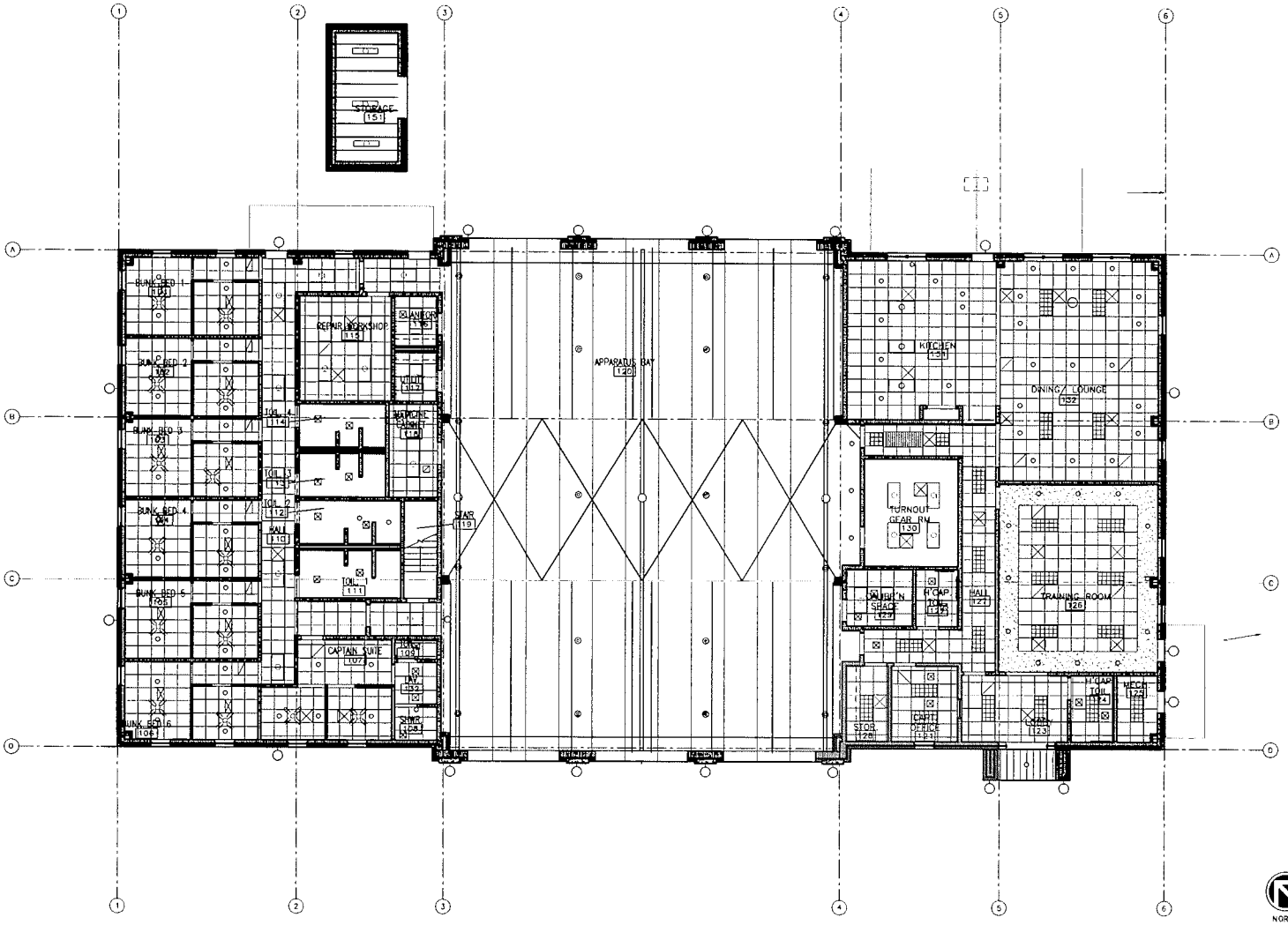

CEILING LEGEND	
	2x4 FLUORESCENT
	2x4 FLUORESCENT - PARABOLIC
	2x2 FLUORESCENT - PARABOLIC
	42" FAN
	2x2 HVAC SUPPLY DIFF.
	2x2 HVAC RETURN AIR
	RECESSED DOWNLIGHT FIXTURE
	RECESSED DOWNLIGHT HALFCOVER
	EMERGENCY EXIT LIGHT
	SPEAKER
	FLUORESCENT LIGHT
	SPRINKER
	2x2 DIRECT/ INDIRECT COMPACT FLUORESCENT LIGHT FIXTURE
	GWB CEILING/SOFFIT AT HEIGHT INDICATED
	2x2 ACCOUSTICAL CEILING GRID AT HEIGHT INDICATED (TEGULAR CEILING TILES)
ROOM 000 0'-0" TYPE	ROOM NAME & NUMBER, CEILING HEIGHT AND TYPE

REFLECTED CEILING PLAN
1/8"=1'-0"

NORTH

STATE OF GEORGIA
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CERTIFICATE NO. 5801
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REFLECTED CEILING PLAN

SHEET 23 OF 69
DWG NO. A3.1
DATE JULY 15, 2011
PROJ NO. 10ATL02-55

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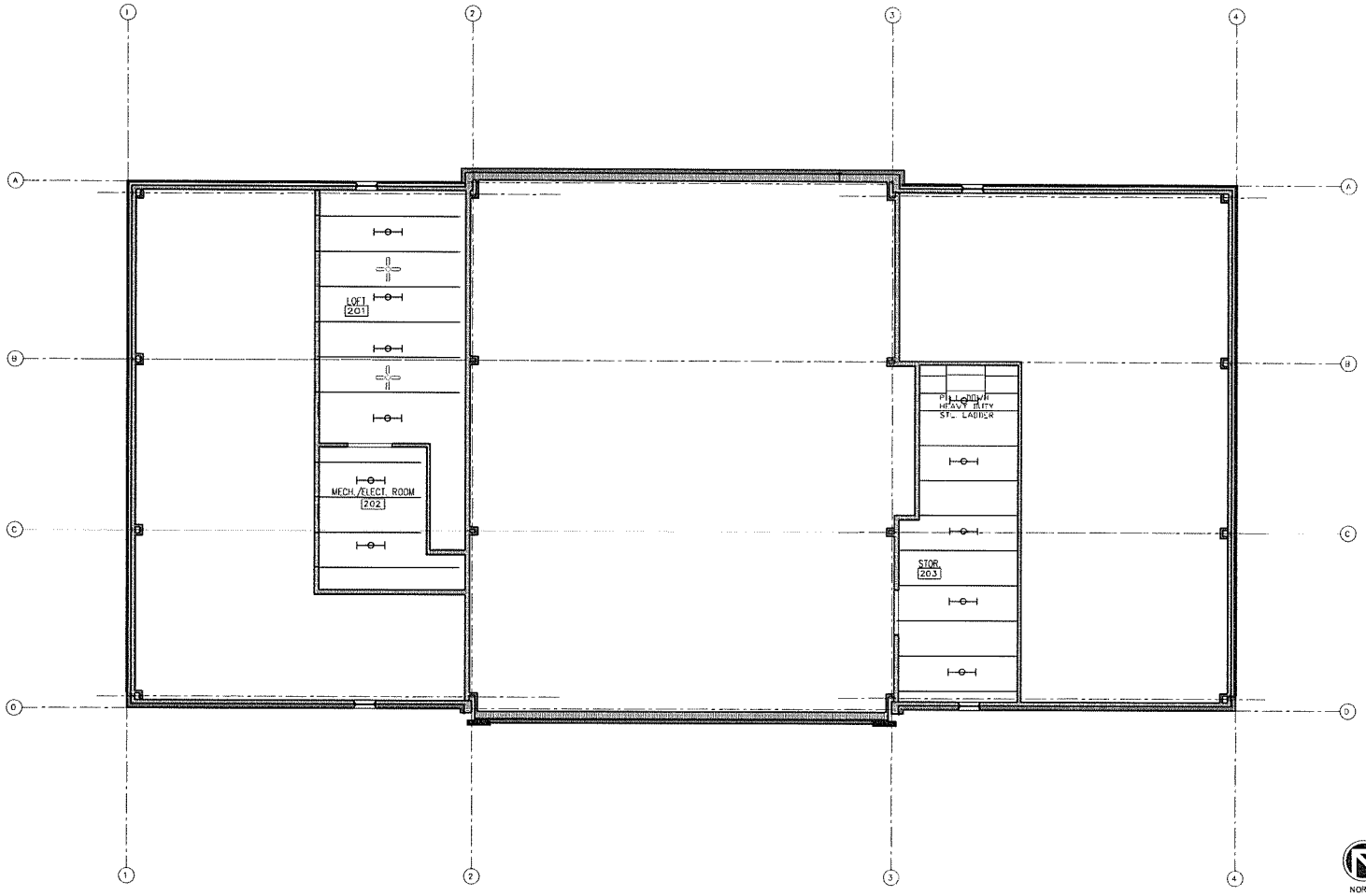

CEILING LEGEND	
	2x4 FLUORESCENT
	2x4 FLUORESCENT – PARABOLIC
	2x2 FLUORESCENT – PARABOLIC
	42" FAN
	2x2 HVAC SUPPLY DIFF.
	2x2 HVAC RETURN AIR
	RECESSED DOWNLIGHT FIXTURE
	RECESSED DOWNLIGHT HALFCOVER
	EMERGENCY EXIT LIGHT
	SPEAKER
	FLUORESCENT LIGHT
	SPRINKER
	2x2 DIRECT/ INDIRECT COMPACT FLUORESCENT LIGHT FIXTURE
	GWB CEILING/SOFFIT AT HEIGHT INDICATED
	2x2 ACCOUSTICAL CEILING GRID AT HEIGHT INDICATED (REGULAR CEILING TILES)
ROOM 100 0'-0" TYPE	ROOM NAME & NUMBER, CEILING HEIGHT AND TYPE

NORTH

REFLECTED CEILING LOFT PLAN
1/8"=1'-0"

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CHARLES W. RAINE
7/15/11
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ARCHITECTURAL
REFLECTED CEILING LOFT PLAN

SHEET 24 OF 69
DWG NO. A3.2
DATE JULY 15, 2011
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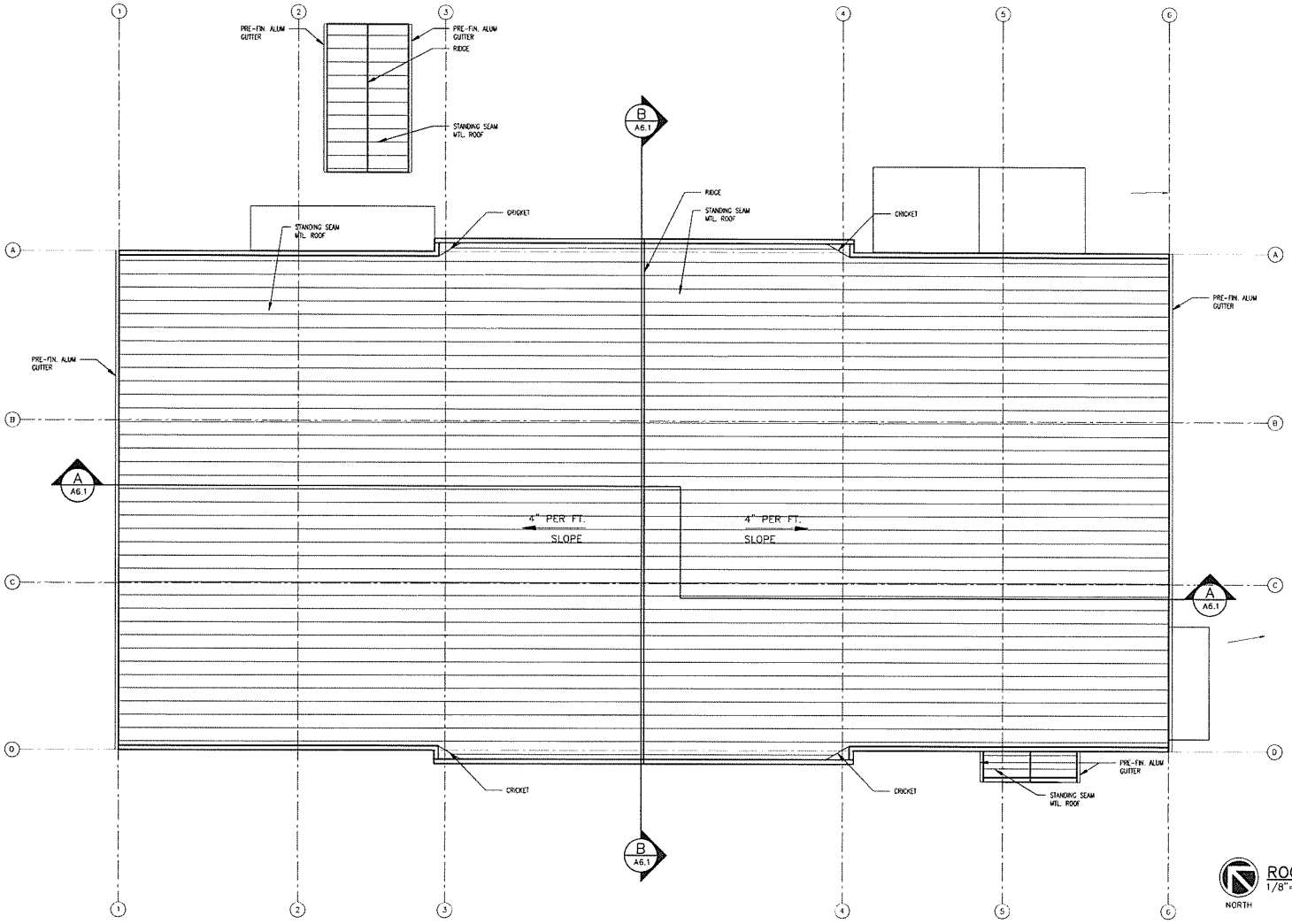

ROOF PLAN
1/8"=1'-0"

NORTH

STATE OF GEORGIA
CHARLES W. RAINE
CERTIFICATE NO. 5661
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ARCHITECTURAL
ROOF PLAN

SHEET	25 OF 69
DWG NO.	A3.3
DATE	JULY 15, 2011
PROJ NO.	10ATL02-55

ROOM FINISH SCHEDULE

Number	ROOM NAME	FLOOR	BASE	WALLS N	WALLS S	WALLS E	WALLS W	WALL FIN.	CEILING MATL	CEILING FINISH	CEILING HEIGHT	NOTES	Number
101	BUNK BED 1	PD CONC.	RUBBER	CMU	CMU	CMU	CMU	PT	GWB	PT	9'-0"	--	101
102	BUNK BED 2	PD CONC.	RUBBER	CMU	CMU	CMU	CMU	PT	GWB	PT	9'-0"	--	102
103	BUNK BED 3	PD CONC.	RUBBER	CMU	CMU	CMU	CMU	PT	GWB	PT	9'-0"	--	103
104	BUNK BED 4	PD CONC.	RUBBER	CMU	CMU	CMU	CMU	PT	GWB	PT	9'-0"	--	104
105	BUNK BED 5	PD CONC.	RUBBER	CMU	CMU	CMU	CMU	PT	GWB	PT	9'-0"	--	105
106	BUNK BED 6	PD CONC.	RUBBER	CMU	CMU	CMU	CMU	PT	GWB	PT	9'-0"	--	106
107	CAPTAIN SUITE	PD CONC.	RUBBER	CMU	CMU	CMU	CMU	PT	GWB	PT	9'-0"	--	107
108	SHWR.	CT	CT	CT	CT	CT	CT	CT	MRGWB	PT-1	8'-0"	--	108
109	TOIL.	CT	CT	CMU	CMU	CMU	CMU	--	GWB	PT	9'-0"	--	109
110	HALL	PD CONC.	RUBBER	CMU	CMU	CMU	CMU	PT	ACT	--	9'-0"	--	110
111	TOIL. 1	CT	CT	CMU	CMU	CMU	CMU	--	MRGWB	PT-1	9'-0"	CT on all walls at shower area	111
112	TOIL. 2	CT	CT	CMU	CMU	CMU	CMU	--	MRGWB	PT-1	9'-0"	CT on all walls in shower area	112
113	TOIL. 3	CT	CT	CMU	CMU	CMU	CMU	--	MRGWB	PT-1	9'-0"	CT on all walls in shower area	113
114	TOIL. 4	CT	CT	CMU	CMU	CMU	CMU	--	MRGWB	PT-1	9'-0"	CT on all walls in shower area	114
115	REPAIR WORKSHOP	PD CONC.	RUBBER	CMU	CMU	CMU	CMU	PT	ACT	--	9'-0"	--	115
116	JANITOR	SCONC.	CT-1	CMU	CMU	CMU	CMU	PT	ACT	--	9'-0"	--	116
117	UTILITY	SCONC.	CT-1	CMU	CMU	CMU	CMU	PT	ACT	--	8'-0"	--	117
118	MEDICINE CABINET	PD CONC.	RUBBER	CMU	CMU	CMU	CMU	PT	ACT	--	9'-0"	--	118
119	STAIR	PD CONC.	RUBBER	CMU	CMU	CMU	CMU	PT	--	--	9'-0"	--	119
120	APPARATUS BAY	SCONC.	CT-1	CMU	CMU	CMU	CMU	PT-1	METAL PANEL	--	24'-0"	See bldg. Sect. For ctg. Profile	120
121	CAPT. OFFICE	CARPET	RUBBER	CMU	CMU	CMU	CMU	PT	ACT	--	9'-0"	--	121
122	H.CAP. TOIL.	CT	CT	CMU	CMU	CMU	CMU	PT	ACT	--	9'-0"	--	122
123	LOBBY	CT	CT	CMU	CMU	CMU	CMU	PT	ACT	--	9'-0"	--	123
124	H.CAP. TOIL.	--	CT	CMU	CMU	CMU	CMU	PT	ACT	--	9'-0"	--	124
125	MECH.	SCONC.	--	CMU	CMU	CMU	CMU	PT	ACT	--	9'-0"	--	125
126	TRAINING ROOM	CARPET	RUBBER	CMU	CMU	CMU	CMU	PT	ACT/GWB	PT	9'-0"	See ref. Ctg. Plan	126
127	HALL	CT	CT	CMU	CMU	CMU	CMU	PT	ACT	--	9'-0"	--	127
128	STOR.	PD CONC.	RUBBER	CMU	CMU	CMU	CMU	PT	ACT	--	8'-0"	--	128
129	GALLEY'N SPACE	PD CONC.	CT-1	CMU	CMU	CMU	CMU	PT	ACT	--	8'-0"	--	129
130	TURNOUT GEAR RM	SCONC.	CT-1	CMU	CMU	CMU	CMU	PT-1	GWB	PT-1	8'-0"	--	130
130	TURNOUT GEAR RM	SCONC.	CT-1	CMU	CMU	CMU	CMU	PT-1	GWB	PT-1	8'-0"	--	130
131	KITCHEN	CT	CT	CMU	CMU	CMU	CMU	--	GWB	PT	9'-0"	--	131
132	LAV	CT	CT	CMU	CMU	CMU	CMU	--	GWB	PT	8'-0"	--	132
132	DINING/ LOUNGE	CT	CT	CMU	CMU	CMU	CMU	PT	ACT/GWB	PT	9'-0"	See ref. Ctg. Plan	132
151	STORAGE	SCONC.	--	--	--	--	--	PT	--	--	8'-6"	--	151

ROOM FINISH SCHEDULE

Number	ROOM NAME	FLOOR	BASE	WALLS N	WALLS S	WALLS E	WALLS W	WALL FIN.	CEILING MATL	CEILING FINISH	CEILING HEIGHT	NOTES	Number
201	LOFT	RUBBER MAT	RUBBER	CMU	CMU	CMU	CMU	?	--	--	8'-6"	--	201
202	MECH./ELECT. ROOM	CONC.	--	CMU	CMU	CMU	CMU	?	--	--	8'-6"	--	202
203	STOR.	PLYWOOD	--	CMU	CMU	CMU	CMU	?	--	--	8'-6"	--	203

INTERIOR FINISH LEGEND

MATERIAL:

CONC = CONCRETE
PD CONC = POLISHED AND OYED CONCRETE
CMU = CONCRETE MASONRY UNIT
CT = CERAMIC TILE
GWB = GYPSUM WALL BOARD
SCONC = SEALED CONCRETE

RUBBER MATT = 1/2" RUBBER MATT TILES
ACT = ACOUSTICAL CEILING TILE
EXP = EPOXY DUR-A-GARD

VCT = VINYL COMPOSITION TILE
GB = GLAZED CONCRETE BLOCK
WG = WIREGLASS
TEMP = TEMPERED GLASS

3. FINISH:
PT = PAINTED U = UNFINISHED
EXP = EPOXY FCT = FACTORY
TBS = COLOR TO BE SELECTED BY ARCHITECT

4. COLOR:
M = MATTE S = SEALED
G = GLOSS
TBS = COLOR TO BE SELECTED BY ARCHITECT

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CHARLES W. HAINE
CERTIFICATE NO. 5365
REGISTERED ARCHITECT

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FINISH SCHEDULE

SHEET 27 OF 69
DWG NO. A4.2
DATE JULY 15, 2011
PROJ NO. 10ATL02-55

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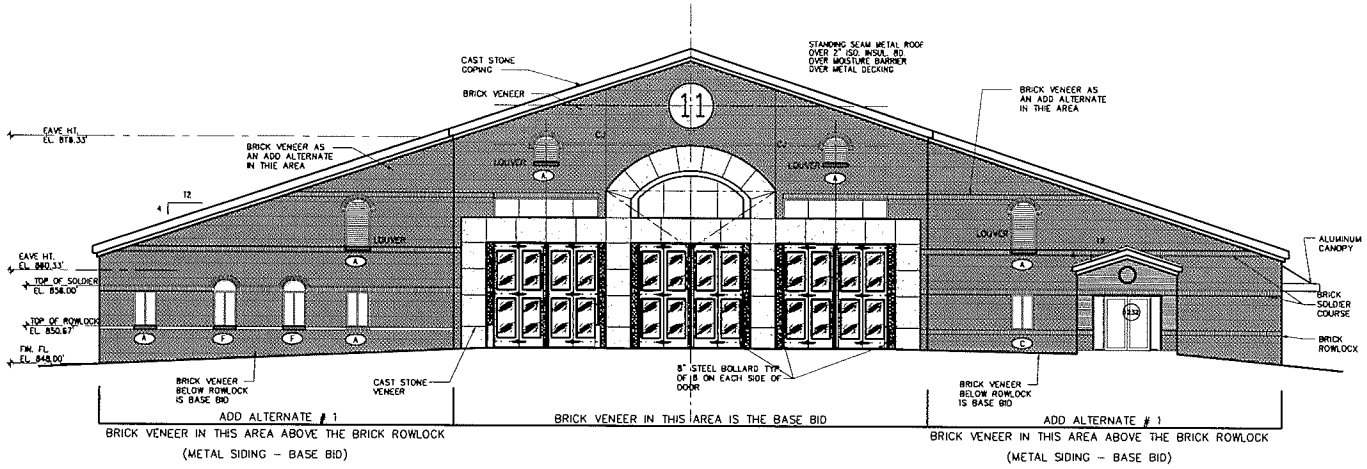
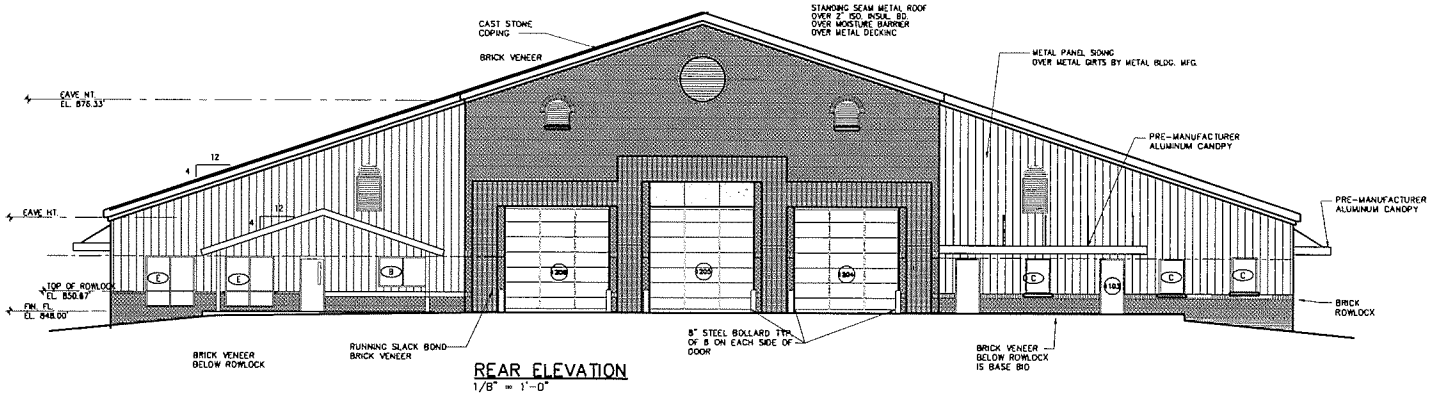


FRONT ELEVATION

1/8" = 1'-0"



REAR ELEVATION

1/8" = 1'-0"

STATE OF GEORGIA
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CERTIFICATE NO. 5361
REGISTERED ARCHITECT
7/15/11

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EXTERIOR ELEVATIONS

SHEET 28 OF 69
DWG NO. A5.1
DATE JULY 15, 2011
PROJ NO. 10ATL02-55

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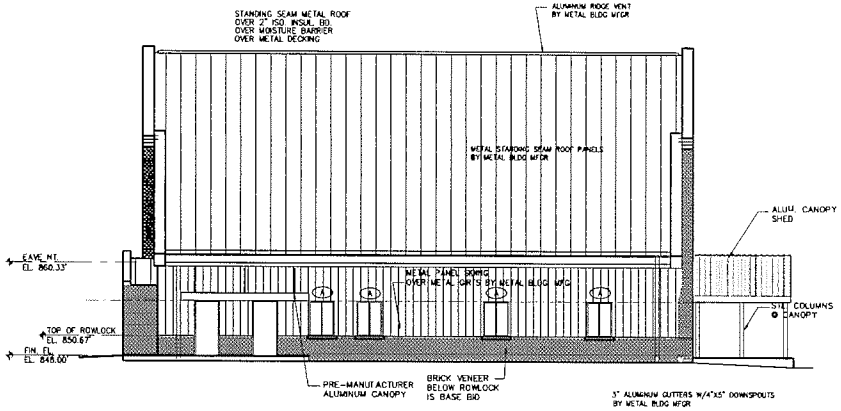
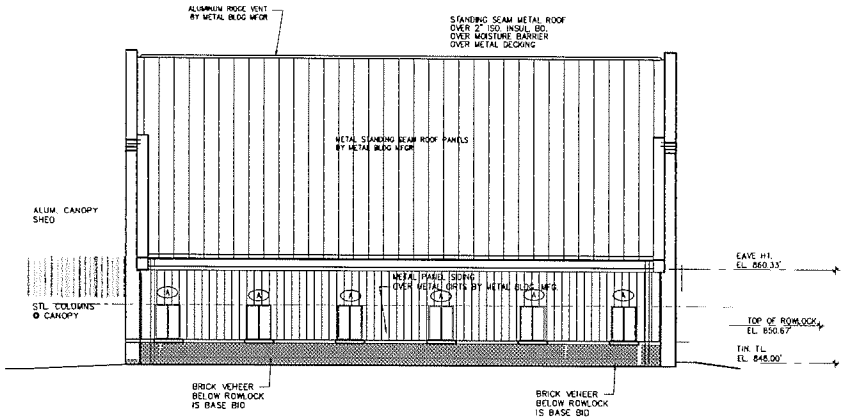


RIGHT SIDE ELEVATION
1/8" = 1'-0"



LEFT SIDE ELEVATION
1/8" = 1'-0"

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EXTERIOR ELEVATIONS – 2

SHEET 29 OF 69
DWG NO. A5.2
DATE JULY 15, 2011
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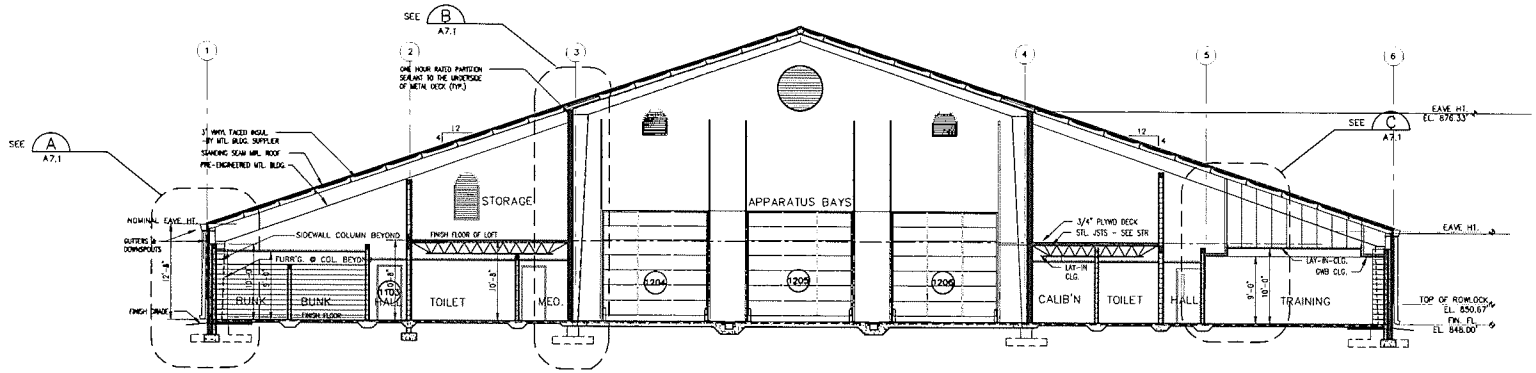
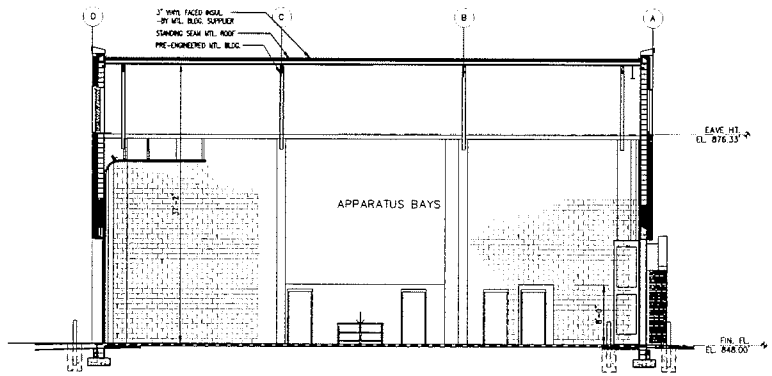


SECTION A
1/8" = 1'-0" A2.1



SECTION B
1/8" = 1'-0" A2.1

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ARCHITECTURAL

BUILDING SECTIONS

STATE OF GEORGIA
CHARLES W. RAINE
CERTIFICATE NO. 5351
REGISTERED ARCHITECT

SHEET	30 OF 69
DWG NO.	A6.1
DATE	JULY 15, 2011
PROJ NO.	10ATL02-55

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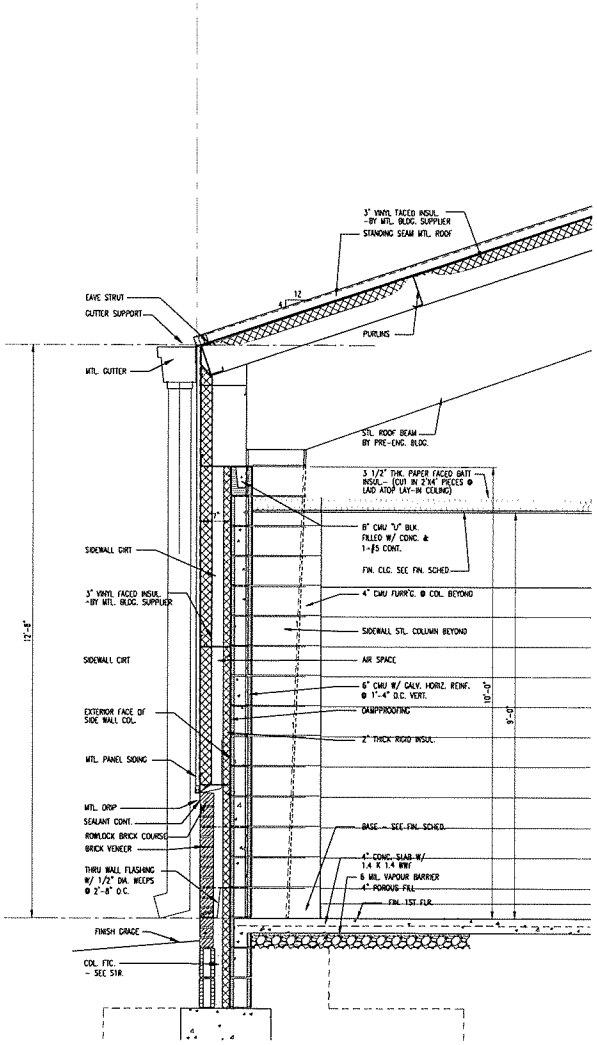
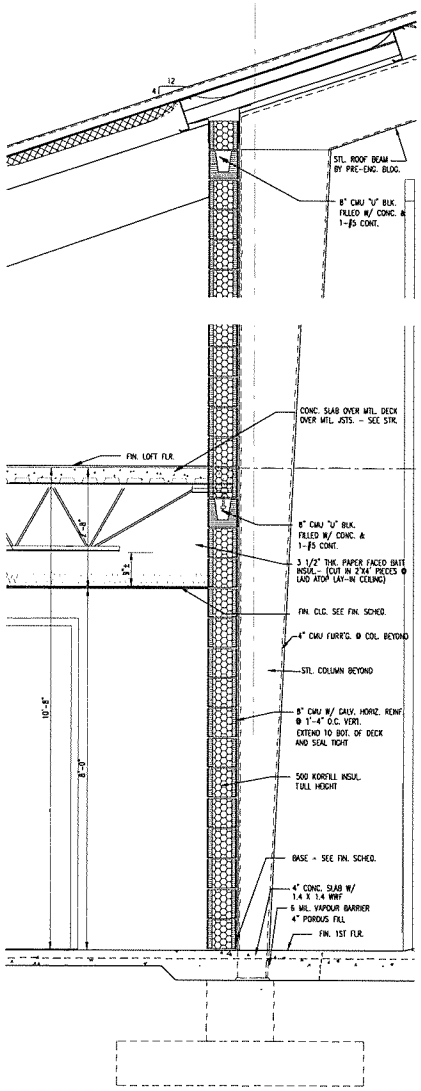
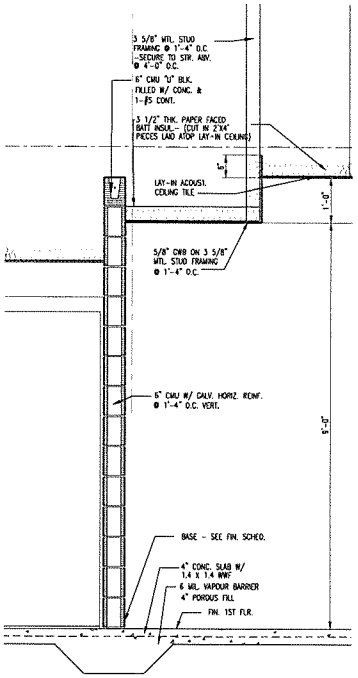


SECTION A
3/4" = 1'-0" A6.1



SECTION B
3/4" = 1'-0" A6.1



SECTION C
3/4" = 1'-0" A6.1

STATE OF GEORGIA
CHARLES W. RAINE
CERTIFICATE NO. 7430
REGISTERED ARCHITECT

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CHK	XXXX
APVD	XXXX

NO.	DATE	REVISION	BY	APVD

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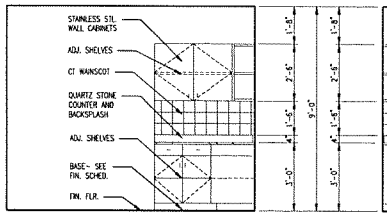
4760 Fulton Industrial Blvd.
Atlanta, Georgia 30336

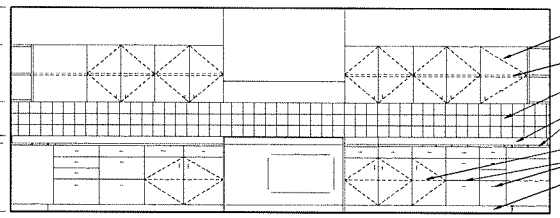
ARCHITECTURAL
WALL SECTIONS

SHEET	31 OF 69
DWG NO.	A7.1
DATE	JULY 15, 2011
PROJ NO.	10ATL02-55

S:\Engineer\10ATL02 Fulton Co Stanby AES Svc\Use 55\Drawings\Architectural\10ATL02-55A7.1-A7.2.dwg July 28, 2011 - 9:20am rbarks



KITCHEN ELEV. 1 A2.1
3/8"=1'-0"



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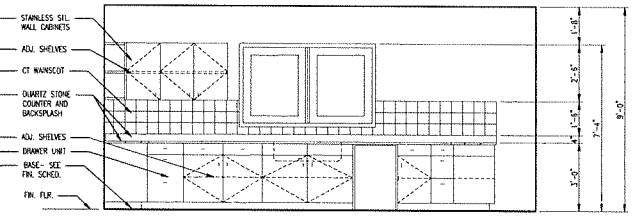
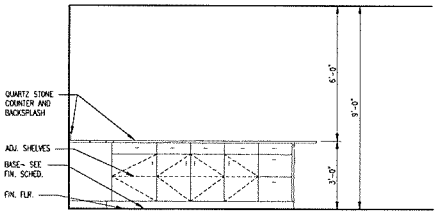
3/8"=1'-0"



KITCHEN ELEV. 3 A2.1
3/8"=1'-0"



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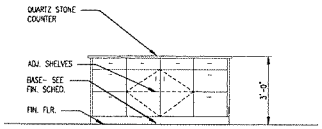
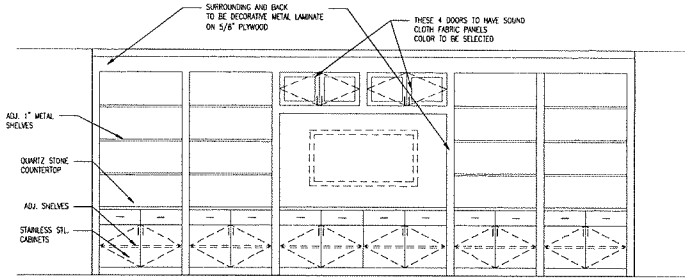
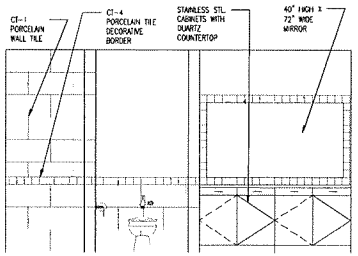
3/8"=1'-0"



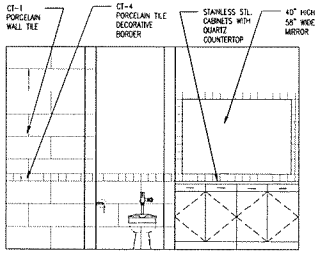
KITCHEN ISLAND ELEV. 5 A2.1
3/8"=1'-0"



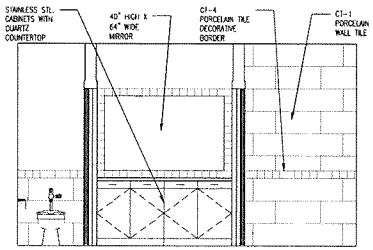
DINING/LOUNGE 132 6 A2.1
3/8"=1'-0"



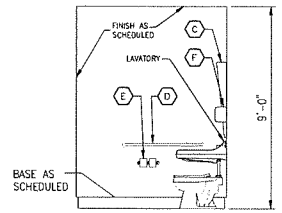
TOILET ROOM 110/112 7 A2.1
3/8"=1'-0"



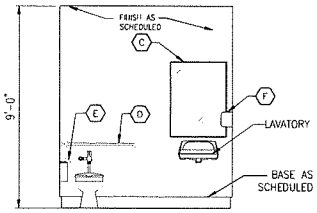
TOILET ROOM 113/114 8 A2.1
3/8"=1'-0"



TOILET ROOM 109 9 A2.1
3/8"=1'-0"



TOILET ROOM 124 10 A2.1
3/8"=1'-0"



TOILET ROOM 124 11 A2.1
3/8"=1'-0"

STATE OF GEORGIA
CHARLES W. RAINE
CERTIFICATE NO. 5363
REGISTERED ARCHITECT

KHAFRA ENGINEERING CONSULTANTS, INC.
225 PEACHTREE STREET, SUITE 1600
ATLANTA, GEORGIA 30303
404-523-2120 FAX 404-522-7941

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Atlanta, Georgia 30336

ARCHITECTURAL
INTERIOR ELEVATIONS

SHEET 32 OF 69
DWG NO. A8.1
DATE JULY 15, 2011
PROJ NO. 10ATL02-55

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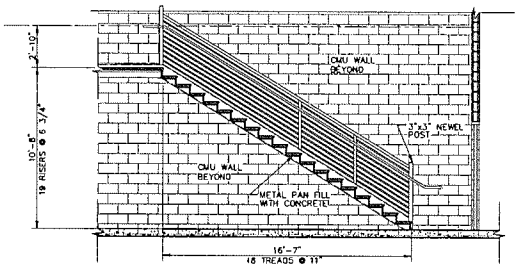
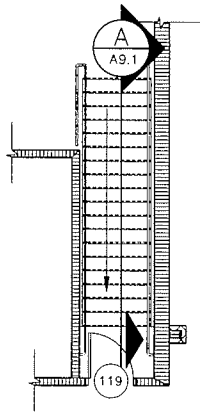
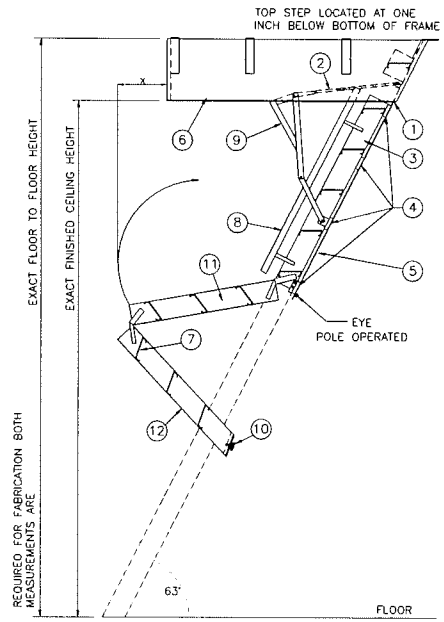


STAIR SECTION (A)
1/4"=1'-0"



ENLARGED STAIR PLAN (1)
1/4"=1'-0"



LOAD RATING – 500 LBS.

CEILING HEIGHT	X (CLEARANCE)
7'-1" to 8'-0"	13"
8'-1" to 8'-9"	14-1/2"
8'-10" to 9'-9"	22"

LADDER LEGEND

1. STEEL PIANO DOOR HINGE
2. DOUBLE SPRING ACTION
3. SIDE RUNNER 5" ALUM.
4. BATTEN 1/8" ALUM.
5. DOOR PANEL 1/8" ALUM.
6. STEEL ANGLE FRAME
7. TREAD (SERRATED ALUM.)
8. HANDRAIL RIGHT SIDE ONLY
9. EXTRA HEAVY OPERATING ARM
10. ADJUSTABLE FOOT
11. MIDDLE SECTION
12. BOTTOM SECTION

PULL-DOWN LADDER SECTION (B)
1" = 1'-0"
A2.2

STATE OF GEORGIA
CHARLES W. RAINE
CERTIFICATE NO. 5[illegible]
REGISTERED ARCHITECT

KHAFRA
ENGINEERING CONSULTANTS, INC.
225 PEACHTREE STREET, SUITE 1600
ATLANTA, GEORGIA 30303
404-523-7120 FAX 404-522-7811

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DR	RKGA
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APVD	CWRE

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FIRE STATION No. 11
4760 Fulton Industrial Blvd.
Atlanta, Georgia 30336

ARCHITECTURAL
DETAILS

SHEET 33 OF 69
DWG NO. A9.1
DATE JULY 15, 2011
PROJ NO. 10ATL02-55

RELEASED FOR BID

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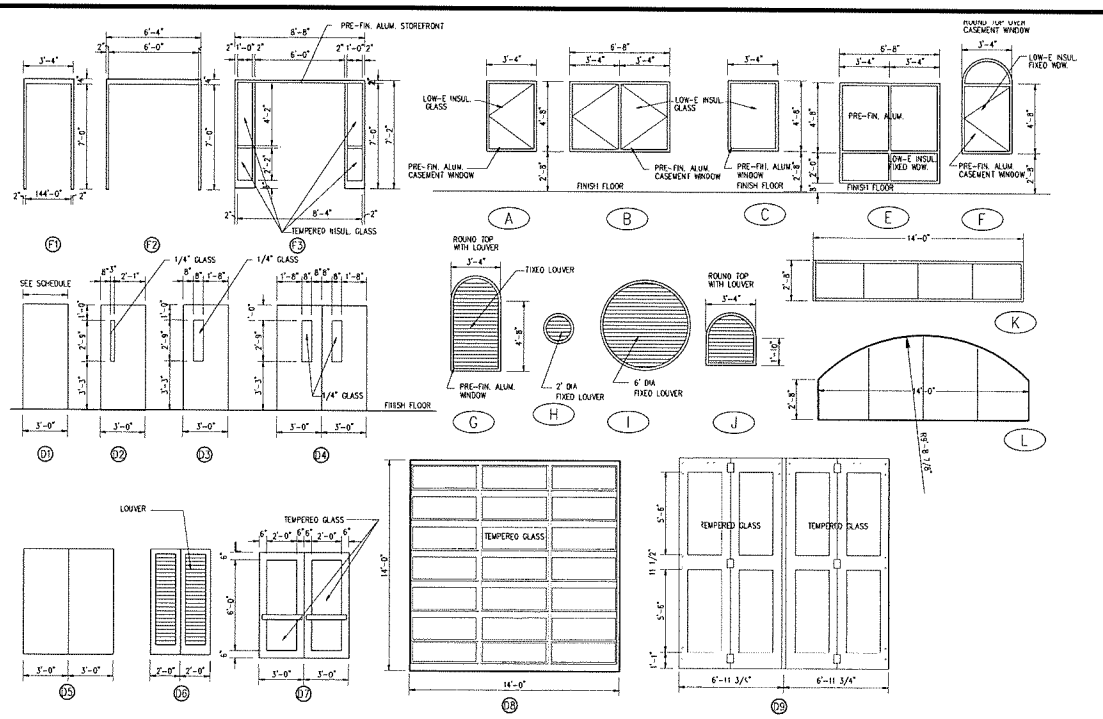
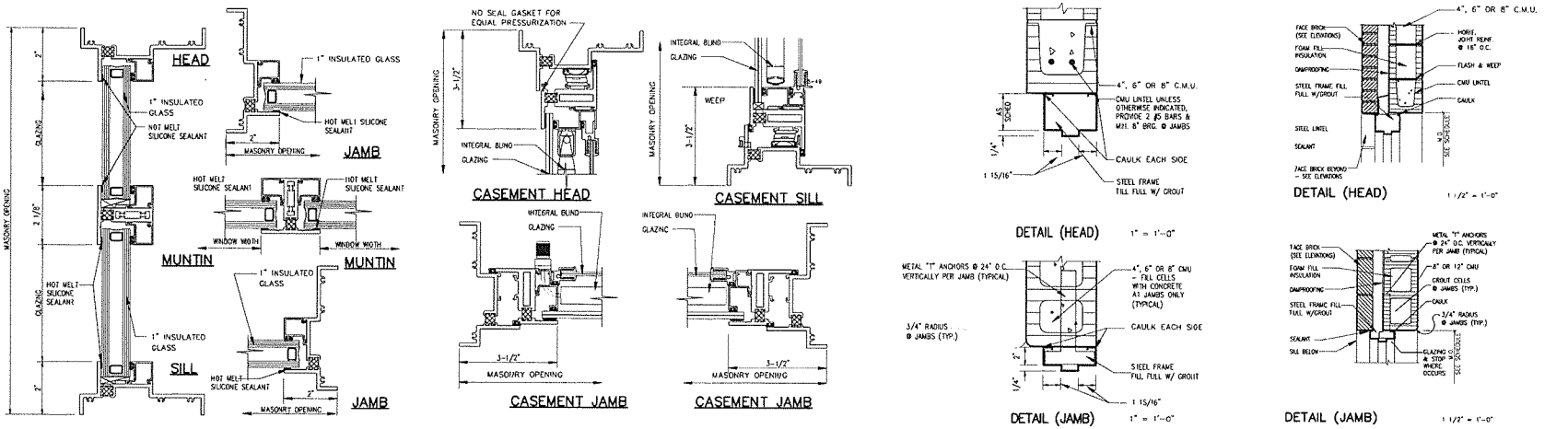
DOOR AND FRAME SCHEDULE

MARK	DOOR SIZE WD	DOOR SIZE HGT	DOOR SIZE THK	DOOR MATL	DOOR EI	DOOR GLAZING	LOUVER WD	LOUVER HGT	FRAME MATL	FRAME EL	DETAIL HEAD	DETAIL JAMB	DETAIL SILL	FIRE RATING LABEL	HARDWARE SET NO	HARDWARE KEYSIDE RM NO	NOTES	MARK
107	3'-0"	7'-0"	1 3/4"	FRP	01	--	0	0"	HM	F1	--	--	--	--	--	--	--	107
110	3'-0"	7'-0"	1 3/4"	FRP	02	3" X 33"	0	0"	HM	F1	--	--	--	60 MIN.	--	--	--	110
111	3'-0"	7'-0"	1 3/4"	FRP	01	--	0	0"	HM	F1	--	--	--	--	--	--	--	111
112	3'-0"	7'-0"	1 3/4"	FRP	01	--	0	0"	HM	F1	--	--	--	--	--	--	--	112
113	3'-0"	7'-0"	1 3/4"	FRP	01	--	0	0"	HM	F1	--	--	--	--	--	--	--	113
114	3'-0"	7'-0"	1 3/4"	FRP	01	--	0	0"	HM	F1	--	--	--	--	--	--	--	114
115	3'-0"	7'-0"	1 3/4"	FRP	02	3" X 33"	0	0"	HM	F1	--	--	--	60 MIN.	--	--	--	115
116	3'-0"	7'-0"	1 3/4"	FRP	01	--	0	0"	HM	F1	--	--	--	60 MIN.	--	--	--	116
117	3'-0"	7'-0"	1 3/4"	FRP	01	--	0	0"	HM	F1	--	--	--	60 MIN.	--	--	--	117
118	3'-0"	7'-0"	1 3/4"	FRP	01	--	0	0"	HM	F1	--	--	--	60 MIN.	--	--	--	118
119	3'-0"	7'-0"	1 3/4"	FRP	01	--	0	0"	HM	F1	--	--	--	60 MIN.	--	--	--	119
121	3'-0"	7'-0"	1 3/4"	FRP	03	8" X 33"	0	0"	HM	F1	--	--	--	--	--	--	--	121
122	3'-0"	7'-0"	1 3/4"	FRP	01	--	0	0"	HM	F1	--	--	--	--	--	--	--	122
123	3'-0"	7'-0"	1 3/4"	FRP	03	8" X 33"	0	0"	HM	F1	--	--	--	--	--	--	--	123
124	3'-0"	7'-0"	1 3/4"	FRP	01	--	0	0"	HM	F1	--	--	--	--	--	--	--	124
125	3'-0"	7'-0"	1 3/4"	INSUL. FRP	01	--	0	0"	HM	F1	--	--	--	--	--	--	--	125
126	6'-0"	7'-0"	1 3/4"	FRP	04	8" X 33"	0	0"	HM	F2	--	--	--	--	--	--	--	126
127	3'-0"	7'-0"	1 3/4"	FRP	02	3" X 33"	0	0"	HM	F1	--	--	--	60 MIN.	--	--	--	127
128	3'-0"	7'-0"	1 3/4"	FRP	01	--	0	0"	HM	F1	--	--	--	--	--	--	--	128
129	3'-0"	7'-0"	1 3/4"	FRP	01	--	0	0"	HM	F1	--	--	--	60 MIN.	--	--	--	129
130	3'-0"	7'-0"	1 3/4"	FRP	01	--	0	0"	HM	F1	--	--	--	60 MIN.	--	--	--	130
131	4'-0"	7'-0"	1 3/4"	FRP	05	--	0	0"	HM	F2	--	--	--	--	--	--	--	131
132	2'-8"	7'-0"	1 3/4"	FRP	01	--	0	0"	HM	F1	--	--	--	--	--	--	--	132
151	6'-0"	7'-0"	1 3/4"	INSUL. FRP	05	--	0	0"	HM	F2	--	--	--	--	--	--	--	151
1102	3'-0"	7'-0"	1 3/4"	FRP	02	3" X 33"	0	0"	HM	F1	--	--	--	60 MIN.	--	--	--	1102
1103	3'-0"	7'-0"	1 3/4"	INSUL. FRP	01	--	0	0"	HM	F1	--	--	--	--	--	--	--	1103
1201	14'-0"	14'-0"	1 3/4"	--	06	--	0	0"	--	--	--	--	--	--	--	--	--	1201
1202	14'-0"	14'-0"	1 3/4"	--	09	TEMPERED	0	0"	--	--	--	--	--	--	--	--	--	1202
1203	14'-0"	14'-0"	1 3/4"	--	09	TEMPERED	0	0"	--	--	--	--	--	--	--	--	--	1203
1204	14'-0"	14'-0"	1 3/4"	--	08	TEMPERED	0	0"	--	--	--	--	--	--	--	--	--	1204
1205	14'-0"	14'-0"	1 3/4"	--	08	TEMPERED	0	0"	--	--	--	--	--	--	--	--	--	1205
1206	14'-0"	14'-0"	1 3/4"	--	08	TEMPERED	0	0"	--	--	--	--	--	--	--	--	--	1206
1232	6'-0"	7'-0"	1 3/4"	ALUM. STOREFRONT	07	SEE ELEV.	0	0"	ALUM	F3	--	--	--	--	--	--	--	1232
1262	3'-0"	7'-0"	1 3/4"	INSUL. FRP	01	--	0	0"	HM	F1	--	--	--	--	--	--	--	1262
1263	3'-0"	7'-0"	1 3/4"	FRP	01	--	0	0"	HM	F1	--	--	--	--	--	--	--	1263
1272	3'-0"	7'-0"	1 3/4"	FRP	02	3" X 33"	0	0"	HM	F1	--	--	--	60 MIN.	--	--	--	1272
1273	3'-0"	7'-0"	1 3/4"	INSUL. FRP	01	--	0	0"	HM	F1	--	--	--	--	--	--	--	1273
1274	2'-8"	7'-0"	1 3/4"	FRP	01	--	0	0"	HM	F1	--	--	--	60 MIN.	--	--	--	1274
1275	3'-0"	7'-0"	1 3/4"	FRP	01	--	0	0"	HM	F1	--	--	--	--	--	--	--	1275
1276	3'-0"	7'-0"	1 3/4"	INSUL. FRP	01	--	0	0"	HM	F1	--	--	--	--	--	--	--	1276

DOOR AND FRAME SCHEDULE

MARK	DOOR SIZE WD	DOOR SIZE HGT	DOOR SIZE THK	DOOR MATL	DOOR EI	DOOR GLAZING	LOUVER WD	LOUVER HGT	FRAME MATL	FRAME EL	DETAIL HEAD	DETAIL JAMB	DETAIL SILL	FIRE RATING LABEL	HARDWARE SET NO	HARDWARE KEYSIDE RM NO	NOTES	MARK
202	6'-0"	7'-0"	1 3/4"	FRP	05	--	0	0"	HM	F2	--	--	--	--	--	--	--	202
203	6'-0"	7'-0"	1 3/4"	FRP	05	--	0	0"	HM	F2	--	--	--	60 MIN.	--	--	--	203





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ATLANTA, GEORGIA 30303
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ARCHITECTURAL

DOOR SCHEDULE

STATE OF GEORGIA
CHARLES W. RAINE
REGISTERED ARCHITECT

SHEET	26 OF 69
DWG NO.	A4.1
DATE	JULY 15, 2011
PROJ NO.	10ATL02-55

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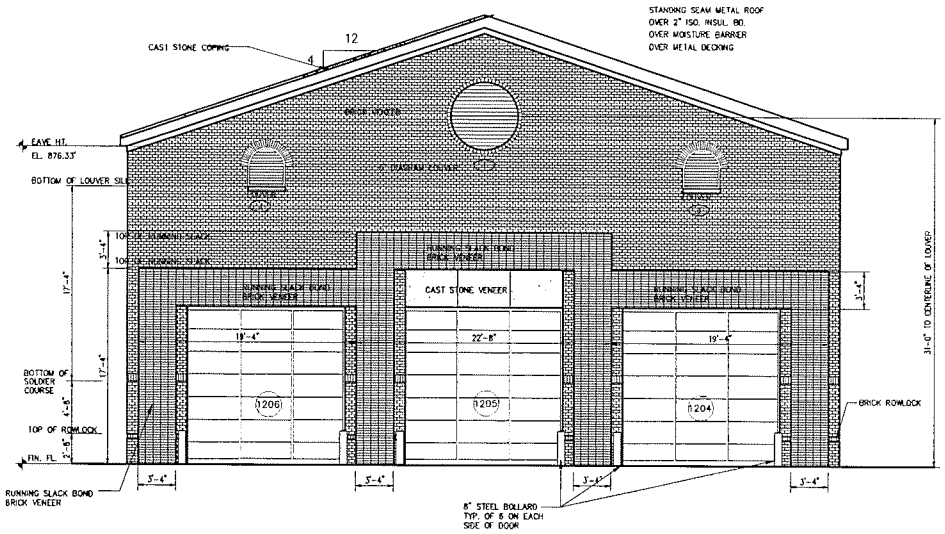
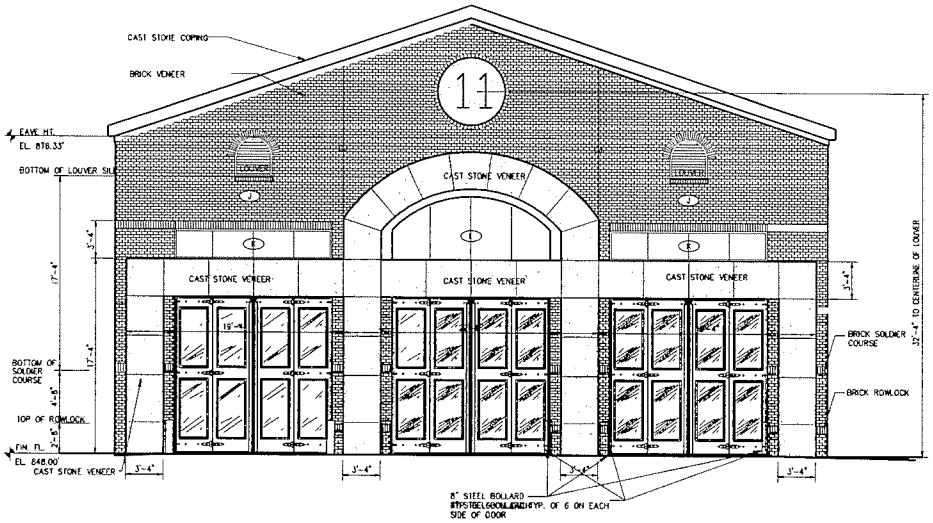


DETAIL 1
3/16" = 1'-0" A5.1



DETAIL 3
3/16" = 1'-0" A5.1

STATE OF GEORGIA
CHARLES W. RAINE
CERTIFICATE NO. 5863
REGISTERED ARCHITECT

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	DR RKGA				
	CHK JTRY				
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Atlanta, Georgia 30336

ARCHITECTURAL
DETAILS

SHEET 34 OF 69
DWG NO. A9.2
DATE JULY 15, 2011
PROJ NO. 10ATL02-55

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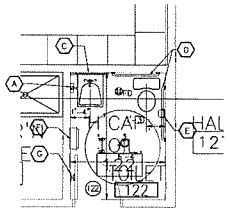
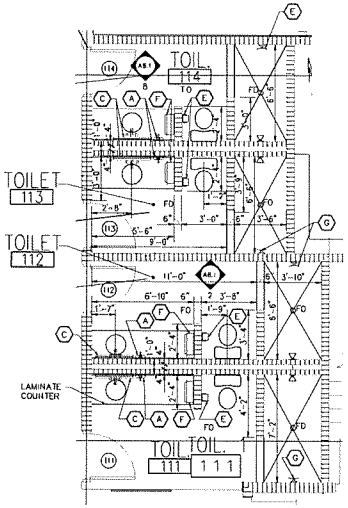
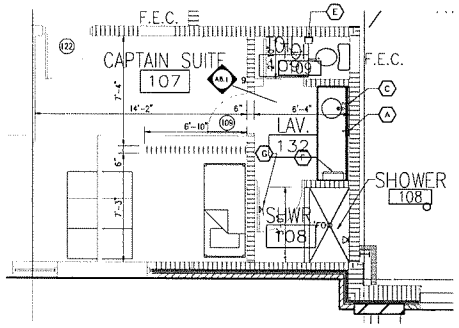


NORTH ENLARGED PLAN 1 (A2.1)
1/4"=1'-0"



NORTH ENLARGED PLAN 2 (A2.1)
1/4"=1'-0"

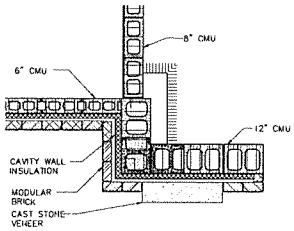


NORTH ENLARGED PLAN 3 (A2.1)
1/4"=1'-0"

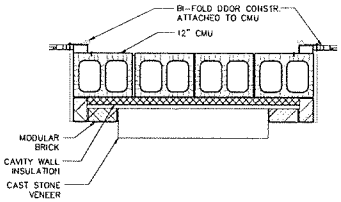
TOILET ACCESSORY SCHEDULE

SYMBOL	MARK	ACCESSORY
	A	LIQUID SOAP DISPENSER SURFACED MOUNTED BRADLEY MODEL NO. 6562
	B	NOT USED
	C	MIRRORS: BRADLEY MODEL NO. 780-3072 (30"x72" VERTICAL)
	D	GRAB BARS CONCEALED MOUNTED BRADLEY MODEL NO. 812-059-2
	E	TISSUE DISPENSERS: BRADLEY MODEL NO. 5241 (DOUBLE ROLL)
	F	PAPER TOWEL DISPENSER / WASTE RECEPTACLE BRADLEY MODEL NO. 235
	G	ROBE HOOK: BRADLEY MODEL NO. 9124
	H	MOP AND BROOM HOLDER - BRADLEY MODEL NO. 9953 INSTALL 1 EACH IN JANITOR 123 AND JANITOR 208
	I	NOT USED
	J	NAPKIN /TAMPON DISPOSAL: BRADLEY MODEL NO. 4722-15

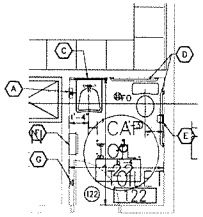
NOTES: THE MANUFACTURER'S NAME AND ITEM NUMBERS LISTED ARE FOR REFERENCE ONLY. THE SOLE PURPOSE IS TO ESTABLISH THE PHYSICAL PROPERTIES REQUIRED FOR THE MATERIALS LISTED.



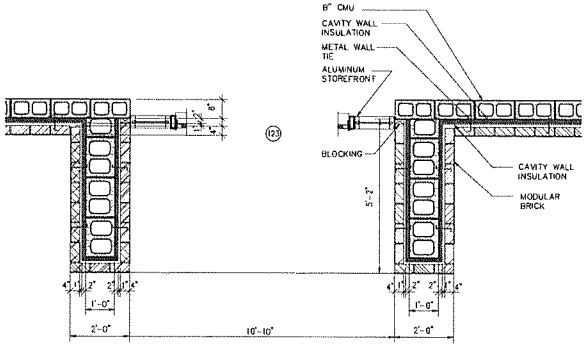
NORTH ENLARGED PLAN 4 (A2.1)
1/2"=1'-0"



NORTH ENLARGED PLAN 5 (A2.1)
3/4"=1'-0"



NORTH ENLARGED PLAN 6 (A2.1)
1/4"=1'-0"



NORTH ENLARGED PLAN 7 (A2.1)
1/2"=1'-0"

STATE OF GEORGIA
CHARLES W. RAINE
CERTIFICATE NO. 5361
REGISTERED ARCHITECT

KHAFRA ENGINEERING CONSULTANTS, INC.
273 PEACHTREE STREET, SUITE 1600
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404-523-2120 FAX 404-522-7941

DSGN	RKGA
DR	RKGA
CHK	JTRY
APVD	CWRE

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FULTON COUNTY

Fulton County Fire Department
FIRE STATION No. 11
4760 Fulton Industrial Blvd.
Atlanta, Georgia 30336

ARCHITECTURAL
ENLARGED PLANS

SHEET 35 OF 69
DWG NO. A10.1
DATE JULY 15, 2019
PROJ NO. 10ATL02-55

RELEASED FOR BID

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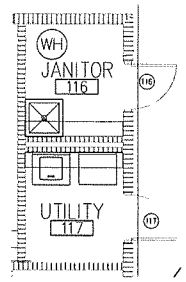
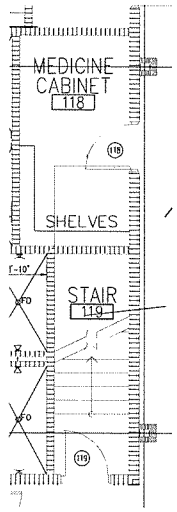


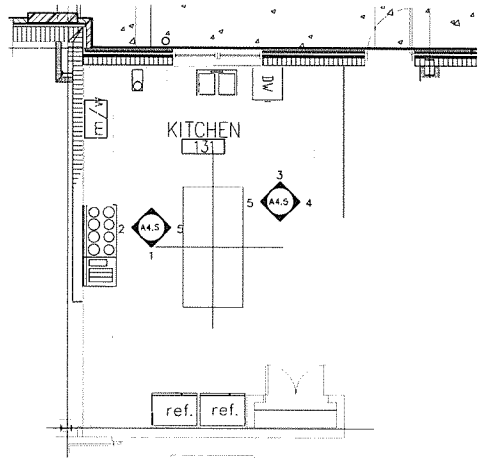
NORTH

ENLARGED PLAN 1
1/4"=1'-0" A2.1



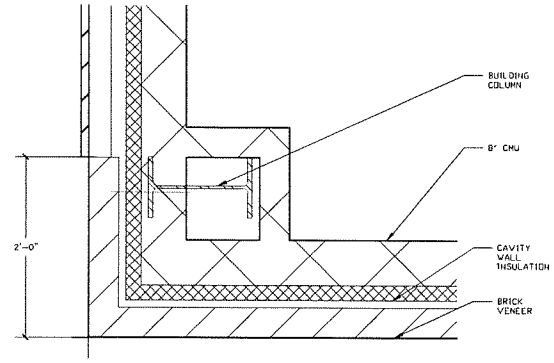
NORTH

ENLARGED PLAN 2
1/4"=1'-0" A2.1

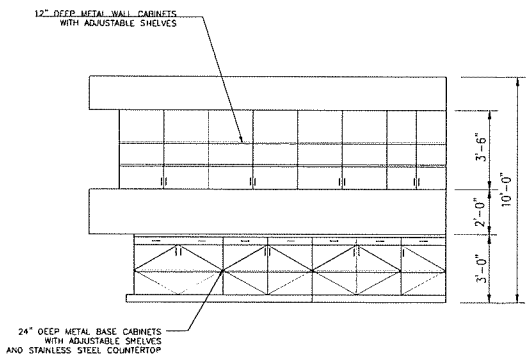


NORTH

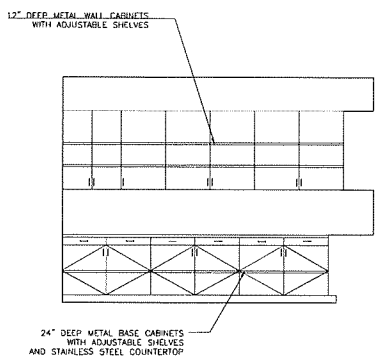
ENLARGED PLAN 3
1/4"=1'-0" A2.1



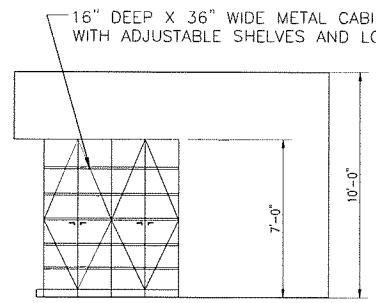
DETAIL 4
1 1/2" = 1'-0" A2.1



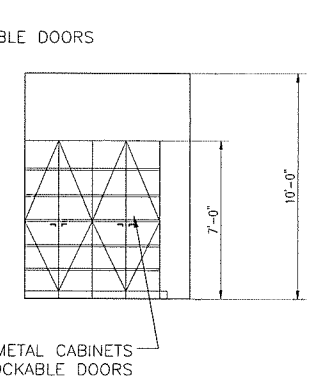
REPAIR WORKSHOP 115 4
1/2"=1'-0" A2.1



REPAIR WORKSHOP 115 5
1/2"=1'-0" A2.1



MEDICINE CABINET 118 6
1/2"=1'-0" A2.1



MEDICINE CABINET 118 7
1/2"=1'-0" A2.1

STATE OF GEORGIA
CHARLES W. HAINE
CERTIFICATE NO. 5363
REGISTERED ARCHITECT

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DR	WDAN
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ARCHITECTURAL
ENLARGED PLANS

SHEET 36 OF 69
DWG NO. A10.2
DATE JULY 15, 2011
PROJ NO. 10ATL02-55

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GENERAL STRUCTURAL NOTES

A. SHOP DRAWINGS

1. SHOP DRAWINGS OF ALL FABRICATED ITEMS SHALL BE SUBMITTED FOR REVIEW ACCORDING TO THE SPECIFICATIONS PRIOR TO FABRICATION.
2. COMPLETE SHOP DRAWINGS FOR CONSTRUCTION, WITH DESIGN CALCULATIONS, FOR ALL SPECIALTY ITEMS SHALL BE SEALED BY A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF GEORGIA, AND SHALL BE AVAILABLE AT THE PROJECT SITE.

B. DESIGN

1. CODES AND SPECIFICATIONS
   A. INTERNATIONAL BUILDING CODE – 2009 EDITION
   B. BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE (ACI 318)
   C. SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS (AISC)
   D. BUILDING CODE REQUIREMENTS FOR MASONRY STRUCTURES (ACI 530/ASCE 5/TMS 402) AND SPECIFICATION FOR MASONRY STRUCTURES (ACI 530.1/ASCE 6/TMS 602)
   E. AMERICAN WELDING SOCIETY STANDARDS AND SPECIFICATIONS (AWS)
   F. METAL BUILDING SYSTEMS MANUAL (MBMA)
   G. WHEN THE PROVISION OF THE ABOVE CODES AND STANDARDS ARE IN CONFLICT WITH IBC OR EACH OTHER, USE THE MOST STRINGENT OF THE REQUIREMENTS.

2. DESIGN LOADS

DEAD:
ROOF DEAD LOAD 20 PSF
FLOOR DEAD LOAD 60 PSF

LIVE:
ROOF LIVE LOAD 20 PSF
FLOOR LIVE LOAD 100 PSF

SNOW:
GROUND SNOW LOAD 5 PSF

WIND:
BASIC WIND SPEED 90 MPH
WIND IMPORTANCE FACTOR 1.15
WIND EXPOSURE B
INTERNAL PRESSURE COEFFICIENT ±0.55
COMPONENTS AND CLADDING DESIGN WIND PRESSURES:

WIDTH OF PRESSURE ZONE (a) 3 FT

ROOF — AREA	SURFACE PRESSURES (PSF) 10 SF	50 SF	≥100 SF
NEGATIVE ZONE 1	-32.7	-29.1	-28.5
NEGATIVE ZONE 2	-49.5	-40.1	-36.9
NEGATIVE ZONE 3	-70.6	-57.5	-53.8
POSITIVE ALL ZONES	22.1	19.2	17.9

WALL — AREA	SURFACE PRESSURES (PSF) 10 SF	100 SF	≥500 SF
NEGATIVE ZONE 4	-34.8	-31.1	-28.5
NEGATIVE ZONE 5	-41.1	-33.7	-28.5
POSITIVE ALL ZONES	32.7	28.9	26.4

SEISMIC:
SEISMIC IMPORTANCE FACTOR 1.5
MAPPED SPECTRAL RESPONSE (Ss) 0.233
MAPPED SPECTRAL RESPONSE (S1) 0.086
SITE CLASS D
SPECTRAL RESPONSE (Sds) 0.249
SPECTRAL RESPONSE (Sd1) 0.138
SEISMIC DESIGN CATEGORY C
DESIGN BASE SHEAR SEE PEMB PLANS
SEISMIC RESPONSE COEFFICIENT SEE PEMB PLANS
RESPONSE MODIFICATION FACTOR SEE PEMB PLANS
ANALYSIS PROCEDURE USED EQUIVALENT LATERAL FORCE PROCEDURE
SEISMIC-FORCE-RESISTING-SYSTEM MOMENT FRAMES, SEE PEMB PLANS,
FOUNDATION AND FRAMING PLANS FOR LOCATIONS OF EACH ELEMENT

3. VERIFY DIMENSIONS AND DETAILS BEFORE BEGINNING WORK. COORDINATE WALL OPENINGS WITH ARCHITECTURAL AND MECHANICAL DRAWINGS. CONTRACTOR SHALL CHECK AND COORDINATE SIZES AND LOCATIONS OF ALL BLOCK-OUTS, CONDUITS, PIPE SLEEVES, EMBEDDED ITEMS, ETC. WITH MECHANICAL AND ELECTRICAL DRAWINGS AND SPECIFICATIONS.
4. NO OPENINGS LARDER THAN 12"x12" SHALL BE PLACES IN SLABS OR WALLS UNLESS SPECIFICALLY SHOWN ON STRUCTURAL DRAWINGS.
5. EXISTING CONDITIONS ARE TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR. VERIFICATION IS THE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER OF ANY DISCREPANCIES OR CONFLICTS BETWEEN EXISTING CONDITIONS AND DESIGN AND DETAILS INDICATED BY THESE DRAWINGS.
6. NO PIPES, SLEEVES, ETC. SHALL PASS THROUGH BEAMS OR COLUMNS UNLESS CLEARLY INDICATED ON THE STRUCTURAL PLANS OR AUTHORIZED BY THE ENGINEER.
7. TYPICAL DETAILS ARE SHOWN ON DRAWINGS S1.7 AND S1.8. THE TYPICAL DETAILS INCLUDED MAY OR MAY NOT BE REFERENCED TO PLANS OR SECTIONS, BUT ARE TO BE USED AS APPLICABLE.
8. DETAILS NOT SPECIFICALLY INDICATED SHALL BE SIMILAR TO DETAILS SHOWN FOR SIMILAR CONDITIONS.

C. FOUNDATIONS

1. SPREAD FOOTINGS AND CONTINUOUS WALL FOOTINGS ARE DESIGNED FOR AN ALLOWABLE BEARING PRESSURE OF 2500 PSF.
2. CONSTRUCT FOOTINGS ON ADEQUATE SUBGRADE SOIL OR ENGINEERED FILL. ADDITIONALLY, PLACE #57 STONE BELOW FOOTINGS.
3. PROOF ROLL EXPOSED FOUNDATION AND SLAB ON GRADE SUBGRADE SOILS TO DELINEATE SOFT SOILS.
4. ALL FOUNDATION EXCAVATIONS SHALL BE INSPECTED BY A QUALIFIED GEOTECHNICAL ENGINEER OR THEIR REPRESENTATIVE TO VERIFY THAT THE MATERIALS IN THE BASE OF THE FOUNDATIONS ARE SUITABLE AND ARE CONSISTENT WITH THE SUBSURFACE INVESTIGATION AND FOUNDATION RECOMMENDATION REPORT.
5. SPECIAL BACKFILL BELOW INTERIOR CONCRETE SLABS ON GRADE AND ANY FILL WITHIN 10'-0" OF BUILDING LIMIT AND BELOW FOUNDATION SHALL BE COMPACTED TO 98% OF STANDARD PROCTOR.
6. SIDES OF ALL FOUNDATIONS ARE TO BE FORMED.
7. WHERE STEPS IN FOUNDATIONS ARE NECESSARY, THEY SHALL BE NO STEEPER THAN ONE VERTICAL TO TWO HORIZONTAL.

D. CONCRETE

1. REINFORCING SHALL BE DETAILED ACCORDING TO THE ACI 315 AND ACI SP-66, THE ACI DETAILING MANUAL.
2. REINFORCING IS TO BE BENT BY MECHANICAL MEANS ONLY.
3. CONCRETE OPERATIONS SHALL COMPLY WITH ACI STANDARDS
4. STANDEES ARE REQUIRED FOR REINFORCING STEEL SUPPORT BETWEEN MATS IN SLABS.
5. DO NOT PLACE PIPES, DUCTS OR CONDUITS EXCEEDING 1/3 THE SLAB OR WALL THICKNESS WITHIN THE SLAB OR WALL UNLESS SPECIFICALLY INDICATED ON THE STRUCTURAL DRAWINGS.
6. PROVIDE CONTINUOUS REINFORCEMENT. SPLICE ONLY AS SHOWN OR APPROVED.
7. CAST-IN-PLACE CONCRETE SHALL HAVE A MINIMUM ULTIMATE STRENGTH AT 28 DAYS OF 4000 PSI, UNLESS NOTED OTHERWISE NOTED.
8. THE FOLLOWING CONCRETE COVER SHALL BE PROVIDED FOR REINFORCEMENT UNLESS OTHERWISE INDICATED:
   CONCRETE CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH..................3 INCHES
   CONCRETE EXPOSED TO EARTH, WEATHER OR FLUID SURFACES BUT CAST AGAINST FORMS..................2 INCHES
   FORMED CONCRETE SURFACES ABOVE AREAS NOT CONTAINING WATER............1½ INCH
9. ALL DOWELS SHALL BE THE SAME SIZE AND SPACING AS THE BARS THAT ARE BEING DOWELED OR AS SHOWN ELSEWHERE ON THE DRAWINGS. ALL REINFORCING STEEL SHALL BE DOWELED INTO ADJACENT STRUCTURAL MEMBERS UNLESS SPECIFICALLY EXCEPTED.
10. 'L' REPRESENTS A TENSION SPLICE, AS NOTE IN THE FOLLOWING TABLE FOR EACH SPECIFIC REINFORCING BAR SIZE. AN UNDIMENSIONED BEND REPRESENTS A STANDARD HOOK. TENSION SPLICES ARE IN ACCORDANCE WITH ACI 318, BASED ON GRADE 60 STEEL REINFORCING AND 4000 PSI 28-DAY CONCRETE STRENGTH BUT ARE NOT LESS THAN THAT NOTED BELOW.

BAR SIZE	CONDITION OTHER	TOP
3	18 INCHES	21 INCHES
4	20 INCHES	24 INCHES
5	24 INCHES	30 INCHES
6	30 INCHES	36 INCHES
7	34 INCHES	42 INCHES
8	37 INCHES	48 INCHES
9	46 INCHES	60 INCHES
10	57 INCHES	74 INCHES
11	68 INCHES	88 INCHES

11. REINFORCING DETAILS SHOWN REPRESENT MINIMUM REQUIREMENTS, ALTERNATE BUT EQUAL METHODS ARE ACCEPTABLE, BUT THEY SHALL NOT BE USED WITHOUT PRIOR APPROVAL BY THE ENGINEER.
12. WHERE ONE GRID OF REINFORCING IS REQUIRED IN A WALL OR SLAB, THE GRID SHALL BE CENTERED IN THE ELEMENT, UNLESS OTHERWISE LOCATED IN THE PLANS WITH A CLEAR DISTANCE TO EITHER SIDE OF THE ELEMENT.
13. REINFORCING BARS: BILLET STEEL, DEFORMED BARS TO COMPLY WITH ASTM A615, GRADE 60.
14. WELDED WIRE FABRIC: TO COMPLY WITH ASTM A185.
15. INTERIOR SLAB ON GRADE SHALL BE PLACED ON A 4 INCH MINIMUM OF COMPACTED SAND. COMPACTED SAND IS TO BE CONTINUOUS UNDER THICKENED SLABS.
16. FOR ALL FINISHED SPACES PROVIDE 10 MIL VAPOR RETARDER/BARRIER BELOW ALL SLAB ON GRADE CONCRETE.
17. CONTROL JOINTS IN SLABS ON GRADE SHALL BE PLACES AS SHOWN ON PLANS. WHERE NOT SHOWN, JOINTS SHALL BE SPACED TO DIVIDE THE SLAB INTO PANELS NOT TO EXCEED 225 SQUARE FEET. JOINTS SHALL BE HAND TOOLED, CAST IN, OR SOFT SAW CUT.
18. ALL EXPOSED CORNER SHALL HAVE ¾ INCH CHAMFER.
19. NO CALCIUM CHLORIDE SHALL BE USED IN CONCRETE.
20. IF CONTRACTOR DESIRES TO INCREASE SLUMP ABOVE ALLOWABLE LIMITS INDICATED IN THE SPECIFICATION TO FACILITATE PLACEMENT OR PUMPING, THIS SHALL BE DONE UTILIZING AN APPROPRIATE APPROVED ADMIXTURE. NO WATER SHALL BE ADDED AT THE PROJECT SITE WITHOUT THE ENGINEER'S APPROVAL. ALL ADMIXTURES ARE TO BE SUBMITTED WITH THE CONCRETE MIX DESIGN AND ARE TO BE APPROVED PRIOR TO USE.
21. WHERE NEW CONCRETE IS DEPOSITED AGAINST CONCRETE THAT IS GREATER THAN 26 DAYS OLD, THOROUGHLY CLEAN EXISTING SURFACE OF LAITANCE AND FOREIGN MATERIAL, AND APPLY BONDING AGENT FOLLOWING RECOMMENDATIONS OF MANUFACTURER.
22. ALL CONCRETE IS REINFORCED UNLESS SPECIFICALLY NOTED AS UNREINFORCED. REINFORCE ALL CONCRETE NOT OTHERWISE SHOWN WITH THE SAME REINFORCING AS IN SIMILAR SECTIONS OR AREAS.
23. MECHANICAL SPLICES, EMBEDDED DOWELS WITH MECHANICAL SPLICES AND DOWEL BAR SUBSTITUTES, SHALL DEVELOP 125% OF THE SPECIFIED YIELD STRENGTH OF THE REINFORCING BAR PER ACI REQUIREMENTS. SPECIFIC USE SHALL BE APPROVED BY THE ENGINEER.

E. STRUCTURAL STEEL

1. STRUCTURAL SHAPES AND PLATES:

SHAPE	ASTM	(Fy)
W-SHAPES AND WT-SHAPES	ASTM A992	50 KSI
M-SHAPES AND S-SHAPES	ASTM A36	36 KSI
ANGLES AND CHANNELS	ASTM A36	36 KSI
HP-SHAPES	ASTM 572 GRADE 50	50 KSI
RECTANGULAR AND SQUARE	ASTM 500 GRADE B	46 KSI
ROUND HSS	ASTM A500 GRADE B	42 KSI
STEEL PIPE	ASTM A53 GRADE B	35 KSI
STRUCTURAL PLATES	ASTM A36	36 KSI
PLATES PART OF SEISMIC SYSTEM	ASTM A572 GRADE 50	50 KSI

2. FASTENING PRODUCTS:

PRODUCT	SPECIFICATION
CONVENTIONAL BOLTS	ASTM A325 TYPE 1
NUTS	ASTM A563
WASHERS	ASTM F436
ANCHOR RODS	ASTM F1554 GRADE 36
THREADED RODS	ASTM A36
WELD FILLER MATERIAL	E70XX

3. WELDING SHALL CONFORM TO AWS STANDARDS AND SPECIFICATIONS, USING E70XX ELECTRODES AND MINIMUM FILLET WELD OF ¼ INCH, UNLESS NOTED OTHERWISE.
4. BOLTED CONNECTIONS SHALL BE ASSEMBLED AND CONNECTED IN ACCORDANCE WITH RCSC-2000 (SPECIFICATIONS FOR STRUCTURAL JOINTS USING A325 OR A490 HS BOLTS). BOLTS THROUGH 4" WIDE BEAM FLANGES SHALL BE ⅝" DIAMETER, ALL OTHERS ARE TO BE ¾" DIAMETER BOLTS.
5. EXPANSION ANCHORS AS SHOWN ON CONTRACT DOCUMENTS SHALL BE HILTI KWIK BOLT II ANCHORS MANUFACTURED BY HILTI FASTENING SYSTEMS, WEDGE-ALL ANCHORS MANUFACTURED BY SIMPSON STRONGTIE COMPANY, POWER-STUD ANCHORS MANUFACTURED BY ITW RAMSET/RED HEAD. INSTALLATION TO BE IN ACCORDANCE WITH MANUFACTURER'S PUBLISHED INSTRUCTIONS.
6. THE DESIGN OF SPECIAL CONNECTIONS BETWEEN STEEL FRAMING COMPONENTS BY OTHER THAN THE STRUCTURAL ENGINEER OF RECORD SHALL BE PERFORMED BY A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF GEORGIA.

F. CONCRETE MASONRY (f'm = 1500 PSI)

1. NET COMPRESSIVE STRENGTH OF THE CONCRETE MASONRY UNITS SHALL BE 1900 PSI MINIMUM. NORMAL WEIGHT HOLLOW LOAD BEARING UNITS CONFORMING TO ASTM C90, GRADE N.
2. CONCRETE MASONRY UNITS SHALL BE 8"x16"x8" DEEP, LAYED IN RUNNING BOND.
3. MASONRY MORTAR SHALL CONFORM TO ASTM C270, TYPE S.
4. THE 28-DAY COMPRESSIVE STRENGTH OF GROUT SHALL BE 2000 PSI. DO NOT ADD AIR-ENTRAINING AGENYS OR OTHER ADMIXTURES TO GROUT.
5. SEE ARCHITECTURAL PLANS FOR CONTROL JOINT LOCATIONS. BOND BEAMS BELOW FLOOR AND ROOF DECK ELEMENTS ARE CONTINUOUS THROUGH ALL CONTROL JOINTS.
6. ALL BLOCK CELLS AND CAVITIES BELOW GRADE SHALL BE FILLED WITH GROUT.
7. MASONRY JOINT REINFORCEMENT SHALL CONFORM TO ASTM A951, W1.7 LADDER TYPE PLACED IN JOINTS AT 16" C/C. DISCONTINUE AT ALL CONTROL JOINTS.
8. REBAR POSITIONERS REQUIRED IN ALL REINFORCED MASONRY.
9. MINIMUM WALL REINFORCEMENT:
   1-#7 IN 8" WIDE BOND BEAM, CONTINUOUS. PROVIDE CORNER BARS.
   9 GA GALVANIZED LADDER-TYPE REINFORCEMENT, PLACE EVERY OTHER COURSE.
   1-#6 VERTICAL BAR AT 32" C/C TYPICAL, UNLESS NOTED OTHERWISE.
   1-#6 VERTICAL BAR AT 48" C/C TYPICAL IN NON-LOAD BEARING CMU, UNLESS NOTED OTHERWISE.
10. ALL VERTICAL REINFORCING STEEL TO BE DOWELED TO FOUNDATION AND SHALL TERMINATE IN BOND BEAM AT TOP OF WALL.
11. PLACE BOND BEAMS BELOW FLOOR AND ROOF DECK, AT TOP OF PARAPET, TOP OF ALL WALLS AND AS SHOWN ON DRAWINGS.
12. PROVIDE ADDITIONAL VERTICAL WALL REINFORCEMENT AS FOLLOWS:
   1-#6 BAR IN ONE CELL AT EACH CORNER, EACH SIDE OF ALL OPENINGS (DOORS, WINDOWS, AND MECHANICAL OPENINGS), AT THE END OF A WALL, ADJACENT TO ALL CONTROL JOINT LOCATIONS AND AT ALL WALL INTERSECTIONS.
13. PLACE 1-#6 VERTICAL BAR IN THE FIRST CELL ADJACENT TO ALL MASONRY OPENINGS LESS THAN 6'-0" WIDE. PLACE 1-#6 VERTICAL BAR IN THE FIRST AND SECOND CELL ADJACENT TO MASONRY OPENINGS EQUAL TO OR GREATER THAN 6'-0" WIDE.
14. REINFORCE MASONRY AT STEEL BEAM AND ALL BEARING POINTS, INCLUDING LINTELS WITH MINIMUM 1-#6 BAR GROUTED CONTINUOUSLY TO FOUNDATION PER EACH CELL BELOW BEARING ELEMENTS.
15. PROVIDE BULLNOSE CMU UNITS AT OPENINGS.
16. PROVIDE NO. 103 DOVETAIL ANCHORS BY HECKMAN BUILDING OR APPROVED EQUAL TO ATTACH VENEER TO CONCRETE WALL. SPACE ANCHORS AT 16" HORIZONTALLY AND VERTICALLY.
17. PRECAST BOND BEAM LINTELS ARE NOT PERMITTED.
18. FOR LINTELS SEE TYPICAL DETAILS ON SHEET S1.7, UNLESS NOTED OTHERWISE.

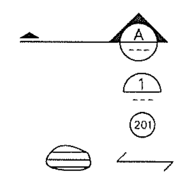
G. COLD-FORM STEEL FRAMING

1. ALL COLD-FORMED STEEL FRAMING SHALL BE DESIGNED, DETAILED, FABRICATED, AND ERECTED IN ACCORDANCE WITH THE FOLLOWING, UNLESS OTHERWISE SPECIFIED:
   AISIS100-07, "NORTH AMERICAN SPECIFICATION FOR THE DESIGN OF COLD-FORMED STEEL STRUCTURAL MEMBERS"
   AWS D1.3, "STRUCTURAL WELDING CODE – SHEET STEEL"
2. UNLESS NOTED OTHERWISE, THE CONTRACTOR SHALL DESIGN AND FURNISH ALL COLD-FORMED STEEL FRAMING, ACCESSORIES, AND FASTENERS. REFER TO THE SPECIFICATIONS FOR PERFORMANCE REQUIREMENTS.
3. MEMBERS WITH A THICKNESS OF 54 MILS (16 GAGE) OR GREATER SHALL HAVE A MINIMUM YIELD STRENGTH OF 50,000 PSI. MEMBERS WITH A THICKNESS OF 43 MILS (18 GAGE) OR LESS SHALL HAVE A MINIMUM YIELD STRENGTH OF 33,000 PSI.
4. COLD-FORMED STEEL FRAMING SHALL BE DESIGNED BY A LICENSED ENGINEER IN THE STATE WHERE THE PROJECT IS LOCATED. STRUCTURAL CALCULATIONS AND DRAWINGS SHALL BE SUBMITTED TO THE CONTRACTING OFFICER FOR APPROVAL PRIOR TO INSTALLATION.

F. METAL DECK

1. ALL METAL FORM DECK SHALL BE DETAILED, FABRICATED AND ERECTED IN ACCORDANCE WITH THE STEEL DECK INSTITUTE.
2. METAL FORM DECK SHALL BE 1½" x 20 GAGE WITH 2½" NORMALWEIGHT CONCRETE (TOTAL SLAB THICKNESS = 4". DECK WIDTH SHALL BE 36" WIDE UNLESS NOTED OTHERWISE.
3. DECKING SHALL BE CONTINUOUS OVER 3 OR MORE SUPPORTS.
4. FASTEN DECKING TO SUPPORTING MEMBERS WITH ⅝" DIAMETER PUDDLE WELDS OR #10 TEK SCREWS IN A 36/4 WELD PATTERN WITH STANDARD WELDING WASHERS.
5. DECK SIDE LAPS SHALL BE CONNECTED WITH 1.5" SEAM WELD @ 12" O.C. OR #10 TEK SELF-TAPPING METAL SCREWS @ 36" O.C. MAXIMUM.
6. WELDERS SHALL BE AWS CERTIFIED FOR LIGHT GAGE METAL WELDING. CERTIFICATIONS ARE TO BE AVAILABLE ON PROJECT SITE.
7. ALL UNSUPPORTED DECK EDGES SHALL BE SUPPORTED BY DECKING LEDGER ANGLES. SEE TYPICAL DETAILS FOR MORE INFORMATION.
8. USE 16 GAGE SHIM MEMBERS TO CREATE ROOF SUPPORT STRUCTURE IN AREAS WHERE ROOF DECK DOES NOT BEAR DIRECTLY ON STRUCTURAL STEEL FRAME BELOW.

LEGEND



STRUCTURAL ABBREVIATIONS

AB	ANCHOR BOLT	OC	ON CENTER
ALUM	ALUMINUM	OPNG	OPENING
ARCH	ARCHITECTURAL	OPP	OPPOSITE
BOT	BOTTOM	OSFO	OUTSIDE FACE OF
BLKG	BLOCKING	PEMB	PRE-ENGINEERED METAL BUILDING
BM	BEAM	PJF	PREMOLDED JOINT FILLER
BRKT	BRACKET	PL	PLATE
CJ	CONTROL JOINT	R	RISERS
CL	CENTERLINE	REINF	REINFORCEMENT
CLR	CLEARANCE	REQ'D	REQUIRED
CMU	CONCRETE MASONRY UNIT	SDI	STEEL DECK INSTITUTE
COL	COLUMN	SST	STAINLESS STEEL
CONC	CONCRETE	SIM	SIMILAR
CTRD	CENTERED	SQ	SQUARE
CTR	CENTER	STD	STANDARD
C/C	CENTER TO CENTER	T	TREADS
DIA	DIAMETER	T&B	TOP AND BOTTOM
DIM	DIMENSION	THK	THICK
DWG(S)	DRAWING(S)	THRD	THREAD
EA	EACH	TOC	TOP OF CONCRETE
EF	EACH FACE	TOF	TOP OF FOOTING
EL, ELEV	ELEVATION	TOS	TOP OF STEEL
EQ	EQUAL	TOW	TOP OF WALL
ESBSM	ENGINEERED STEEL BUILDING SYSTEM MANUFACTURER	TYP	TYPICAL
EW	EACH WAY	UNO	UNLESS NOTED OTHERWISE
FDN	FOUNDATION	VERT	VERTICAL
FLG	FLANGE	W/	WITH
FTG	FOOTING	WWR	WELDED WIRE REINFORCEMENT
HD	HEAD		
HORIZ	HORIZONTAL		
HR	HANDRAILS		
HT	HEIGHT		
MAX	MAXIMUM		
MFR'D	MANUFACTURED		
MIN	MINIMUM		
NO.	NUMBER		
NTS	NOT TO SCALE		

GEORGIA REGISTERED PROFESSIONAL ENGINEER No. PE027471 7/15/2011 DIETRICH O. BANKHEAD

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STRUCTURAL

GENERAL NOTES

SHEET 37 OF 69
DWG NO. S0.1
DATE JULY 15, 2011
PROJ NO. 10ATL02-SS

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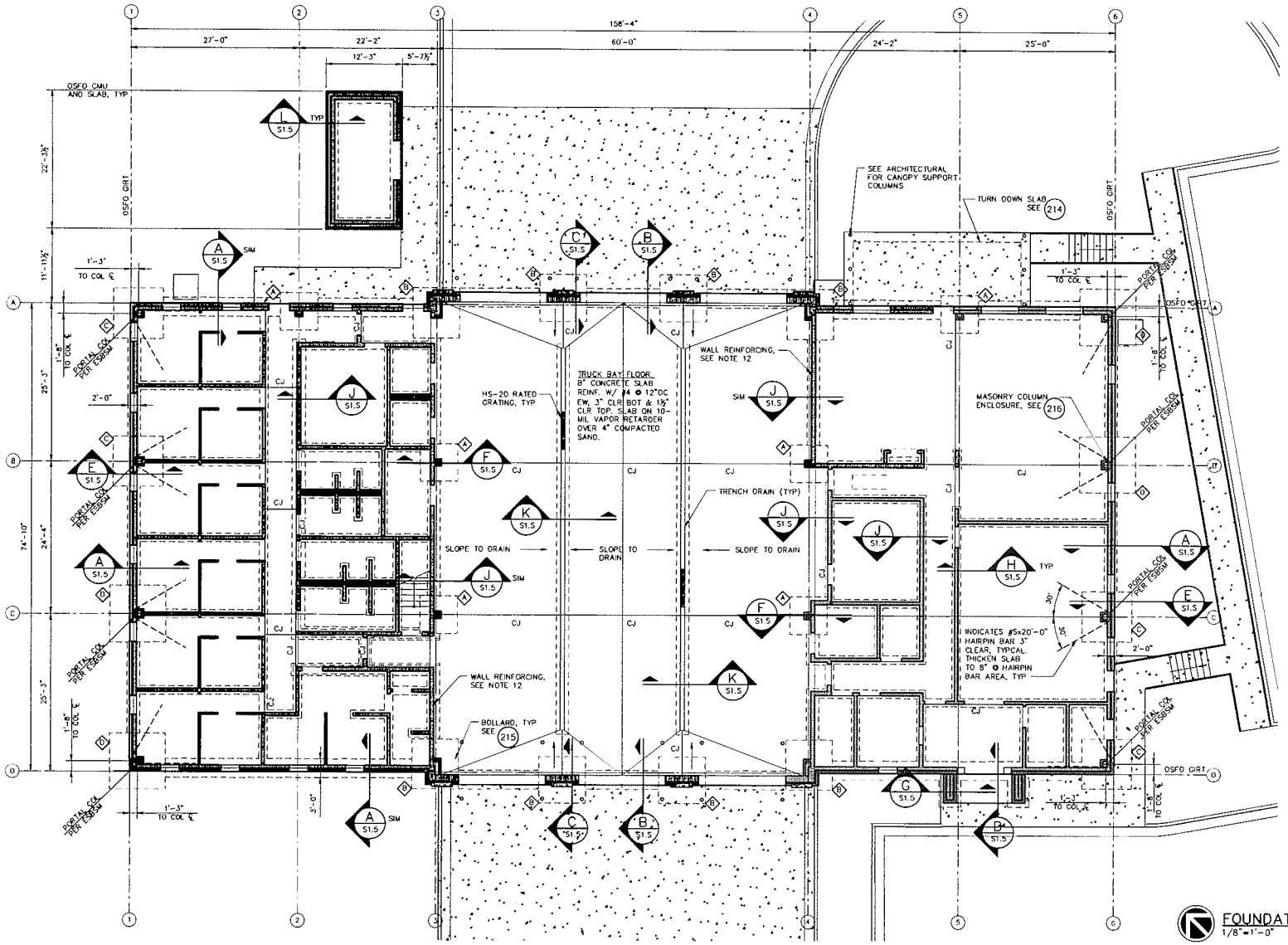

NOTES:

1. FOR GENERAL STRUCTURAL NOTES, ABBREVIATIONS AND SYMBOLS LEGEND, SEE SHEET S0.1.
2. 4" CONCRETE SLAB ON GRADE REINFORCED W/ 6x6-W2.9xW2.9 WWR. REINFORCING SHALL BE LOCATED 1½" BELOW TOP OF SLAB. SLAB SHALL BE PLACED ON 10 MIL-VAPOR RETARDER OVER 4" LAYER OF COMPACTED SAND, UNLESS NOTED OTHERWISE.
3. CONTRACTION JOINTS (CJ) ARE SHOWN ON PLAN. FOR JOINT LOCATIONS, SEE ARCHITECTURAL DRAWINGS. UNLESS OTHERWISE SHOWN ON DRAWINGS, PLACE CONTROL JOINTS AT COLUMNS LINES AND AT INTERMEDIATE LINES SUCH THAT AREA OF EACH PANEL DOES NOT EXCEED 225 SQUARE FEET. CONTRACTOR TO SUBMIT PLACING PLANS SHOWING LOCATION OF SLAB CONTROL JOINTS AND CONSTRUCTION JOINTS. PLANS ARE SUBJECT TO PRIOR APPROVAL. CONSTRUCTION JOINTS SHALL HAVE DIAMOND DOWELS PLACED AT THE CENTER OF SLAB SPACED AT 18" OC, SEE DETAIL 213
4. TOP OF FOOTING ELEVATION IS -2'-0", UNLESS NOTED OTHERWISE.
5. ALL SLAB PENETRATIONS ARE NOT SHOWN. CONTRACTOR SHALL COORDINATE ALL SLAB PENETRATION LOCATIONS WITH MECHANICAL AND PLUMBING DRAWINGS.
6. SEE ARCHITECTURAL DRAWINGS FOR DIMENSIONS LOCATING ALL CMU WALLS AND PILASTERS. FOR THICKENED SLAB UNDER NON-LOAD BEARING INTERIOR CMU WALLS, REFER TO DETAIL H/S1.5.
7. FOR TRENCH DRAIN AND FLOOR DRAIN (FD) LOCATIONS, SEE PLUMBING DRAWINGS
8. USE CEMENTITIOUS GROUT ON TOP OF SLAB TO CREATE FLOOR SLOPES, WHERE NECESSARY.
9. ALL CMU WALLS ARE 6" WIDE EXCEPT:
   - BATHROOM CHASE WALLS ARE 4"
   - WALLS SURROUNDING THE TRUCK BAY ARE 12"
   - EXTERIOR WALLS ARE 8" EXCEPT AROUND TRUCK BAY.
10. FOR MASONRY OPENING REINFORCING, SEE DETAIL 201
11. COLUMN LINES ARE TO OUTSIDE FACE OF HORIZONTAL GIRT AT BUILDING EXTERIOR. DIMENSIONS TO CENTER OF COLUMNS AT BASE ARE INDICATED ON PLAN.
12. 8" BAY WALLS ALONG COLUMN LINES 3 BETWEEN COLUMN LINES C AND D AND ALONG 4 BETWEEN COLUMN LINES A AND B SHALL BE REINFORCED WITH #6 @ 16" OC.

FOOTING SCHEDULE

MARK	SIZE	DEPTH	REINFORCEMENT
A	6'-0"x6'-0"	12"	7#5 EW T&B
B	7'-6"x7'-6"	15"	8#5 EW T&B
C	8'-0"x8'-0"	15"	9#6 EW T&B
D	9'-6"x9'-6"	15"	10#6 EW T&B

FOOTING LOAD SCHEDULE

MARK	P (DOWN)	P (UP)	V (HORIZ)	MOMENT
A	40 K	0 K	4 K	0 FT-K
B	55 K	0 K	6 K	25 FT-K
C	60 K	0 K	12 K	0 FT-K
D	65 K	10 K	22 K	95 FT-K

NOTE:
CONTRACTOR SHALL VERIFY FOOTING REACTIONS NOTED IN SCHEDULE ABOVE WITH METAL BUILDING MANUFACTURER FINAL BUILDING REACTIONS. IF FINAL BUILDING REACTIONS EXCEED REACTIONS NOTED IN SCHEDULE BY MORE THAN 5% THE CONTRACTOR SHALL BE RESPONSIBLE FOR RE-DESIGN OF FOUNDATIONS BY A QUALIFIED ENGINEER LICENSED IN THE STATE OF GEORGIA.

NORTH

FOUNDATION PLAN
1/8"=1'-0"

KHAFRA ENGINEERING CONSULTANTS, INC
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ATLANTA, GEORGIA 30303
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STRUCTURAL
FOUNDATION PLAN

SHEET 38 OF 69
DWG NO. S1.1
DATE JULY 15, 2011
PROJ NO. 10ATL02-SS

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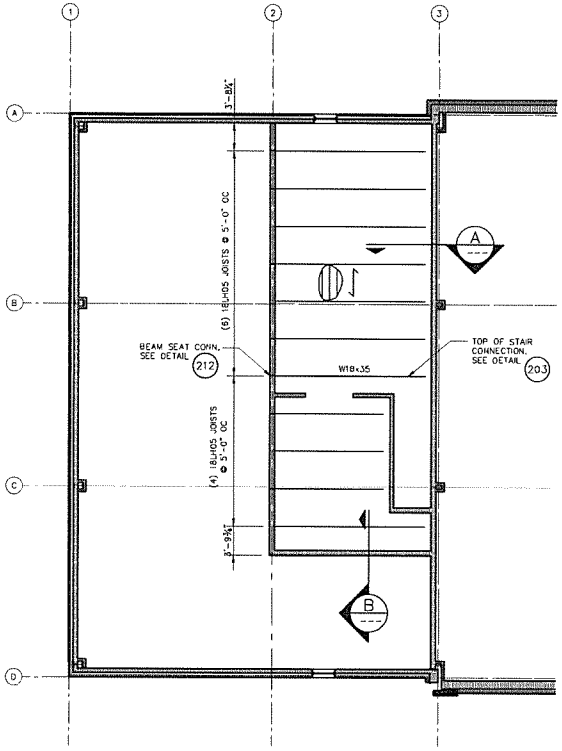
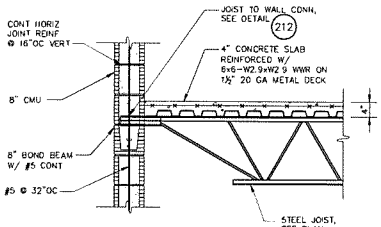
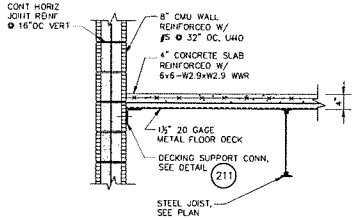


LOFT FRAMING PLAN
NTS

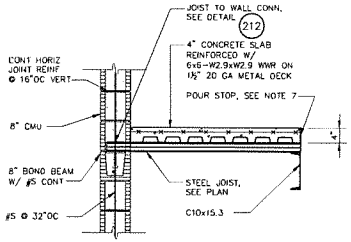
NORTH



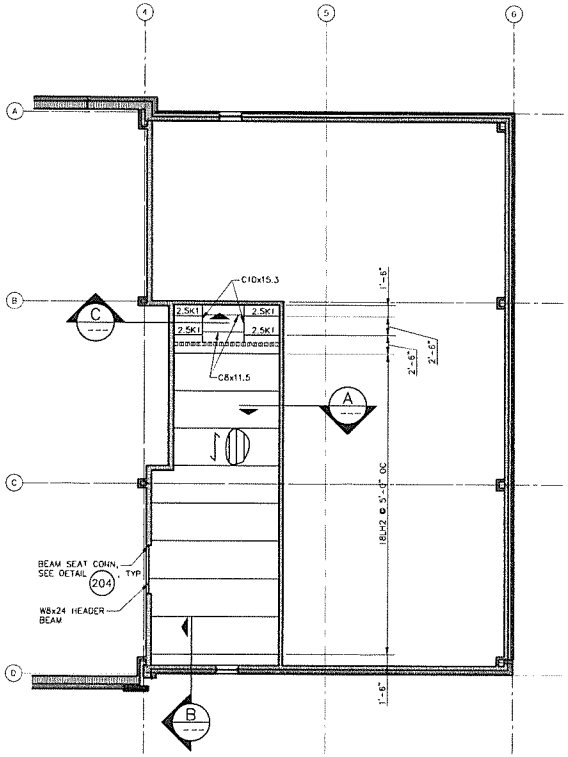
SECTION A
NTS



SECTION B
3/4"=1'-0"



SECTION C
3/4"=1'-0"



LOFT FRAMING PLAN
NTS

NORTH

NOTES:

1. FOR GENERAL STRUCTURAL NOTES, ABBREVIATIONS AND SYMBOLS LEGEND, SEE SHEET S0.1.
2. METAL FLOOR DECK SHALL BE 1½" DEEP 20 GAGE DECKING.
3. ALL FLOOR OPENINGS ARE NOT SHOWN. CONTRACTOR SHALL COORDINATE ELECTRICAL, MECHANICAL AND PLUMBING FLOOR OPENINGS WITH ELECTRICAL, MECHANICAL AND PLUMBING DRAWINGS.
4. 2½" CONCRETE SLAB ON 1½" METAL DECK SHALL BE REINFORCED WITH 6x6-W2.9xW2.9 WWR. TOTAL SLAB THICKNESS EQUALS 4".
5. SEE ARCHITECTURAL DRAWINGS FOR DIMENSIONS LOCATING ALL CMU WALLS.
6. CONTRACTOR SHALL COORDINATE ALL WALL LOUVER OPENINGS WITH MECHANICAL DRAWINGS.
7. ALL POUR STOPS SHALL BE SIZED AND PLACED ACCORDING TO S01 POUR STOP TABLE, UNLESS NOTED OTHERWISE.

GEORGIA REGISTERED PROFESSIONAL ENGINEER DIETRICH G. BANNERMAN

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STRUCTURAL

LOFT FRAMING PLAN

SHEET NO.	39 OF 69
DWG NO.	S1.2
DATE	JULY 15, 2011
PROJ NO.	10ATL02-55

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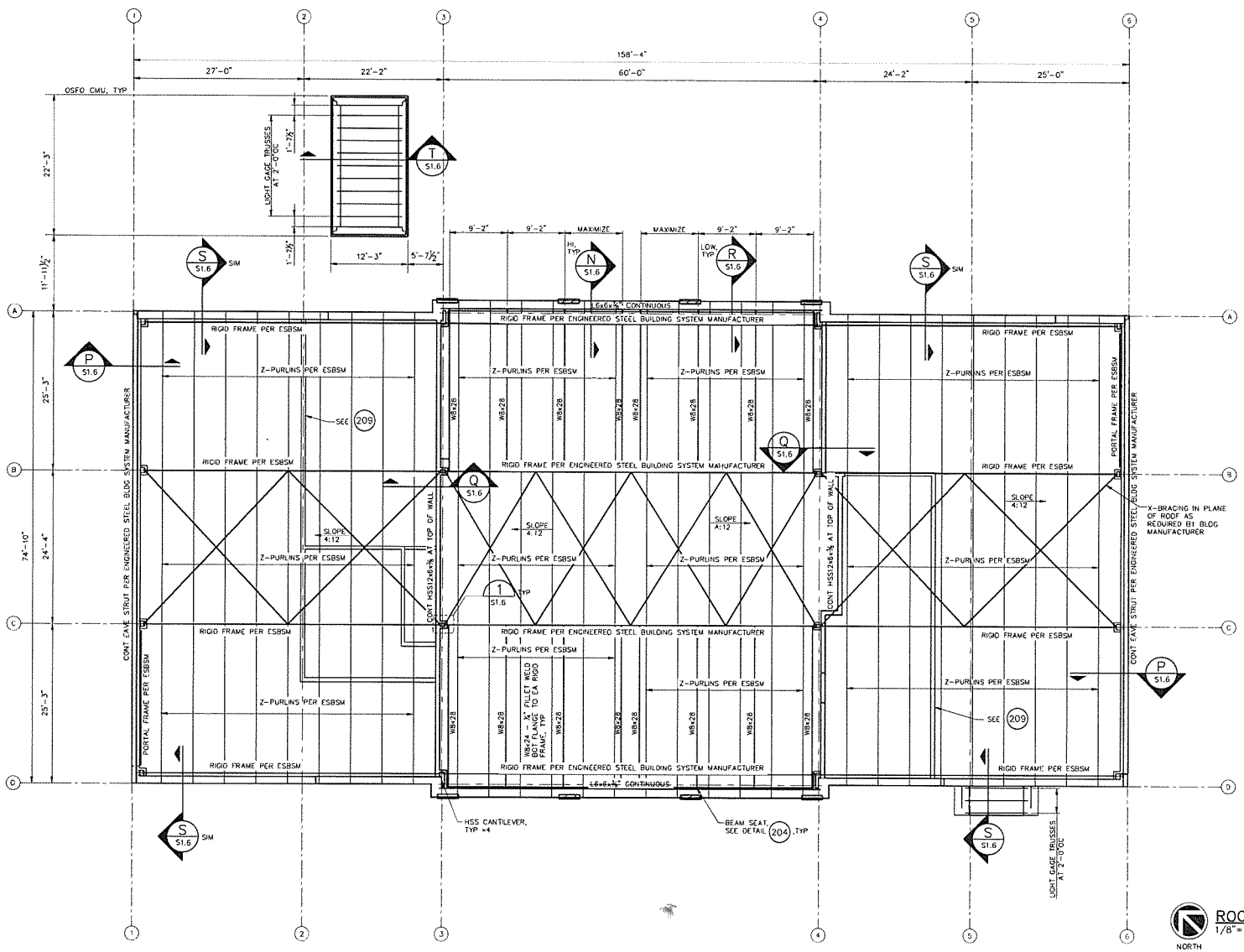

NOTES:

1. FOR GENERAL STRUCTURAL NOTES, ABBREVIATIONS AND SYMBOLS LEGEND, SEE SHEET S0.1.
2. METAL ROOF SHALL BE STANDING SEAM METAL ROOF.
3. ALL ROOF PENETRATIONS ARE NOT SHOWN. CONTRACTOR SHALL COORDINATE ALL ROOF PENETRATION LOCATIONS WITH MECHANICAL DRAWINGS.
4. SEE ARCHITECTURAL DRAWINGS FOR DIMENSIONS LOCATING ALL CMU WALLS.
5. FOR MASONRY OPENING REINFORCING, SEE DETAIL 201.
6. SEE ELEVATION A/S1.6 FOR TOP OF INTERIOR CMU WALL DETAIL.

ROOF FRAMING PLAN

1/8" = 1'-0"

NORTH

GEORGIA REGISTERED PROFESSIONAL ENGINEER 11/18/2011 DIETRICH O. BANNERJEE

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ROOF FRAMING PLAN

SHEET	40 OF 69
DWG NO.	S1.3
DATE	JULY 15, 2011
PROJ NO.	10A1L02-SS

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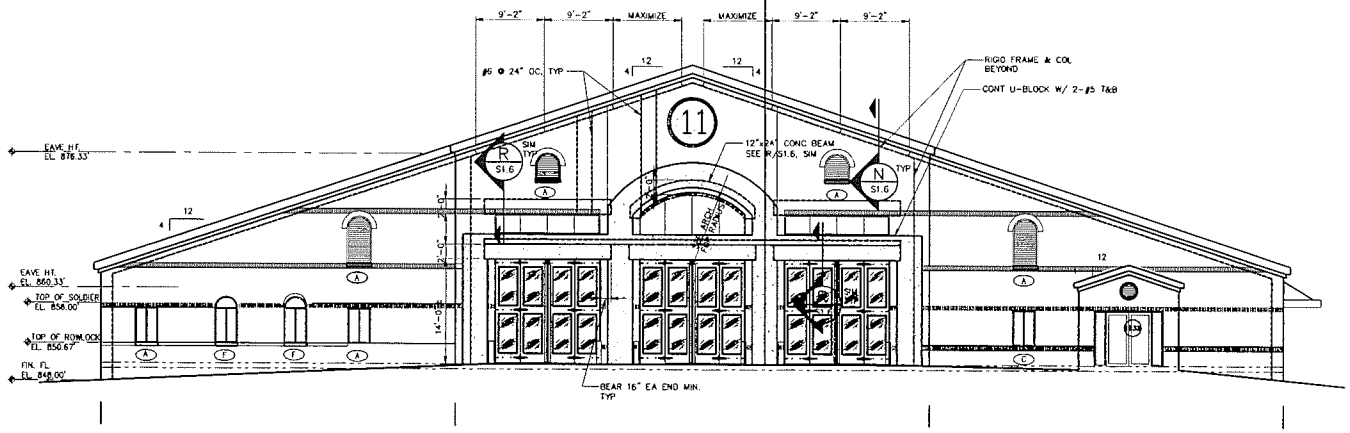
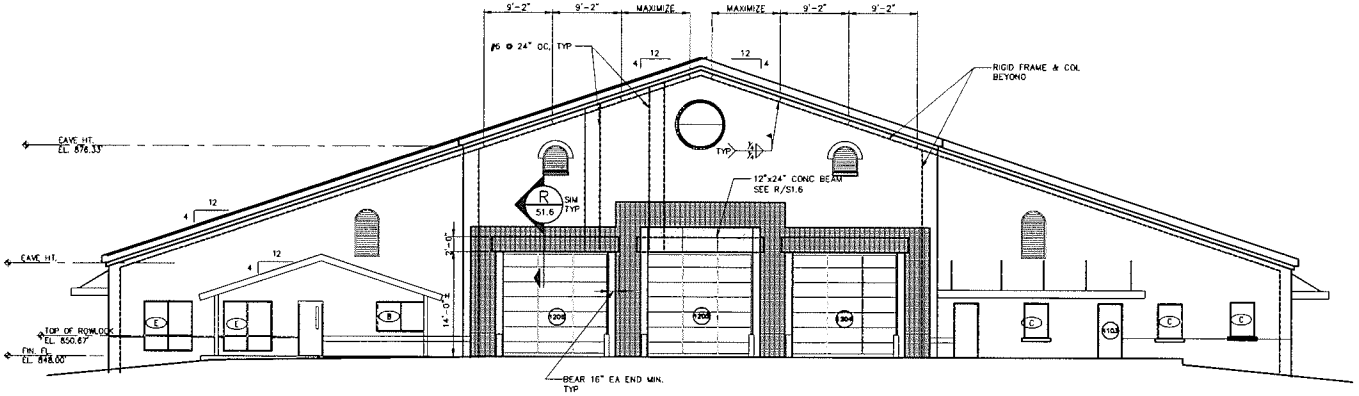


FRONT ELEVATION
1/8"=1'-0"



REAR ELEVATION
1/8"=1'-0"

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STRUCTURAL

ELEVATONS, SECTION AND DETAILS

SHEET 41 OF 69
DWG NO. S1.4
DATE JULY 15, 2011
PROJ NO. 10ATL02-55

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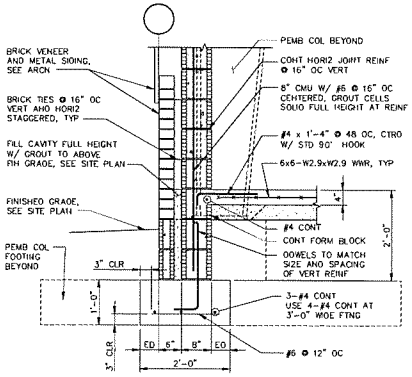
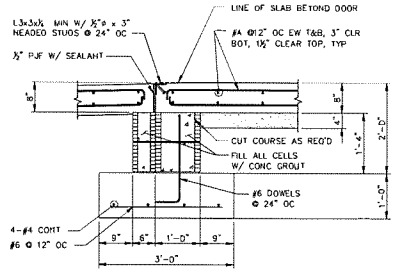
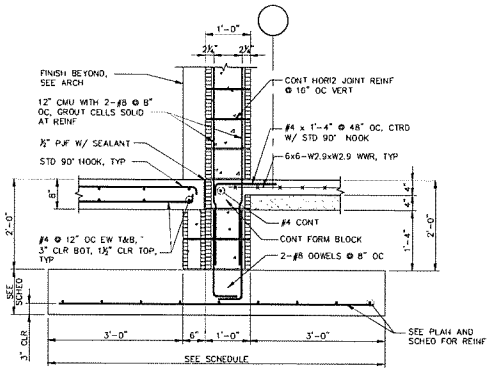


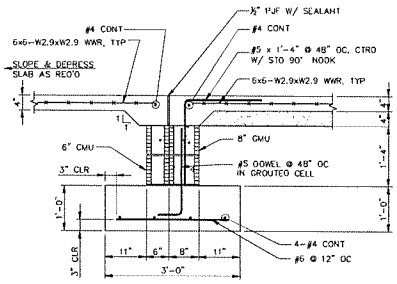
SECTION A
3/4"=1'-0" S1.1



SECTION B
3/4"=1'-0" S1.1

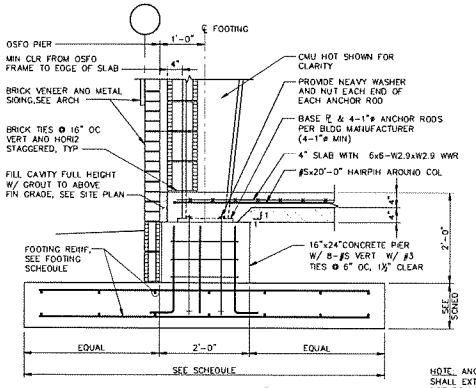


SECTION C
3/4"=1'-0" S1.1



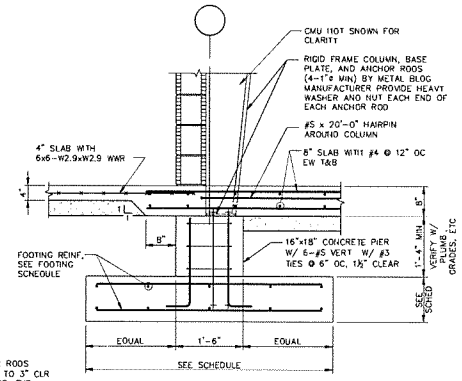
NOTE: COORDINATE JOINT LOCATION W/ ARCHITECTURAL REQUIREMENTS

SECTION D
3/4"=1'-0" S1.1



SECTION E
3/4"=1'-0" S1.1

NOTE: ANCHOR RODS SHALL EXTEND TO 3" CLR BOT OF FOOTING, TYP



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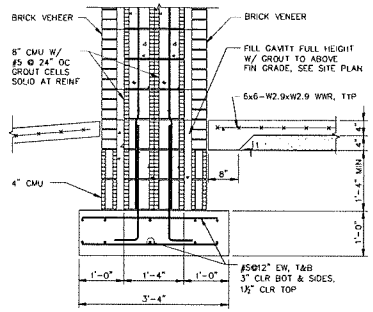
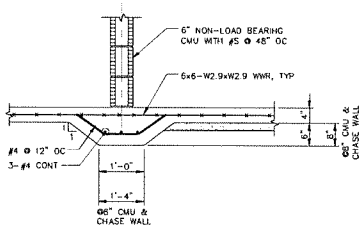
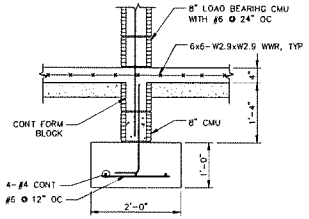


SECTION G
3/4"=1'-0" S1.1



SECTION H
3/4"=1'-0" S1.1



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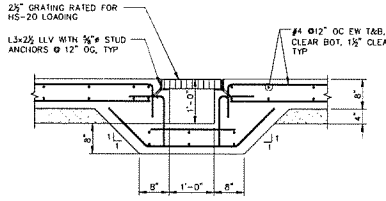
3/4"=1'-0" S1.1



SECTION K
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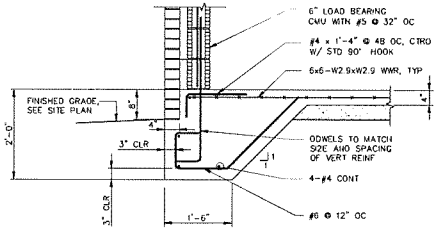

SECTION L
3/4"=1'-0" S1.1

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STRUCTURAL

SECTIONS

SHEET	42 OF 69
DWG NO.	S1.5
DATE	JULY 15, 2011
PROJ NO.	10ATL02-SS

GEORGIA REGISTERED PROFESSIONAL ENGINEER DIETRICH O. DANIELSON 11/18/2011

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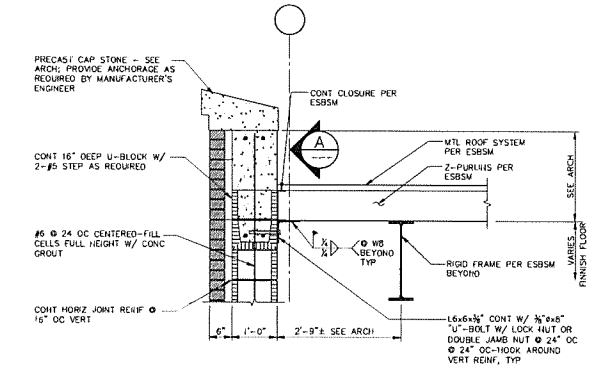
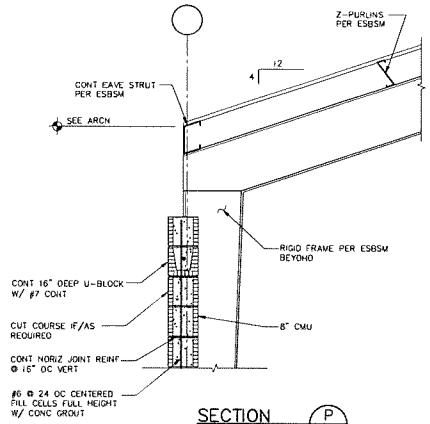


SECTION N
3/4"=1'-0" S1.3



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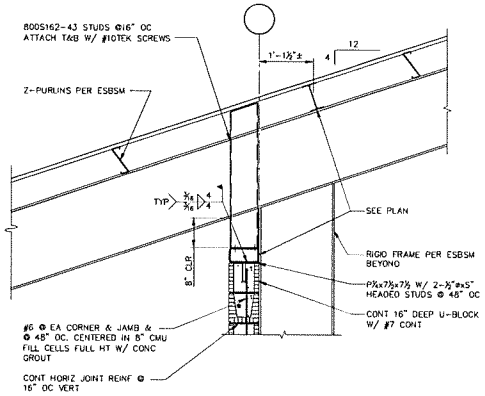

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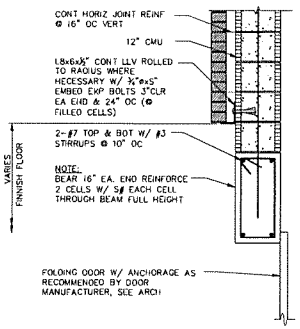

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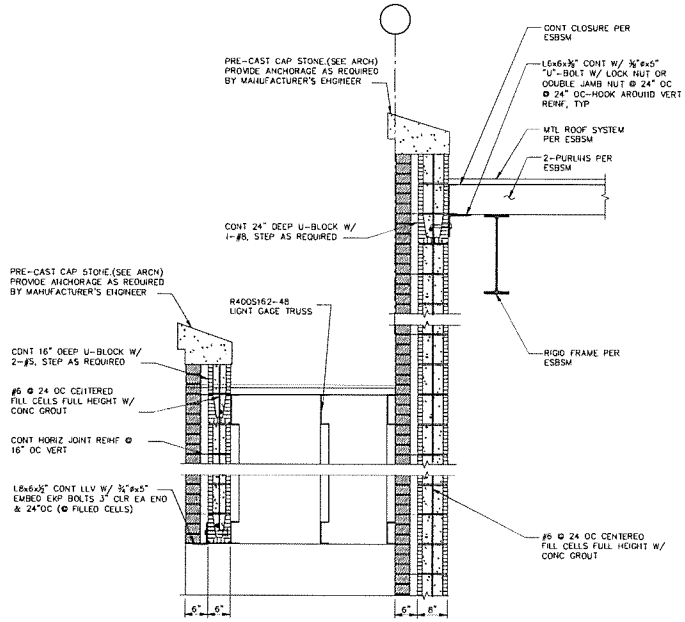
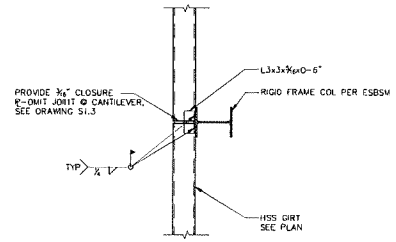
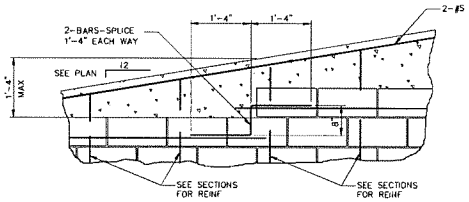


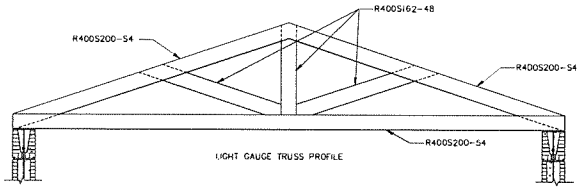
SECTION S
3/4"=1'-0" S1.3



DETAIL 1
3/4"=1'-0"



ELEVATION A
3/4"=1'-0" ---, S1.3



SECTION T
3/4"=1'-0" S1.3

GEORGIA REGISTERED PROFESSIONAL ENGINEER 7/8/2015 DIETRICH O. BANNFIELD JR.

KHAFRA ENGINEERING CONSULTANTS, INC. 225 PEACHTREE STREET, SUITE 1600 ATLANTA, GEORGIA 30303 404-525-2120 FAX 404-522-7941	OSGN DOBO				
	DR BOLR				
	CHK APWD				
	APVD DOBO	NO.	DATE	REVISION	BY / APVD

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STRUCTURAL
SECTIONS AND DETAILS

SHEET 43 OF 69
DWG NO. S1.6
DATE JULY 15, 2015
PROJ NO. 10ATL02-55

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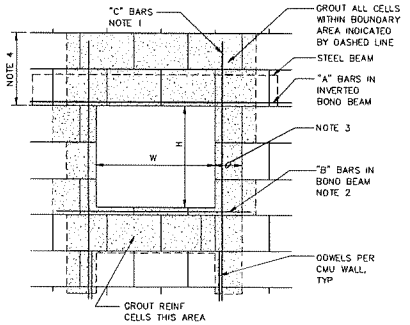
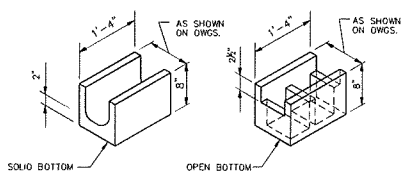


CMU OPENING REINFORCEMENT SCHEDULE									
W	"A" BARS		"B" BARS		"C" BARS		# CELLS TO GROUT NOTE 3		REMARKS
	8" CMU	12" CMU	8" CMU	12" CMU	8" CMU	12" CMU	8" CMU	12" CMU	
≤2'-0"	1-#5	2-#5	1-#5	2-#5	1-#5	2-#4	ONE	ONE	SEE LOOSE LINTEL SCHEDULE, DETAIL 208
>2'-0" ≤6'-0"	1-#6	2-#5	1-#5	2-#5	1-#5	2-#4	ONE	ONE	SEE LOOSE LINTEL SCHEDULE, DETAIL 208
>6'-0" ≤8'-0"	1-#7	2-#6	1-#6	2-#6	1-#6	2-#5	TWO	TWO	SEE MASONRY LINTEL DETAIL BELOW
>8'-0" ≤10'-0"	1-#8	2-#8	1-#7	2-#6	1-#6	2-#6	THREE	THREE	SEE MASONRY LINTEL DETAIL BELOW
>10'-0" ≤12'-0"	USE W8x21 STEEL BEAM				1-#6	2-#6	SIX	SIX	SEE STEEL BEAM LINTEL DETAIL BELOW
>12'-0" ≤16'-0"	USE W8x28 STEEL BEAM				1-#6	2-#6	SIX	SIX	SEE STEEL BEAM LINTEL DETAIL BELOW

NOTES:

1. EXTEND "C" BARS 2'-0" MINIMUM BEYOND TOP AND BOTTOM OF OPENING EXCEPT THAT WHEN "H" OR "W" EXCEEDS 2'-0", "C" BARS SHALL EXTEND FULL HEIGHT.
2. "A" AND "B" BARS SHALL EXTEND 2'-0" EACH SIDE OF THE OPENING. GROUT TO END OF BARS.
3. SEE SCHEDULE FOR NUMBER OF CELLS TO GROUT EACH SIDE OF OPENING.
4. GROUT ALL CELLS OVER OPENING TO W/2 OR 2'-0", WHICHEVER IS GREATER UNLESS TOP OF WALL IS REACHED FIRST.
5. IF OPENING DOES NOT FALL EXACTLY ON A CELL, GROUT PARTIAL BLOCK IN ADDITION TO CELLS REQUIRED ABOVE.
6. JOINT REINFORCING SHALL BE AT 16" OC. SEE SPECIFICATIONS FOR TYPE.
7. MINIMUM LINTEL BEARING 8" EACH SIDE OF OPENING.
8. NOTCH BEAM FLANGES AS NEEDED TO PASS VERTICAL REINFORCING BARS AND GROUT BEAM BEARING AREA SOLID.
9. LINTEL BLOCK FOR 8" WALL SHALL BE 24" DEEP MINIMUM AND LINTEL BLOCK FOR 12" WALL SHALL BE 16" DEEP MINIMUM.
10. LINTEL BLOCKS OR BOND BEAMS MAY NEED TO BE MODIFIED FOR WALL OPENINGS. IN THOSE CASES GROUT THE MODIFIED COURSE AND THE COURSE ABOVE OR BELOW.



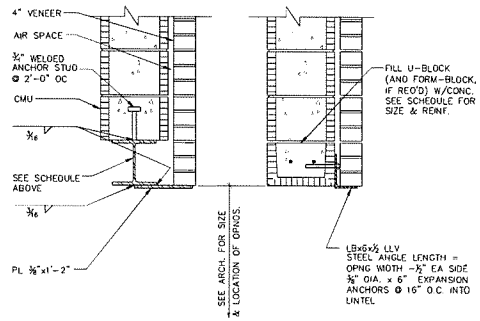
NOTES:

1. IF BOND BEAM BLOCK IS NOT LOCALLY AVAILABLE, STANDARD BLOCK SHALL BE SAW CUT TO CONFIGURATION SHOWN.

NOMINAL DIMENSIONS SHOWN.

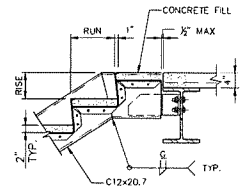
MASONRY WALL OPENING DETAIL
NTS

201



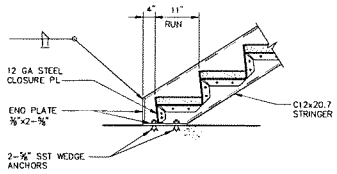
STEEL BEAM LINTEL

MASONRY LINTEL



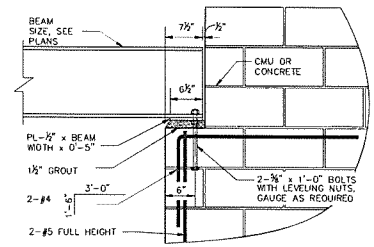
STAIR TOP CONNECTION
NTS

202

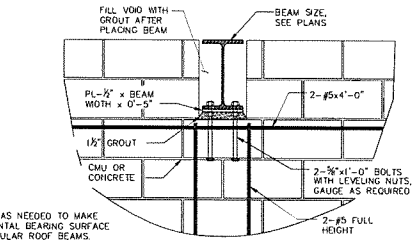


STAIR BOTTOM CONNECTION
NTS

203



PARALLEL TO WALL

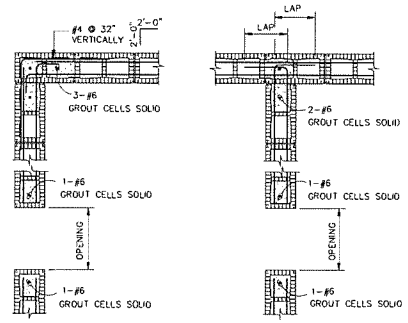


NOTE:
GROUT AS NEEDED TO MAKE HORIZONTAL BEARING SURFACE AT ANGULAR ROOF BEAMS.

PERPENDICULAR TO WALL

BEAM SEAT
NTS

204



EXTERIOR CORNER

INTERIOR CORNER

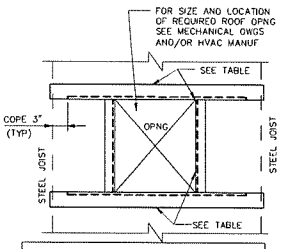
DOUBLE MAT

NOTES:

1. f'm = 1500 PSI, Fs = 24,00 PSI
2. LAP = 48 BAR DIAMETERS OR 1'-0" MIN FOR #3 TO #11 BARS, UNO (PER MSJC CODE ACI 530)

CMU WALL CORNERS
NTS

205



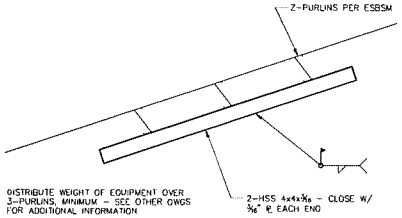
SPAN	ANGLE SIZE
UP TO 4'-0"	L3x3x1/4
4'-1" TO 6'-0"	L4x3x1/4 (LLV)
6'-1" TO 8'-0"	L5x3x1/4 (LLV)
8'-1" TO 10'-0"	L6x4x5/16 (LLV)
HVAC UNIT SUPPORT	L6x4x5/16 (LLV)

NOTES:

1. WELD ANGLES TOGETHER USING 3/16 FILLET WELD.
2. WELD ANGLES TO SUPPORTING JOIST USING 3/16 FILLET WELD.
3. ANGLES SIZES ABOVE SHOULD BE USED UNLESS DETAILED OTHERWISE.

ROOF OPENING FRAMING DETAIL
NTS

206

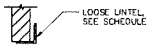


NOTE:

DETAIL APPLIES TO ALL SUSPENDED EQUIPMENT OVER 150 POUNDS IN WEIGHT, OR AS DIRECTED BY BUILDING SYSTEM MANUFACTURER. CONTRACTOR SHALL PROVIDE WEIGHT & LOCATION OF ALL EQUIPMENT TO ROOF SYSTEM MANUFACTURER.

EQUIPMENT SUPPORT DETAIL
NTS

207



BRICK LOOSE LINTEL SCHEDULE	
SPAN	ANGLE SIZE
UP TO 2'-0"	L6x4x⅜ (LLH)
2'-1" TO 6'-0"	L6x6x⅜
NOTE: 8" MIN. BEARING EACH END	

LOOSE LINTEL
NTS

208

GEORGIA REGISTERED PROFESSIONAL ENGINEER DIETRICH O. BANKHEAD 17 MARCH

KHAFRA ENGINEERING CONSULTANTS, INC.
225 PEACHTREE STREET, SUITE 1600
ATLANTA, GEORGIA 30303
404-525-2120 FAX 404-522-7941

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STRUCTURAL

DETAILS

SHEET 44 OF 69
DWG NO. S1.7
DATE JULY 15, 2011
PROJ NO. 10ATL02-55

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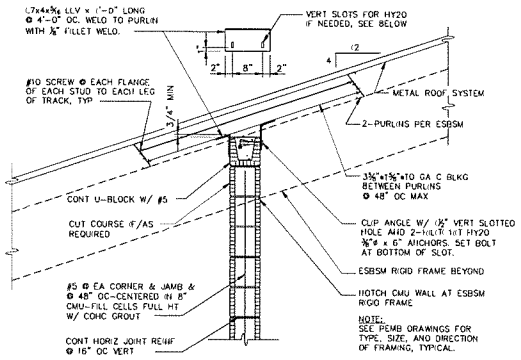
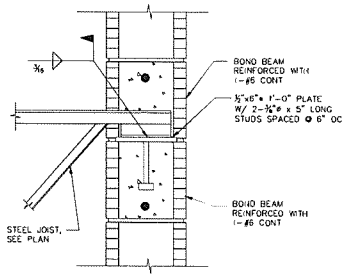


TYPICAL INTERIOR WALL BRACING DETAIL PARALLEL TO FRAMING

NTS

209

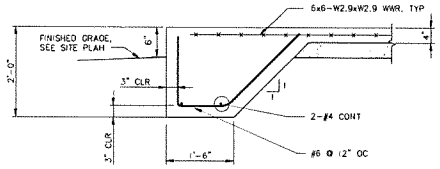


8" CMU

TYPICAL JOIST BEARING

NTS

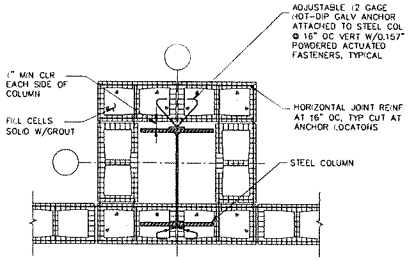
212



TURN DOWN SLAB

NTS

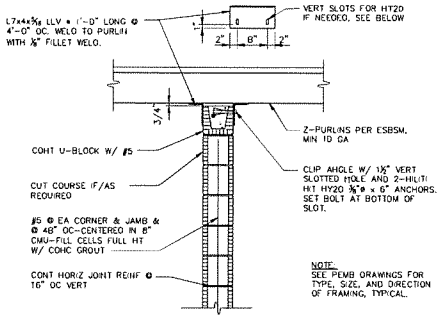
214



MASONRY COLUMN ENCLOSURE

NTS

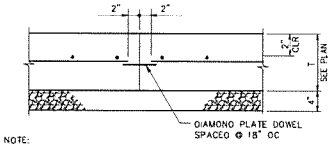
216



TYPICAL INTERIOR WALL BRACING DETAIL WALLS PERPENDICULAR OR SKEWED WITH ROOF FRAMING

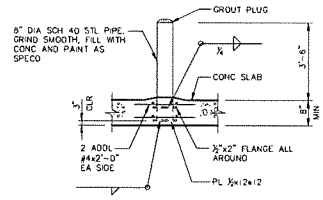
NTS

210

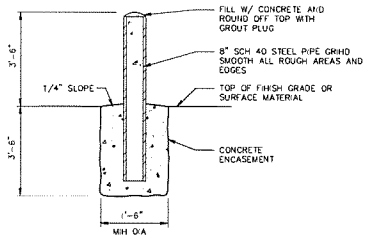


NOTE:
FOR SLAB THICKNESS AND REINFORCING, SEE PLAN DRAWINGS.

TYPICAL SLAB HORIZONTAL CONSTRUCTION JOINT



INTERIOR

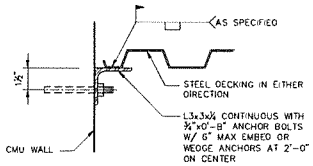


EXTERIOR

BOLLARD DETAIL

NTS

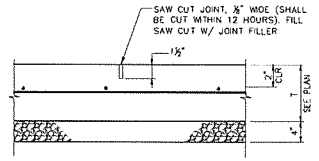
215



STEEL DECKING LEDGER SUPPORT ANGLE

NTS

211



TYPICAL CONTRACTION JOINT

CONSTRUCTION AND CONTRACTION JOINT DETAIL

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STRUCTURAL

DETAILS

SHEET 45 OF 69
DWG NO. S1.8
DATE JULY 15, 2011
PROJ NO. 10AFL02-55

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GEORGIA REGISTERED PROFESSIONAL ENGINEER
DIETRICH O. BANNFIELD

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GENERAL NOTES - PLUMBING

1. SCOPE OF WORK SHOWN ON PLUMBING PLANS DEFINE LIMIT OF ARCHITECTURAL WORK. PLUMBING WORK WILL EXTEND BEYOND THESE LIMITS FOR POINTS OF CONNECTION TO EXISTING RISERS.
2. THESE DWGS. HAVE BEEN PREPARED FROM THE LATEST INFORMATION AVAILABLE, BUT VARIATIONS MAY OCCUR IN THE ACTUAL CONSTRUCTION. ANY DISCREPANCIES SHALL BE REPORTED TO THE ENGINEER PRIOR TO COMMENCING WORK.
3. REQUIRED INSURANCE SHALL BE PROVIDED BY THE CONTRACTOR FOR PROTECTION AGAINST PUBLIC LIABILITY AND PROPERTY DAMAGE FOR THE DURATION OF WORK.
4. CONTRACTOR SHALL SECURE AND PAY FOR ALL PLUMBING FEES, AND PERMITS. ALL OTHER FEES AND TAXES SHALL BE INCLUDED IN PLUMBING CONTRACT.
5. ALL WORK SHALL BE PERFORMED BY A LICENSED PLUMBING CONTRACTOR IN A FIRST CLASS WORKMANLIKE MANNER. THE COMPLETED SYSTEM SHALL BE FULLY OPERATIVE.
6. THESE DWGS. DO NOT PURPORT TO SHOW ALL EXISTING UTILITIES.
7. CONTRACTOR SHALL VISIT THE JOB SITE AND THOROUGHLY FAMILIARIZE HIMSELF WITH ALL EXISTING CONDITIONS.
8. ALL WORKMANSHIP AND MATERIAL SHALL BE IN STRICT ACCORDANCE WITH APPLICABLE INTERNATIONAL AND LOCAL PLUMBING CODES, RULES AND ORDINANCES.
9. ALL PLUMBING FIXTURES SHALL MEET INTERNATIONAL, STATE AND LOCAL PLUMBING CODES.
10. ALL MATERIAL SHALL BE NEW.
11. ALL FIXTURE CONNECTIONS SHALL BE MADE WITH NEW FITTINGS.
12. ALL FIXTURES AND EQUIPMENT SHALL BE KEPT CLEAN DURING ALL CONSTRUCTION AND NOT USED DURING CONSTRUCTION.
13. ALL FIXTURES MUST BE PROVIDED WITH READILY ACCESSIBLE STOPS AND APPROPRIATELY MARKED ACCESS PANELS. COORDINATE LOCATIONS WITH GENERAL CONTRACTOR PRIOR TO INSTALLATION.
14. ALL EXPOSED PLUMBING EQUIPMENT,PIPING, ETC. SHALL BE PAINTED. THE COLOR SHALL BE SELECTED BY THE ARCH.
15. CONCEAL ALL PIPING IN FINISHED PORTIONS OF THE BUILDING UNLESS NOTED OTHERWISE.
16. DIELECTRIC COUPLINGS ARE REQUIRED BETWEEN ALL DISSIMILAR METAL IN PIPING AND EQUIPMENT CONNECTIONS.
17. THESE DRAWINGS ARE DIAGRAMMATIC ONLY. REFER TO THE ARCH. DWG's FOR BLDG DIMENSIONS AND EXACT LOCATIONS AND ELEVATIONS OF ALL FIXTURES AND EQUIPMENT.
18. PLUMBING CONTRACTOR SHALL MAKE CONNECTIONS TO EXISTING CONCEALED RISER MAINS AS REQUIRED TO MEET DESIGN.
19. WATER PIPING SHALL BE TYPE "L" COPPER FOR 2" AND UNDER AND TYPE "K" COPPER FOR 2-1/2" AND ABOVE. ALL UNDERGROUND WATER PIPING SHALL BE TYPE "K" COPPER.
20. FURNISH AND INSTALL (COLD & HOT) WATER ISOLATION VALVES ON MAINS, MAIN BRANCH LINES, EQUIPMENT AND FIXTURES TO BE INSTALLED.
21. THE HOT AND COLD WATER PIPING SYSTEM SHALL BE INSULATED THROUGHOUT THE PROJECT.
22. PROVIDE AND INSTALL NEW TEES, WYES OR ELLS AT EACH WATER AND SEWER POINT OF CONNECTION.
23. PROVIDE AND INSTALL HAMMER ARRESTORS ON HOT AND COLD WATER BRANCH LINES SERVING FIXTURES OR EQUIPMENT WITH QUICK CLOSING (SOLENOID) VALVES. SHOCK ABSORBERS SHALL BE READILY ACCESSIBLE. SHOCK ABSORBERS SHALL BE JOSAM, ZURN OR APPROVED EQUAL.
24. PROVIDE 1/2" TRAP PRIMER LINE FOR ALL FLOOR DRAINS FROM THE NEAREST PLUMBING FIXTURE.
25. PROVIDE ACCESS PANELS FOR ALL CONCEALED VALVES AND ALL WATER HAMMER ARRESTERS. ACCESS PANELS IN RATED WALLS MUST MAINTAIN THE SAME RATING AND MUST MATCH THE FINISH OF THE WALL IN WHICH IT IS INSTALLED.
26. APPLY A WATER PRESSURE TEST TO ALL PARTS OF THE WATER PIPING SYSTEM NOT LESS THAN 150 PSIG OR 1.25 TIMES THE SYSTEM WORKING PRESSURE (WHICHEVER IS GREATER), FOR A PERIOD OF 4 HOURS. REPAIR ANY LEAKS.
27. ALL CONTROL VALVES SHALL BE TAGGED AND MARKED. A REPRODUCEABLE DIAGRAM LOCATING ALL VALVES SHALL BE PROVIDED FOR OWNER/OPERATOR.
28. EXISTING SANITARY AND VENT RISERS SHALL BE OFFSET AS REQUIRED AND CONCEALED.
29. ALL HORIZONTAL WASTE PIPING AND CONDENSATE DRAINS SHALL HAVE A MIN. SLOPE OF 2% (UNLESS NOTED OTHERWISE ON PLANS).
30. AIR CONDITIONING CONDENSATE DRAIN PIPING SHALL BE PVC.
31. INSULATE ALL CONDENSATE PIPING EXCEPT UNDERGROUND AND ELECTRIC HEAT WRAP WHERE EXPOSED TO FREEZING CONDITIONS.
32. MAKE PROPER SANITARY, WASTE, VENT, HOT AND COLD WATER CONNECTIONS TO ALL FIXTURES AND EQUIPMENT EVEN THOUGH ALL BRANCH MAINS, ELBOWS AND CONNECTIONS ARE NOT SHOWN.
33. SCHEDULE 40 PVC D.W.V. TO BE USED ON ALL SANITARY, STORMDRAINS, AND CONDENSATE LINES PIPING RUNNING BELOW GROUND FLOOR SLAB AND GRADE ONLY.
34. ALL CONDENSATE RISERS WITHIN UNITS TO BE 2" (INCH.)
35. DRAINS SHALL BE AS FOLLOWS: (ZURN) DRAIN IN BATHROOM AREA. (#2N415-P-6B) INTERIOR FLOOR CLEANOUTS SHALL BE ZURN 2N1400.
36. PROVIDE CHROME PLATED COMBINATION COVER PLATE AND CLEANOUT PLUG OR ACCESS PANEL FOR ALL WALL CLEANOUTS - ZURN 2S-1469 SERIES C.O. OR APPROVED ACCESS PANEL.
37. CONTRACTOR SHALL GUARANTEE ALL MATERIALS AND WORKMANSHIP FREE FROM DEFECTS FOR A PERIOD OF NOT LESS THAN ONE (1) YEAR FROM DATE OF ACCEPTANCE BY OWNER. CORRECTION OF ANY DEFECTS SHALL BE COMPLETED WITHOUT ADDITIONAL CHARGE AND SHALL INCLUDE REPLACEMENT OR REPAIR OF ANY OTHER PHASE OF THE INSTALLATION WHICH MAY HAVE BEEN DAMAGED.

PLUMBING FIXTURE SCHEDULE

TAG	FIXTURE/ITEM	TRAP	CONNECTION SIZES S/W	V	CW	HW	DESCRIPTION
WC 1	WATER CLOSET DISABLED ACCESSIBLE	INT	4"	2"	1-1/4"	-	AMERICAN STANDARD #2257.103, ELONGATED, 1.5 GPF WITH OLSONITE SEAT #95, SLOAN FLUSH VALVE #111 AND J.R. SMITH CARRIER OR EQUAL.
LAV 1	LAVATORY DISABLED ACCESSABLE	1 1/4"	2"	1-1/2"	1/2"	1/2"	AMERICAN STANDARD #0470.013, FAUCET # 2385.245. POP-UP DRAIN, ANGLE STOPS, SUPPLIES AND 'P' TRAP. INSULATE HOT WATER AND WASTE. OR EQUAL.
UR 1	URINAL DISABLED ACCESSABLE	1 1/2"	2"	1-1/2"	1-1/4"	-	AMERICAN STANDARD #6541.132, 1 GPF WITH SLOAN ROYAL FLUSH VALVE # 186-1. OR EQUAL.
S1 1	SINGLE COMPT SINK	2"	2"	1-1/2"	1/2"	1/2"	ELKAY MODEL LR 2219, 18 GA. STAINLESS STEEL, 3-HOLE PUNCH, 7-1/2" DEEP, 3-1/2" DRAIN, ELKAY MODEL LK-4100 FAUCET WITH SWING SPOUT AND AERATOR, 3-HOLE, ELKAY LK-35 STRAINER
S2 1	DOUBLE COMPT SINK	2"	2"	1-1/2"	1/2"	1/2"	ELKAY 2-COMP, 18 GA. STAINLESS STEEL, 3-HOLE PUNCH, 7-1/2" DEEP, 3-1/2" DRAIN, ELKAY MODEL LK-4100 FAUCET WITH SWING SPOUT AND AERATOR, 3-HOLE, ELKAY LK-35 STRAINER
S2B 1	TWO COMPT SINK	2"	2"	1-1/2"	1/2"	1/2"	ELKAY 2-COMP, 18 GA. STAINLESS STEEL, 3-HOLE PUNCH, 7-1/2" DEEP, 3-1/2" DRAIN, ELKAY MODEL B2C24X24 FAUCET WITH SWING SPOUT AND AERATOR, 3-HOLE, ELKAY LK-35 STRAINER
JS 1	JANITOR'S SINK	3"	3"	1-1/2"	3/4"	3/4"	SINK: AMERICAN STANDARD FLORWELL MODEL 7745.811 28" X 28" X 13" CORNER MODEL ENAMELED CAST IRON W/ VINYL RIM GUARD FAUCET: AMERICAN STANDARD 8344.111 FAUCET W/ TOP BRACE, STOPS AND VACUUM BREAKER. STRAINER: AMERICAN STANDARD 7721.038, OR EQUAL.
SH 1	SHOWER	-	-	-	1/2"	1/2"	PRE-FAB SHOWER STALL FLORESTONE MODEL 40-62H ADA COMPLIANT ; BARRIER-FREE SHOWER INCLUDE WITH STAINLESS STEEL CURTAIN ROD, SYMMONS PRESSURE BALANCE MIXING VALVE WITH CONCEALED CHECK STOPS; ALSONS HAND-HELD SHOWER HEAD WITH ULTRA FLEX HOSE AND SLIDE BAR; STAINLESS STEEL CORNER GRAB BAR; STAINLESS STEEL SOAP DISH; WHITE NAUGAHYDE FOLDING WHEELCHAIR TRANSFER SEAT
TD 1	TRENCH DRAIN	-	-	-	1-1/2"	-	12" STAINLESS STEEL TRENCH DRAIN COORDINATE LENGTH AND DEPTH WITH STRUCTURAL DWGS
BFP 1	BACKFLOW PREVENTER	-	-	-	1-1/2"	-	WATTS MODEL #909 OR EQUAL; REDUCED PRESSURE BACK FLOW PREVENTER.
TP-1	TRAP PRIMER	-	-	-	1/2"	-	PRECISION PLUMBING PRODUCTS MODEL PR-500, OR EQUAL.
WHA-1	WATER HAMMER ARRESTOR	-	-	-	-	-	ZURN SHOCKTROL MODEL Z-1700 SERIES.
FD-1	FLOOR DRAIN	2"	2"	1-1/2"			J.R. SMITH #2005-A WITH HEAL PROOF GRATE AND TRAP PRIMER CONNECTION
SD-1	SHOWER DRAIN	2"	2"	1-1/2"			J.R. SMITH #2005-F WITH 5" ROUND STRAINER AND TILE FLANGE.
HB-1	HOSE BIBB	-	-	-	1/2"	-	WALL TYPE WITH INTEGRAL VACUUM BREAKER
AD-1	AREA DRAIN	3"	3"	-	-	-	JAY R. SMITH #2120 HEAVY DUTY DRAIN WITH TRACTOR GRATE.

PLUMBING EQUIPMENT SCHEDULE

TAG	FIXTURE/ITEM	DESCRIPTION	ELECTRICAL V	Φ	HZ	FLA
GT 1	GREASE TRAP	1500 GAL GREASE TRAP	-	-	-	-
CDP 1	CONDENSATE PUMP	LITTLE GIANT MODEL VCM-20UL, 55 GPH @ 9' HEAD. 1/30 HP.	120	1	60	-
GD 1	GARBAGE DISPOSAL	IN-SINK-ERATOR MODEL 555	120	1	60	-

GAS WATER HEATER SCHEDULE

TAG	FIXTURE/ITEM	DESCRIPTION	GAS INPUT	THERMAL EFFICIENCY	ELECTRICAL V	Φ	HZ	FLA
WH-1	WATER HEATER	A.O. SMITH CYCLONE BTH 199 USABLE STORAGE. 100 GALLONS. RECOVERY: 230 AT 1000EG F TEMP RISE 4" PVC FLUE VENT, 4" AIR INTAKE	199 MBH	95%	120	1	60	1
WH-2	WATER HEATER	A.O. SMITH CYCLONE BTH 250 USABLE STORAGE. 100 GALLONS RECOVERY: 288 AT 1000EG F TEMP RISE 4" PVC FLUE VENT, 4" AIR INTAKE	250 MBH	95%	120	1	60	1

GEORGIA REGISTERED PROFESSIONAL ENGINEER ERNEST OKOYE 7/15/2011

DSI ENGINEERING CONSULTANTS INC.
KHAFRA ENGINEERING CONSULTANTS, INC.
725 PEACHTREE SUITE 1600
ATLANTA, GEORGIA 30303
404-525-2120 FAX 404-522-7941

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DR	ML
CHK	WOT
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PLUMBING

PLUMBING NOTES & SCHEDULES

SHEET 53 OF 69
DWG NO. P.00
DATE JULY 15, 2011
PROJ NO. 10ATL02-55

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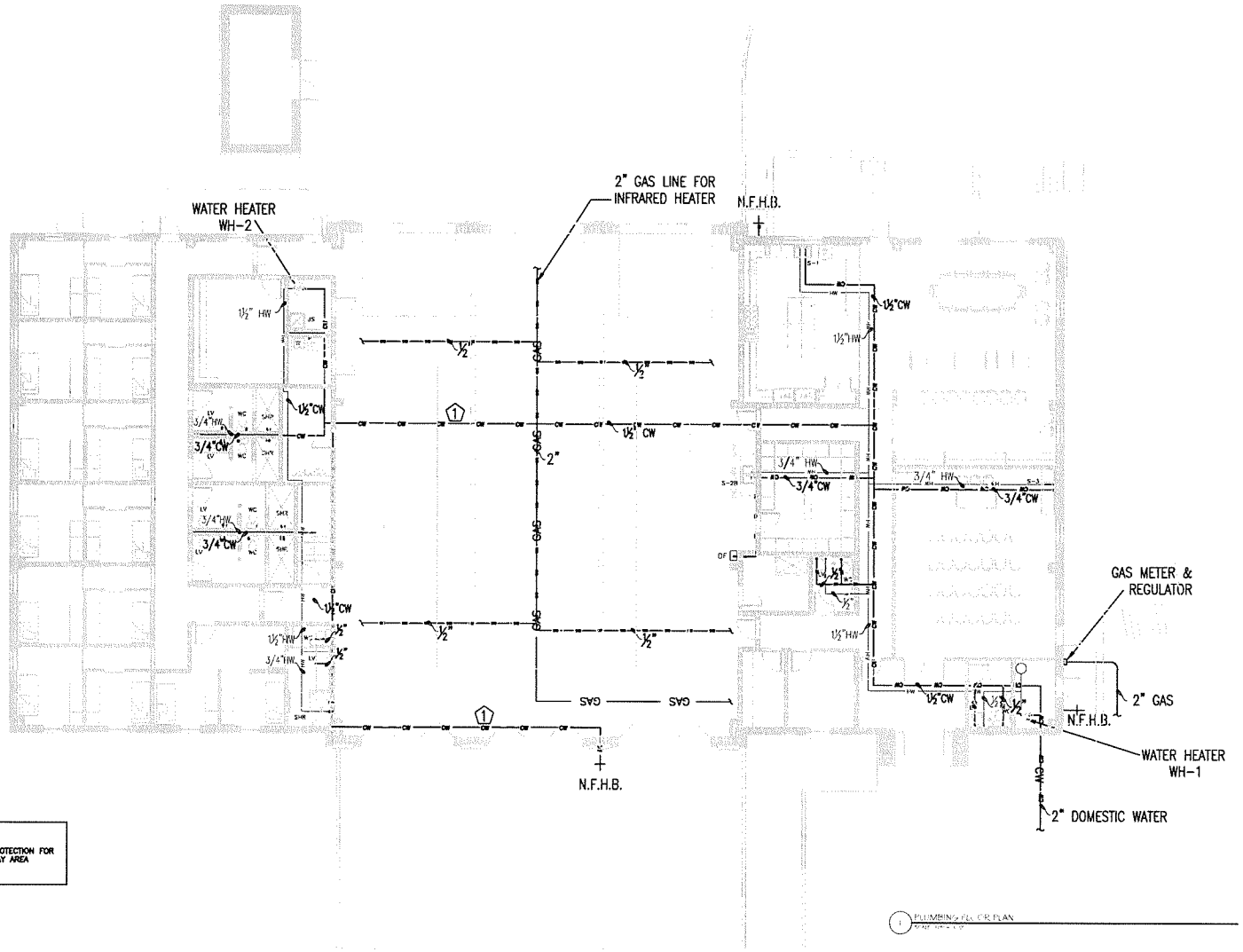

KEY NOTES:

1. PROVIDE FREEZE PROTECTION FOR ALL CW PIPING IN BAY AREA

1 PLUMBING FLOOR PLAN

DSGN	DB						
DR	ML						
CHK	WDT						
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Atlanta, Georgia 30336

PLUMBING

DOMESTIC FLOOR PLAN

SHEET	54 OF 69
DWG NO.	P.01
DATE	JULY 15, 2011
PROJ NO.	10ATL02-55

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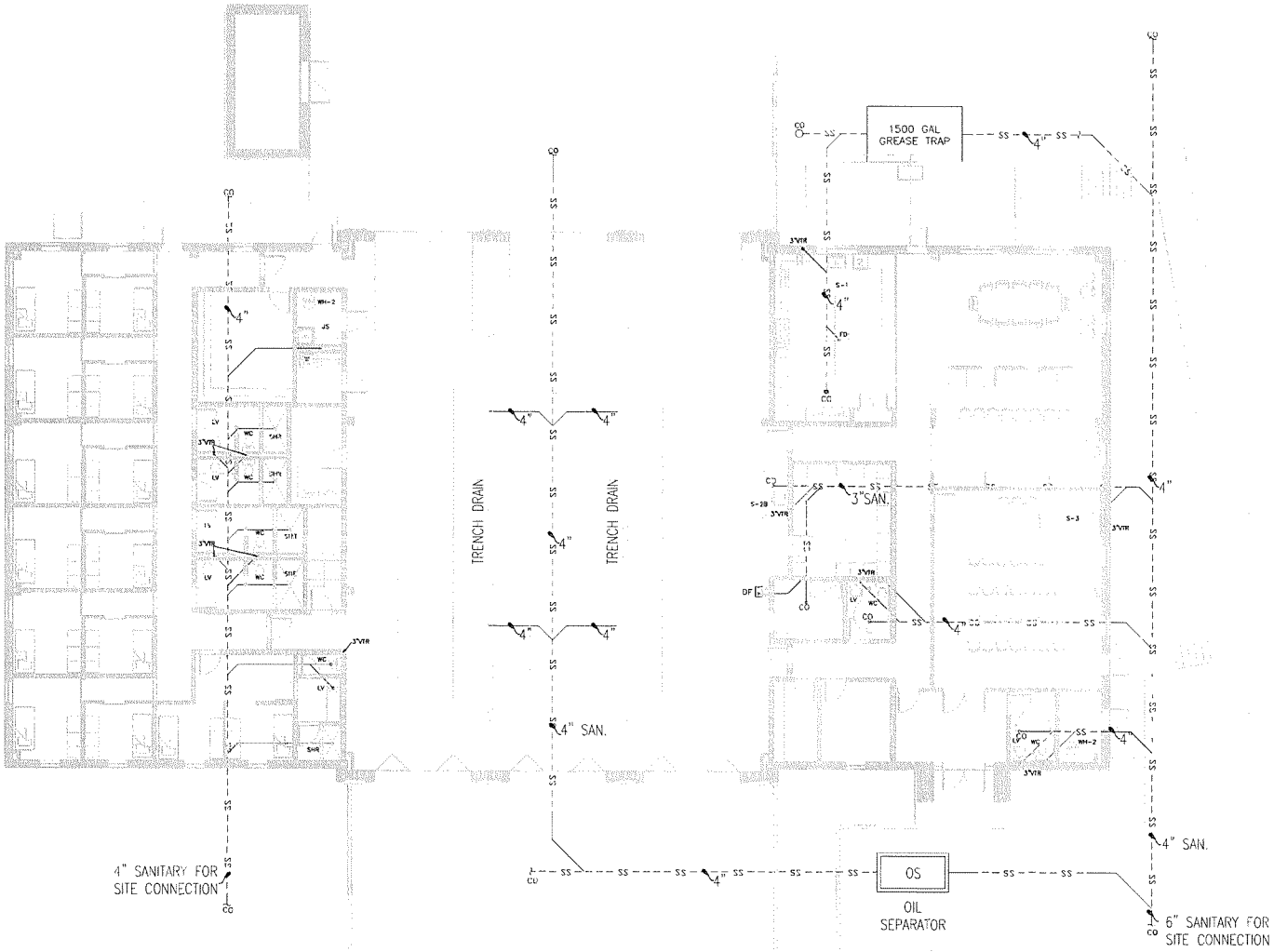

1 SANITARY FLOOR PLAN

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PLUMBING

SANITARY FLOOR PLAN

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DATE	JULY 15, 2011
PROJ NO.	10ATL02-55

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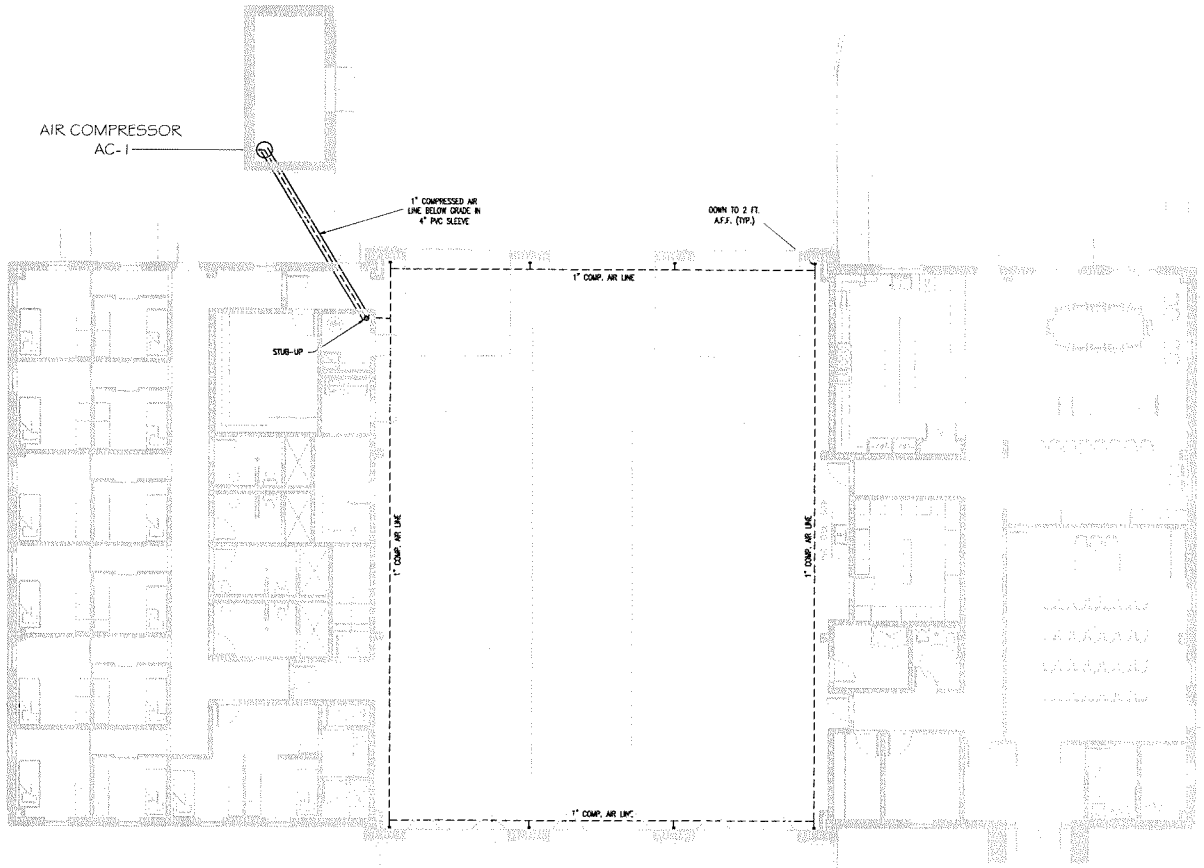

AIR COMPRESSOR SCHEDULE								
MARK	MAX. PSI	CFM	SERVICE	HP	ELECTRICAL	MANUF.	MODEL	NOTES
AC1	125	13.1	BAM	2	208/3/60	EMGLO	K-ZA-60	1,2

NOTES:

1.PROVIDE COMPRESSOR WITH CONCRETE PAD AND VIBRATION ISOLATORS.
2.PROVIDE WITH 60GA STORAGE TANK, SHUTOFF VALVE, FILTER AND PRESSURE GAUGE.

1 COMPRESSED AIR PLAN
SCALE: 1/8" = 1'-0"

GEORGIA REGISTERED PROFESSIONAL ENGINEER
Engineer: Office
7/16/2011
ORIGINAL
ERNEST OKOYE

DSI DESIGN SYSTEMS INC. CONSULTING ENGINEERS, PLANNERS
KHAFRA ENGINEERING CONSULTANTS, INC.
225 PEACHTREE STREET, SUITE 1600
ATLANTA, GEORGIA 30303
404-525-2120 FAX 404-522-7941

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PLUMBING

COMPRESSED AIR PLAN

SHEET 56 OF 69
DWG NO. P.03
DATE JULY 15, 2011
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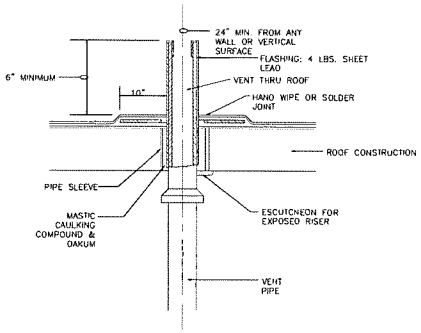
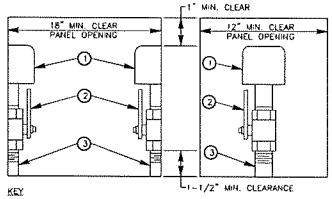


1 VENT THROUGH ROOF DETAIL
NO SCALE

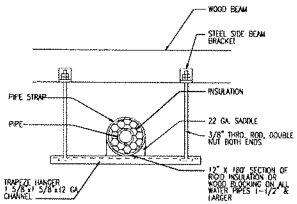


KEY

1. WATER HAMMER ARRESTOR
2. BALL VALVE, SAME NOMINAL SIZE AS PIPE BRANCH IN CHASE. OPENING IN BALL VALVE TO MATCH PIPE I.D.
3. PIPE SAME SIZE AS BRANCH IN CHASE TO WHICH IT IS ATTACHED.

NOTE: PROVIDE REDUCER IF REQUIRED BETWEEN VALVE AND WATER HAMMER ARRESTOR.

2 TYP. WATER HAMMER PANEL INSULATION
SINGLE AND DOUBLE APPLICATION
NO SCALE



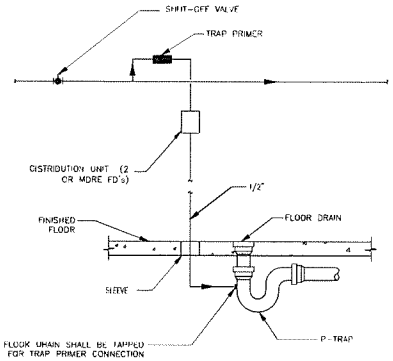
4 PIPE HANGER AND INSULATION DETAIL
NO SCALE

NOTES:

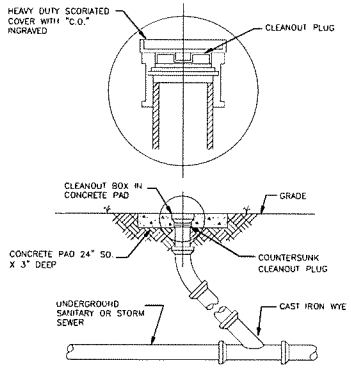
1. LOW WATER CUT- OFF.
2. HIGH AND LOW PRESSURE LIMIT SWITCHES.
3. TEMPERATURE & PRESSURE GAUGES.

PROVIDE AND INSTALL NEW UNDER COUNTER DISHWASHER. CONNECT NEW DISHWASHER WATER SUPPLY AND DRAIN LINES IN THE BREAK ROOM. MAKE: KENMORE-ELITE#16939.

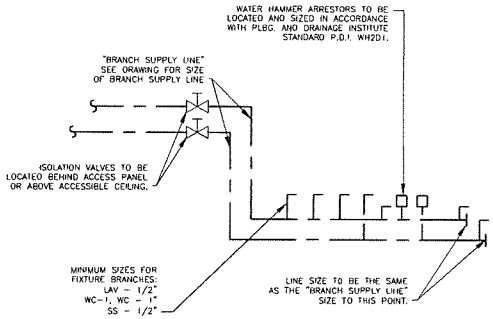
PROVIDE AND INSTALL ONE NEW UNDER COUNTER ICE MAKER PROVIDE 3/4" WATER SUPPLY. MAKE: KITCHENAID #KUIA18NNJS.



7 TRAP PRIMER DETAIL
NO SCALE



6 CLEANOUT DETAIL
NO SCALE



5 TYPICAL WATER PIPING FOR TOILETS
NO SCALE

GEORGIA REGISTERED PROFESSIONAL ENGINEER
Ernest O'Rourke
7/15/2011
ERNEST O'ROURKE

DSI

KHAFRA ENGINEERING CONSULTANTS, INC.
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PLUMBING

PLUMBING DETAILS 1

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DATE JULY 15, 2011
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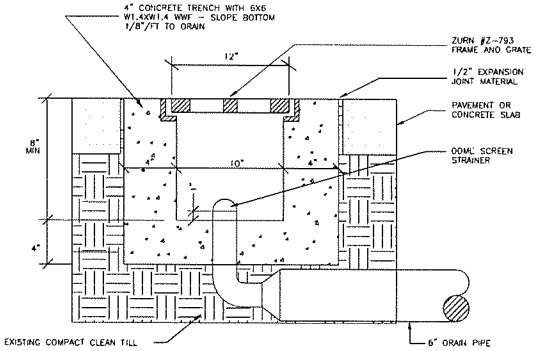
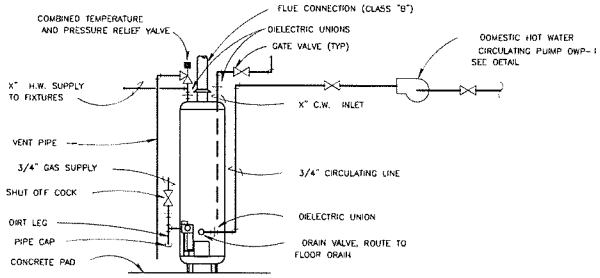


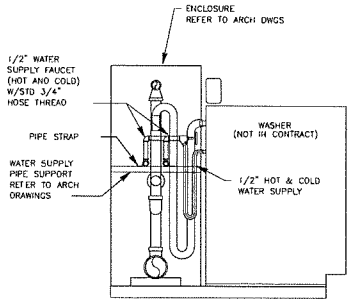
TRENCH DRAIN DETAIL

N.T.S. TD04



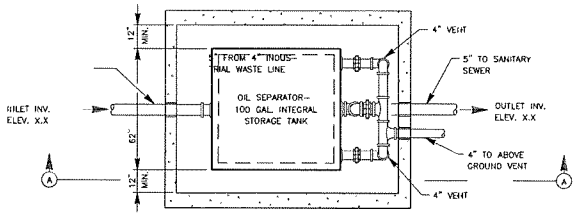
GAS FIRED HOT WATER HEATER CONNECTIONS WITH RECIRCULATING LOOP

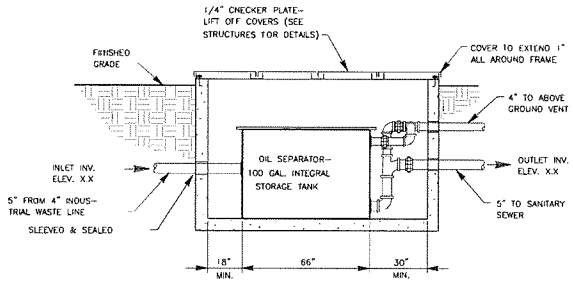
N.T.S. GFHWHCWRL



WASHER WATER CONNECTION DETAIL

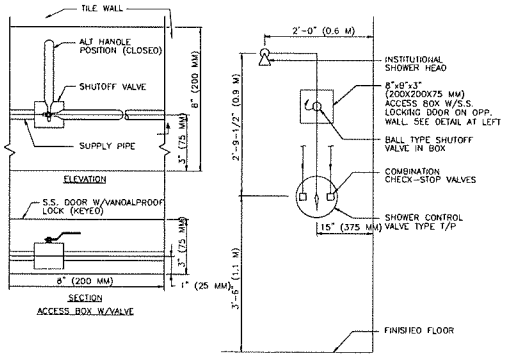
N.T.S. WWCO





TYPICAL OIL SEPARATOR DETAIL

N.T.S. OS0



TYPICAL SHOWER

N.T.S. SH2

GEORGIA REGISTERED PROFESSIONAL ENGINEER 7/15/2011 ERNEST OLIVE

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		DR ML					
		CHK WDT					
		APVD OB	NO.	DATE	REVISION	BY	APVD

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BURTON & BOWDEN

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Atlanta, Georgia 30336

PLUMBING

PLUMBING DETAILS 2

SHEET 58 OF 69
DWG NO. P.05
DATE JULY 15, 2011
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GENERAL NOTES:

1. ALL MECHANICAL EQUIPMENT AND INSTALLATIONS SHALL CONFORM WITH THE REQUIREMENTS OF THE INTERNATIONAL MECHANICAL CODE 2000, WITH 2002 GEORGIA AMENDMENTS.
2. PRIOR TO PURCHASING ANY MATERIALS OR STARTING ANY WORK, CONTRACTOR SHALL VERIFY ALL EXISTING CONDITIONS, DUCTWORK SIZES AND LOCATIONS, EQUIPMENT, ETC. SHOWN ON DRAWINGS OR AFFECTING THIS WORK, AND SHALL REPORT ANY DEVIATIONS TO THE ENGINEER.
3. SHOP DRAWINGS SHALL BE SUBMITTED AND APPROVED BY THE ENGINEER PRIOR TO ORDERING, PURCHASING OR FABRICATING ANY MECHANICAL EQUIPMENT. SHOP DRAWINGS SHALL INCLUDE: ALL EQUIPMENT SCHEDULED ON THE DRAWINGS; DUCTWORK DRAWN TO 1/4" SCALE OR THE SCALE SHOWN ON THE DRAWINGS; ALL SPECIFIED CONNECTIONS TO EXISTING CONDITIONS SHALL BE DETAILED.
4. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL ELECTRICAL REQUIREMENTS OF ALL MECHANICAL EQUIPMENT WITH ELECTRICAL DRAWINGS PRIOR TO ORDERING EQUIPMENT OR SUBMITTING SHOP DRAWINGS, AND SHALL FURNISH EQUIPMENT WIRED FOR THE VOLTAGES SHOWN THEREIN.
5. ALL MECHANICAL EQUIPMENT REQUIRING ELECTRICAL POWER SHALL BE INSTALLED WITH DISCONNECT SWITCHES AT EACH PIECE OF EQUIPMENT. COORDINATE SWITCH TYPE WITH EQUIPMENT CHARACTERISTICS AND THE ELECTRICAL DRAWINGS.
6. ALL REQUIRED CONTROL WIRING NOT SHOWN ON THE ELECTRICAL DRAWINGS SHALL BE INCLUDED AS PART OF THE MECHANICAL WORK. WIRING IN HVAC PLENUM SPACES SHALL BE INSTALLED ACCORDING TO CODE REQUIREMENTS.
7. UNLESS NOTED OTHERWISE, STARTERS, SMOKE DETECTORS, TRANSFORMERS, CONTROLS AND CONTROL WIRING REQUIRED FOR ALL MECHANICAL SYSTEMS SHALL BE FURNISHED AND INSTALLED BY THE MECHANICAL CONTRACTOR. ALL FANS SUPPLYING MORE THAN 2000 CFM OF AIR TO ANY SPACE AND ALL RECIRCULATING FAN SYSTEMS SERVING AREAS OF EGRESS SHALL BE INSTALLED WITH A SMOKE DETECTOR IN THE SUPPLY DUCTWORK. THE SMOKE DETECTOR SHALL BE WIRED TO SHUT OFF FAN UPON DETECTION OF SMOKE, AND SIGNAL THE FIRE ALARM CONTROL PANEL.

   SMOKE DETECTOR TROUBLE CONDITIONS SHALL BE INDICATED VISUALLY OR AUDIBLY IN A NORMALLY OCCUPIED AREA AND SHALL BE IDENTIFIED AS AIR DUCT DETECTOR TROUBLE. IF A BUILDING FIRE ALARM SYSTEM IS INSTALLED, THE SMOKE DETECTOR SHALL BE PROVIDED BY BEING MOUNTED IN THE DUCT BY THE MECHANICAL CONTRACTOR AND WIRED BY THE ELECTRICAL CONTRACTOR.
8. ALL MECHANICAL EQUIPMENT SHALL BE INSTALLED ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS.
9. ALL MECHANICAL EQUIPMENT AND SYSTEMS SHALL BE GUARANTEED FOR A PERIOD OF ONE YEAR AFTER AFS FINAL CERTIFICATE OF APPROVAL BY THE ENGINEER AND OWNER.
10. ALL HVAC COMPRESSORS SHALL HAVE EXTENDED 5 YEAR MANUFACTURER'S WARRANTY BECOMING EFFECTIVE AFTER THE INITIAL 1 YEAR WARRANTY.
11. COORDINATE EXACT LOCATION OF EQUIPMENT WITH ARCHITECTURAL AND STRUCTURAL DRAWINGS.
12. INSTALL OUTDOOR HVAC EQUIPMENT LEVEL ON 6" THICK REINFORCED CONCRETE PADS, EXTENDING 24" BEYOND ACTUAL EQUIPMENT LAYOUT, FENCED AS DETAILED.
13. DUCTWORK SHALL BE CONSTRUCTED OF GALVANIZED SHEET METAL AS RECOMMENDED IN SMACNA LOW PRESSURE DUCT CONSTRUCTION STANDARDS, LATEST EDITION. FIRE DAMPERS SHALL BE INSTALLED IN ALL DUCTWORK PER LOCAL CODE, NFPA AND SMACNA STANDARDS. ALL JOINTS AND SEAMS IN ALL DUCTWORK SHALL BE SEALED WITH MASTIC.
14. SHEET METAL SUPPLY, RETURN AND OUTSIDE AIR DUCTWORK IN NON-AIR CONDITIONED AREAS AND MECHANICAL ROOMS SHALL BE INSULATED WITH 2" THICK FIBERGLASS DUCT INSULATION WITH FOIL VAPOR BARRIER, U.L. LISTED, MINIMUM R=6.0. EXTERIOR SUPPLY AND RETURN DUCTWORK SHALL BE CONSTRUCTED OF GALVANIZED SHEET METAL, LINED WITH 2" THICK DUCT LINER BOARD, WITH ALL SEAMS CAULKED AND SEALED WEATHER TIGHT, AND COATED WITH RUST PREVENTIVE COATING OVER ENTIRE DUCT SURFACE.
15. EXHAUST DUCTWORK SHALL NOT BE INSULATED UNLESS OTHERWISE NOTED.
16. ALL DUCTWORK SHALL BE SUPPORTED BY THE BUILDING STRUCTURE AND SHALL NOT REST ON CEILING TILES OR CEILING STRUCTURE. DUCT SUPPORTS AND ATTACHMENTS TO STRUCTURE SHALL BE AS PER SMACNA STANDARDS AND SUBMITTED WITH SHOP DRAWINGS.
17. FLEXIBLE DUCT SHALL BE FLEX MASTER TYPE 4 OR EQUAL, SAME SIZE AS DIFFUSER NECKS, MAXIMUM 8'-0" LONG.
18. ROUND AND FLEXIBLE DUCTWORK SHALL BE CONNECTED TO MAIN DUCTS WITH SPIN-IN FITTINGS WITH AIR EXTRACTORS AND BALANCING DAMPERS.
19. SHEET METAL DUCTWORK SHOWN AS INTERNALLY LINED SHALL BE LINED WITH 1" THICK 3 LB/CU FT DENSITY DUCT LINER, MANVILLE LINACOUSTIC OR EQUAL. LINE ALL DUCTWORK A MINIMUM OF 10'-0" DOWNSTREAM OF ALL ROOF TOP UNITS.
20. DUCTWORK DIMENSIONS SHOWN ON THE DRAWINGS ARE INSIDE CLEAR DIMENSIONS.
21. CONDENSATE FROM ALL AIR CONDITIONING EQUIPMENT SHALL BE TRAPPED AND ROUTED TO THE NEAREST FLOOR DRAIN OR TO EXTERIOR DRY WELLS. CONDENSATE PIPING SHALL BE TYPE "L" COPPER (EXCEPT INSULATED COPPER IN HVAC PLENUMS).
22. CONTRACTOR SHALL COORDINATE ALL DUCTWORK AND DIFFUSER LOCATIONS WITH LIGHTING LAYOUTS, AND ALL OTHER STRUCTURAL CONDITIONS.
23. AFTER CONSTRUCTION, THE ENTIRE HVAC SYSTEM SHALL BE TESTED, ADJUSTED AND BALANCED TO DELIVER THE AIR (AND WATER) FLOW QUANTITIES SHOWN ON THE DRAWINGS. SUBMIT CERTIFIED TEST AND AIR BALANCE REPORTS TO ENGINEER FOR APPROVAL. OUTSIDE AIR AND RETURN AIR MODULATING DAMPERS SHALL BE ADJUSTED TO ADMIT THE SPECIFIC QUANTITIES OF ALL AIR UNDER ALL CYCLES OF OPERATION. ALL FINAL ADJUSTED AIR QUANTITIES SHALL BE WITHIN +10% OF THE DESIGN REQUIREMENTS.
24. PROVIDE VIBRATION ISOLATION DEVICES AND FLEXIBLE CONNECTIONS WITH SHOP DRAWINGS, TO ALL MOVING MACHINERY.
25. REVIEW CITY OF ATLANTA DESIGN GUIDELINES BEFORE STARTING WORK.
26. CONTRACTOR SHALL COORDINATE THE INSULATION OF ALL MECHANICAL EQUIPMENT, DUCTWORK, ETC. TO FIT WITHIN THE SPACE ALLOWED BY THE ARCHITECTURAL AND STRUCTURAL CONDITIONS. CUTTING OR OTHERWISE ALTERING ANY STRUCTURAL MEMBERS SHALL NOT BE PERMITTED WITHOUT WRITTEN PERMISSION FROM THE ENGINEER.
27. MOUNT THERMOSTATS 48" ABOVE THE FINISHED FLOOR UNLESS NOTED OTHERWISE. PROVIDE CLEAR LOCKING COVER ASSEMBLIES FOR ALL THERMOSTATS. MOUNT THERMOSTATS ABOVE LIGHT SWITCHES.
28. ALL ROOFTOP MOUNTED EQUIPMENT SHALL BE INSTALLED LEVEL ON AND ANCHORED TO MINIMUM 12" HIGH INSULATED ROOF CURBS. REUSE EXISTING CURB IF APPLICABLE. CONTRACTOR SHALL COORDINATE ROOF SLOPE AND ACTUAL ROOF CURB HEIGHTS WITH ARCHITECTURAL DRAWINGS. ALL REFERENCES TO ROOF CURB HEIGHTS REFER TO HEIGHTS ABOVE FINISHED ROOF SURFACE.
29. LOCATIONS OF GRILLES, REGISTERS AND DIFFUSERS SHOWN ON THE DRAWINGS ARE APPROXIMATE. COORDINATE EXACT LOCATIONS FOR EXISTING CONDITIONS.
30. ALL PIPING ABOVE GRADE SHALL BE SUPPORTED BY THE BUILDING STRUCTURE AND SHALL NOT REST ON CEILING TILES OR CEILING STRUCTURE. PIPING HUNG FROM CEILING JOIST SHALL BE HUNG FROM THE TOP CHORDS OF THE JOISTS. HANGERS AND SUPPORTS SHALL BE SUBMITTED SHOP DRAWINGS.
31. ALL PIPE PENETRATIONS OF FIRE AND/OR SMOKE RATED ASSEMBLIES SHALL BE FIRE-STOPPED AS REQUIRED TO RESTORE ASSEMBLY TO ORIGINAL INTEGRITY. FIRE BARRIER PRODUCTS SHALL BE AS MANUFACTURED BY 3M CO., CP25 CAULK, CS195 CONFIGSTIK PANEL, FS195 WRAP/STRIP, OR PS 7800 SERIES SYSTEMS AS RECOMMENDED BY MANUFACTURER FOR A PARTICULAR APPLICATION, OR BY THE FIRE MARSHALL.
32. MANUAL OVERRIDE CONTROL (EMERGENCY SHUTDOWN) SWITCHES FOR ALL HVAC UNITS SHALL BE LOCATED IN LOCKING COVER ADJACENT TO FIRE ALARM ANNUNCIATOR PANEL.
33. ALL MECHANICAL EQUIPMENT AND OPERATING CONTROLS SHALL BE PERMANENTLY IDENTIFIED TO CORRESPOND WITH CONTRACT DRAWING TAG NUMBERS.
34. ALL EQUIPMENT & INSTALLATION SHALL COMPLY WITH THE CURRENT ASHRAE-62 AND ASHRAE-90.1 STANDARDS.
35. SCOPE OF THE WORK: THE SCOPE OF THE WORK CONSISTS OF THE FURNISHING AND INSTALLING OF COMPLETE MECHANICAL SYSTEMS AS DETAILED AND SPECIFIED. THE MECHANICAL CONTRACTOR SHALL PROVIDE ALL SUPERVISION, LABOR, MATERIALS, EQUIPMENT, MACHINERY, AND ANY AND ALL OTHER ITEMS NECESSARY TO COMPLETE THE SYSTEMS. THE MECHANICAL CONTRACTOR SHALL NOTE THAT ALL ITEMS OF EQUIPMENT ARE SPECIFIED IN THE SINGULAR; HOWEVER, THE CONTRACTOR SHALL PROVIDE AND INSTALL THE NUMBER OF ITEMS OF EQUIPMENT AS INDICATED ON THE DRAWINGS AND AS REQUIRED FOR COMPLETE SYSTEMS.
36. IT IS THE INTENTION OF THE SPECIFICATIONS AND DRAWINGS TO CALL FOR FINISHED WORK, TESTED, AND READY FOR OPERATION. THE CONTROLS SYSTEM WILL NOT BE ACCEPTED UNTIL FULLY ON SITE, AND OPERATIONAL.
37. ANY EQUIPMENT, APPLIANCE, MATERIAL OR WORK NOT SHOWN ON DRAWINGS, BUT MENTIONED IN THE SPECIFICATIONS, OR VICE VERSA, OR ANY INCIDENTAL ACCESSORIES NECESSARY TO COMPLETE THE WORK IN ALL RESPECTS, READY FOR OPERATION, EVEN IF NOT PARTICULARLY SPECIFIED, SHALL BE FURNISHED, DELIVERED AND INSTALLED BY THE CONTRACTOR WITHOUT ADDITIONAL EXPENSE TO THE OWNER. ANY CONDITION IN QUESTION SHALL BE BROUGHT TO THE OWNER/ENGINEER PRIOR TO THE BID DATE.
38. MINOR DETAILS NOT USUALLY SHOWN OR SPECIFIED, BUT NECESSARY FOR PROPER INSTALLATION AND OPERATION, SHALL BE INCLUDED IN THE CONTRACTOR'S ESTIMATE, THE SAME AS IF HEREIN SPECIFIED OR SHOWN.
39. THE MECHANICAL CONTRACTOR SHALL GIVE FULL COOPERATION TO OTHER TRADES AND SHALL FURNISH IN WRITING WITH COPIES TO THE PROJECT MANAGER ANY INFORMATION NECESSARY TO PERMIT THE WORK OF ALL TRADES TO BE INSTALLED SATISFACTORILY AND WITH LEAST POSSIBLE INTERFERENCE OR DELAY.
40. PROVIDE GAS TO ALL HVAC EQUIPMENT. SEE PLUMBING DRAWINGS FOR DETAILS.
41. PROVIDE REGULATORS AT ALL GAS APPLIANCES.
42. PROVIDE DECKTITE FLASHINGS AT ALL ROOF PENETRATIONS.
43. PROVIDE SMOKE DETECTOR AT ALL AREAS OF EGRESS, SUPPLY AND RETURN FOR ALL UNITS 2000 CFM OR GREATER.
44. PROVIDE FIRE DAMPERS AS REQUIRED WHERE DUCTS PENETRATE RATED WALLS. ALL FIRE DAMPERS SHALL BE INSTALLED, POWERED AND TESTED BY THE MECHANICAL CONTRACTOR. SHOP DRAWINGS TO BE FURNISHED PRIOR TO INSTALLATION.

ABBREVIATIONS

A	ALUMINUM CONSTRUCTION
A.F.F.	ABOVE FINISH FLOOR
AHU	AIR HANDLING UNIT
BS	PVC COATED BIRD SCREEN
GA	PROVIDE EC COATED ALUMINUM CURB ADAPTOR/REDUCER AS NECESSARY SEE DWG.____ FOR ADDITIONAL DETAILS
CD	CEILING DIFFUSER
CFM	CUBIC FEET PER MINUTE
CS	CURB SEAL
D.B.	DRY BULB
EAT	ENTERING AIR TEMPERATURE
EF	EXHAUST FAN
FD	FIRE DAMPER
MOD	MOTOR OPERATED DAMPER
MVD	MANUAL VOLUME DAMPER
RA	RETURN AIR
SA	SUPPLY AIR
SF	SUPPLY FAN
TD	TIE DOWN (SET OF 4) REFER DETAIL _/M-___
TE	TOTALLY ENCLOSED
W.B.	WET BULB

HVAC LEGEND

SYMBOL	DESCRIPTION
R.A.G.	RETURN AIR GRILLE
S.A.R.	SUPPLY AIR REGISTER
OA	OUTSIDE AIR
ER	EXHAUST REGISTER
	SINGLE LINE DUCTWORK
	DOUBLE LINE DUCTWORK
	TURNING VANES
	SUPPLY AIR DIFFUSER
	RETURN, RELIEF OR EXHAUST AIR GRILLE
	FLEXIBLE DUCT
	SPIN-IN DAMPER (REQ. ON ALL DIV. BRANCH LINES)
SD	SMOKE DETECTOR
FD	FIRE DAMPER
A	TYPE OF AIR DISTRIBUTION DEVICE
T	THERMOSTAT
H	HUMIDISTAT
F	FREEZESTAT
	FLEXIBLE JOINTS
P	PRESSURE SENSOR
	ROUND DIFFUSER
	ROOF MOUNTED EXHAUST FAN
1	HEAVY DUTY CORROSION RESISTANT LINE VOLTAGE THERMOSTAT (EXHAUST FANS). REFER TO AIR HANDLING UNIT SCHEDULE AND SPECIFICATIONS FOR AIR CONDITIONING LINE THERMOSTAT REQUIREMENTS
SD	SMOKE DETECTOR
M	MOTOR OPERATED DAMPER WITH NEMA 4X ENCLOSURE. LOW VOLTAGE DAMPER: RUSKIN MODEL CD40 WITH SERIE MODEL MA-318/418-500 ACTUATOR OR EQUAL UNLESS OTHERWISE NOTED. PROVIDE MULTIPLE ACTUATORS TO MEET TORQUE REQUIREMENTS
HT	HEAVY DUTY CORROSION RESISTANT LINE VOLTAGE THERMOSTAT/HIGH TEMPERATURE SWITCH. JOHNSON CONTROLS A19BAF-1C OR EQUAL WITH CLEAR LOCKING COVER, SET AT 95°
FS	FLOW SENSOR
DS	DOOR SWITCH
WM	WET WELL ACCESS ROOM INTERIOR LOCAL VISIBLE AND AUDIBLE ALARM STATION. LABEL "VENTILATION SYSTEM FAILURE." PROVIDE FEDERAL SIGNAL CORPORATION (OR EQUAL) MODEL 191XL ALARM LIGHT, FLASHING (ALARM ONLY) WITH RED DOME, DOME GUARD, AND WALL MOUNT. PROVIDE FEDERAL SIGNAL CORPORATION (OR EQUAL) MODEL 350WRX VIBRATING HORN. PROVIDE AN ADDITIONAL FEDERAL SIGNAL CORPORATION (OR EQUAL) MODEL 191XL ALARM LIGHT, STEADY BURN (ALARM ACKNOWLEDGED LIGHT) WITH RED DOME, DOME GUARD, AND WALL MOUNT. ALARM STATION SHALL BE FIELD WIRED TO CHANGE FROM FLASHING LIGHT TO STEADY BURN LIGHT WHEN ALARM IS SILENCED/ACKNOWLEDGED AT THE ATC PANEL. STEADY BURN ALARM LIGHT SHALL REMAIN ON UNTIL RESET AT THE ATC PANEL.
DW	DRY WELL INTERIOR LOCAL VISIBLE AND AUDIBLE ALARM STATION. PROVIDE A STAINLESS STEEL NEMA 4X ENCLOSURE WITH TWO PILOT LIGHTS AND AN ALARM HORN. FIRST PILOT LIGHT SHALL BE LABELED "VENTILATION SYSTEM FAILURE" AND SHALL BE A RED FLASHING NEMA 4 30 MM STANDARD PILOT LIGHT, SQUARE D OR EQUAL. SECOND LIGHT SHALL BE LABELED "VENTILATION SYSTEM FAILURE ACKNOWLEDGED" AND SHALL BE A RED STEADY BURN NEMA 4 30 MM STANDARD PILOT LIGHT SQUARE D OR EQUAL. HORN SHALL BE A FEDERAL SIGNAL CORPORATION (OR EQUAL) MODEL 350WRX VIBRATING HORN. ALARM STATION SHALL BE FIELD WIRED TO CHANGE FROM FLASHING PILOT LIGHT TO STEADY BURN PILOT LIGHT WHEN ALARM IS SILENCED/ACKNOWLEDGED AT THE ATC PANEL. STEADY BURN ALARM LIGHT SHALL REMAIN ON UNTIL RESET AT THE ATC PANEL
	EXTERIOR LOCAL VISIBLE GREEN LIGHT/RED LIGHT (GO/NO GO) ALARM STATION. PROVIDE A STAINLESS STEEL NEMA 4X ENCLOSURE WITH THREE PILOT LIGHTS. FIRST PILOT LIGHT SHALL BE LABELED "VENTILATION SYSTEM NORMAL OPERATION" AND SHALL BE A GREEN STEADY BURN NEMA 4 30 MM STANDARD PILOT LIGHT, SQUARE D OR EQUAL. SECOND PILOT LIGHT SHALL BE LABELED "VENTILATION SYSTEM FAILURE" AND SHALL BE A RED FLASHING NEMA 4 30 MM STANDARD PILOT LIGHT, SQUARE D OR EQUAL. THIRD LIGHT SHALL BE LABELED "VENTILATION SYSTEM FAILURE ACKNOWLEDGED" AND SHALL BE A RED STEADY BURN NEMA 4 30 MMSTANDARD PILOT LIGHT. ALARM STATION SHALL BE FIELD WIRED TO CHANGE FROM FLASHING PILOT LIGHT TO STEADY BURN PILOT LIGHT WHEN ALARM IS SILENCED/ACKNOWLEDGED AT THE ATC PANEL. STEADY BURN ALARM LIGHT SHALL REMAIN ON UNTIL RESET AT THE ATC PANEL
AL	ALUMINUM DUCTWORK PER SMACNA STANDARDS
SS	STAINLESS STEEL DUCTWORK PER SMACNA STANDARDS

GEORGIA REGISTERED PROFESSIONAL ENGINEER ERNEST ONOYE 7/15/2011

DSI ENGINEERING CONSULTANTS, INC.

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404-525-2120 FAX 404-522-1941

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MECHANICAL

LEGEND & NOTES – HVAC

SHEET 46 OF 69
DWG NO. M0.1
DATE JULY 15, 2011
PROJ NO 10ATL02-55

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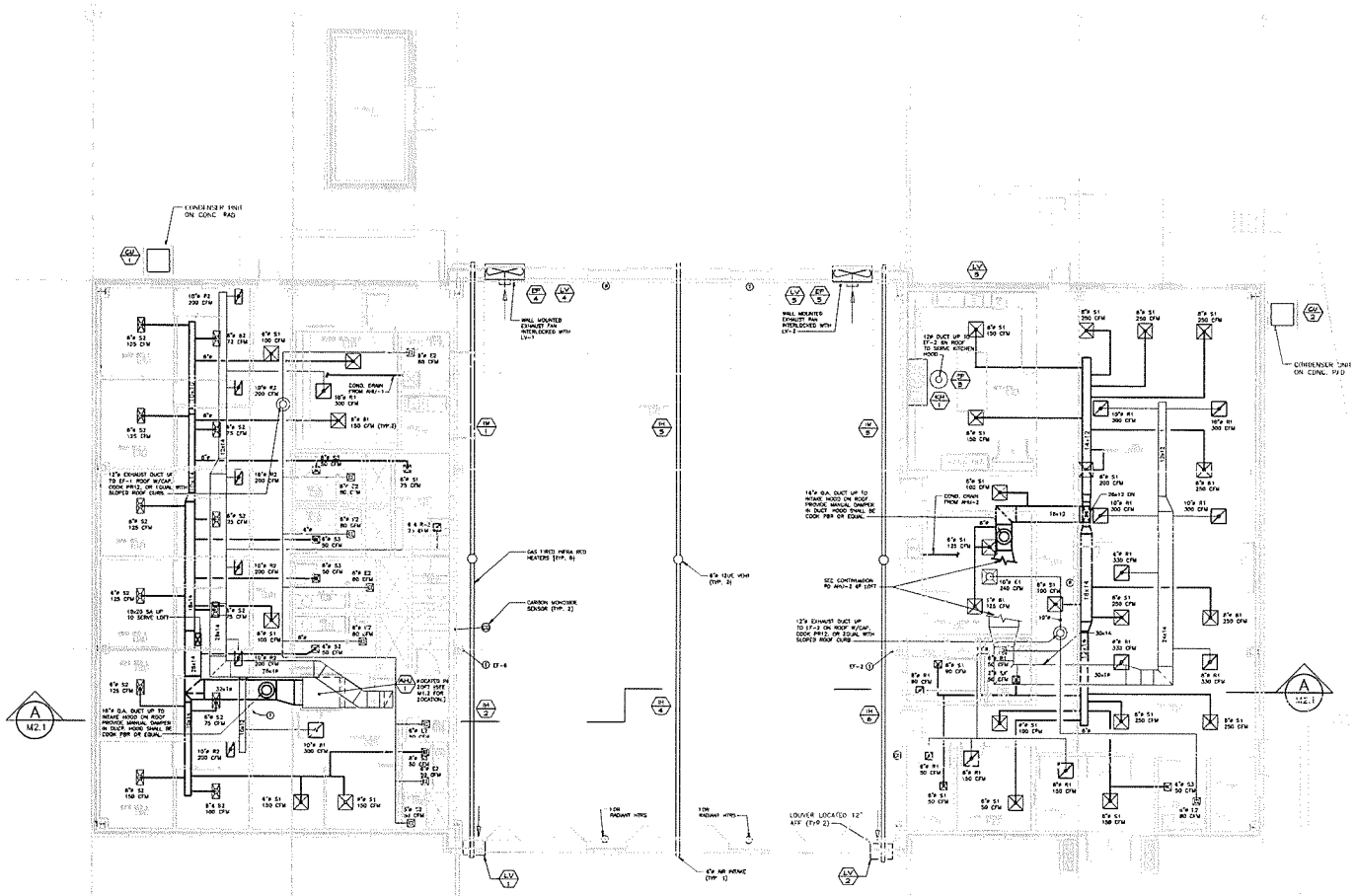

FLOOR PLAN – HVAC

1/8" = 1'-0"

NORTH

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MECHANICAL

FLOOR PLAN – HVAC

SHEET 47 OF 69
DWG NO. M1.1
DATE JULY 15, 2011
PROJ NO. 10ATL02-55

GEORGIA REGISTERED PROFESSIONAL ENGINEER ERNEST OLOYE 2/16/2011 ORIGINAL

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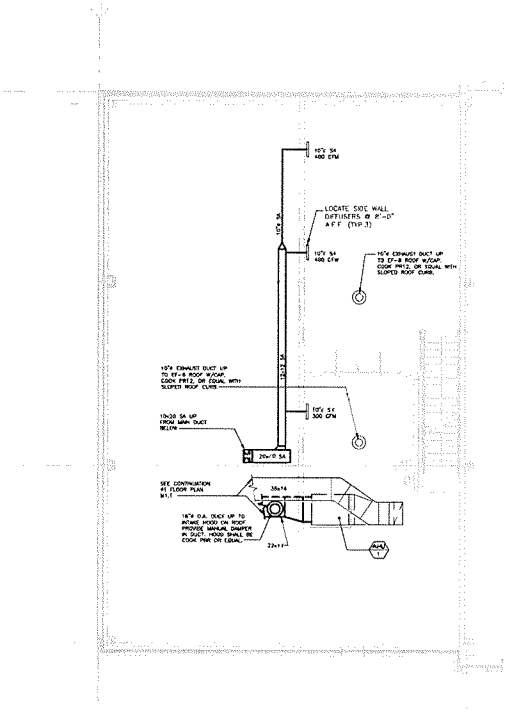

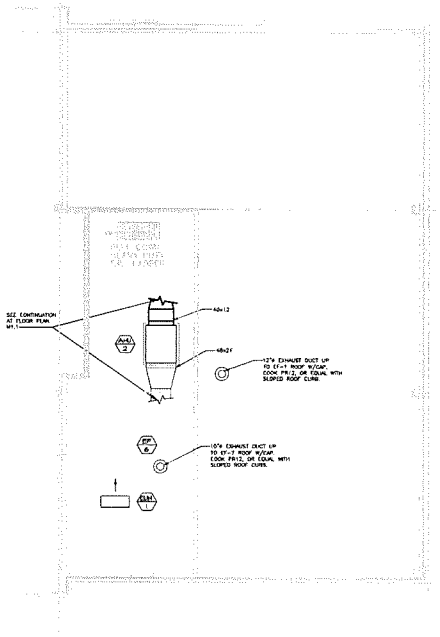

LEFT SIDE LOFT PLAN – HVAC
1/8"=1'-0"
NORTH

RIGHT SIDE LOFT PLAN – HVAC
1/8"=1'-0"
NORTH

GEORGIA REGISTERED PROFESSIONAL ENGINEER
Ernest Okoye
7/18/2011
ORIGINALS ISSUED
ERNEST OKOYE

DSI

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MECHANICAL

LOFT FLOOR PLANS

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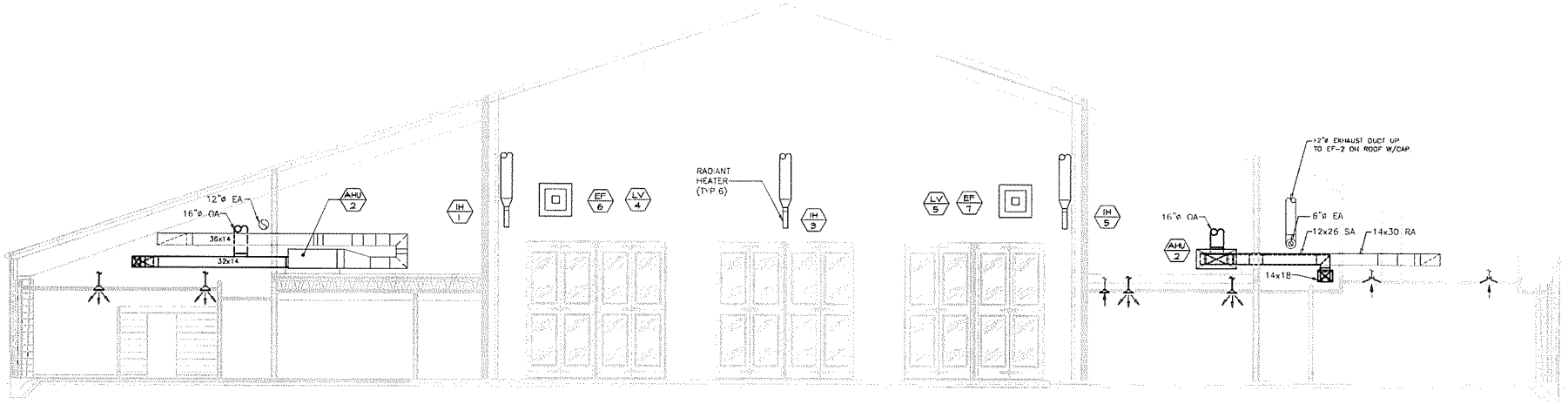

SECTION A
SCALE: 1/8"=1'-0" M2.1

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MECHANICAL

SECTION THRU BUILDING

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DWG NO.	M2.1
DATE	JULY 15, 2011
PROJ NO.	10ATL02-55

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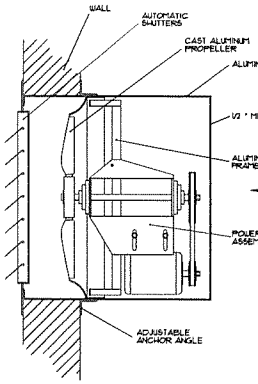
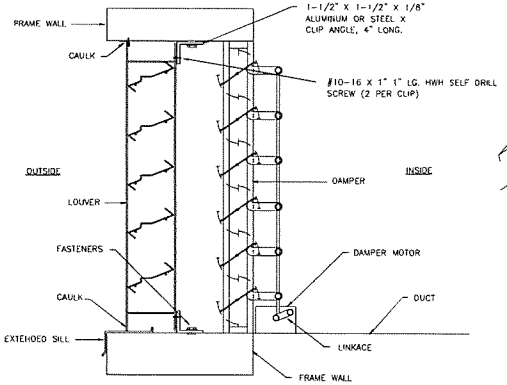


WALL FAN DETAIL (1)
NOT TO SCALE M2.2



FRESH AIR LOUVER & DAMPER DETAIL (2)
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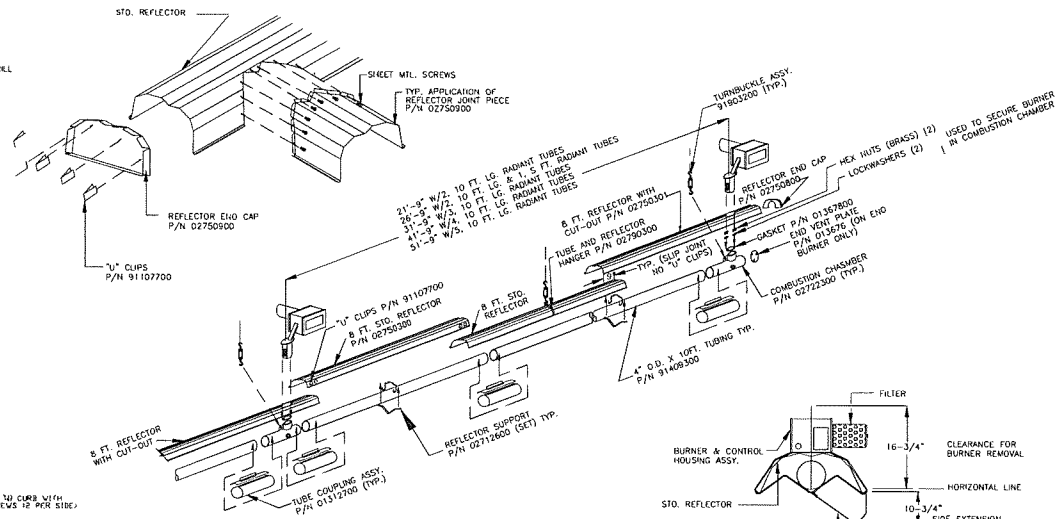

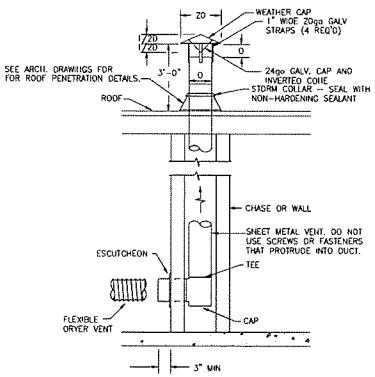

DRYER VENT DETAIL (3)
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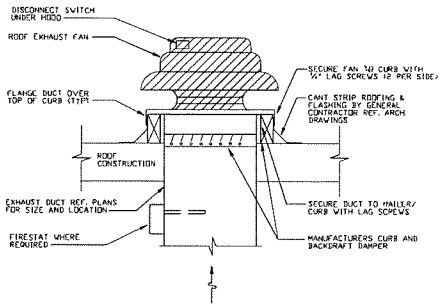
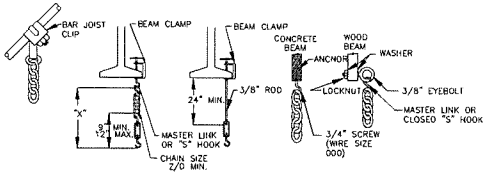
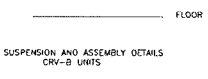




TYPICAL SUSPENSION DETAILS

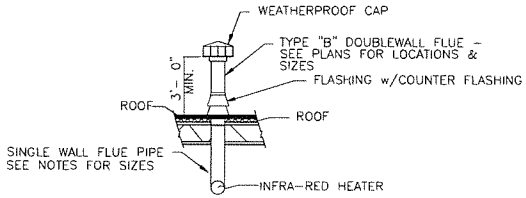
(NOTE: USE ONLY THE TURNBUCKLES FURNISHED BY ROBERTS-GORDON INC.)

STRAIGHT RUN LENGTH (FT.)	MIN. LENGTH "X" (IN.)	TYPICAL EXPANSION (IN.)
50	12	+/-1
100	24	+/-2
150	36	+/-3
200	46	+/-4
250	57	+/-5



SUSPENSION AND ASSEMBLY DETAILS CRV-8 UNITS

INFRA RED HEATER DETAIL (5)
NOT TO SCALE M2.2



ALL PIPE, FITTINGS AND ACCESSORIES AS SHOWN SHALL BE FURNISHED AND INSTALLED BY MECHANICAL CONTRACTOR

FLUE DUCT THRU ROOF DETAIL (6)
NOT TO SCALE M2.2

GEORGIA REGISTERED PROFESSIONAL ENGINEER ERNEST O'LOYE 7/16/2011

DSI — DESIGN SYSTEMS INC. ARCHITECTURE & ENGINEERING

KHAFRA ENGINEERING CONSULTANTS, INC. 225 PEACHTREE STREET, SUITE 1600 ATLANTA, GEORGIA 30303 404-525-2120 FAX 404-522-7941

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MECHANICAL

DETAILS HVAC

SHEET 50 OF 69
DWG NO. M2.2
DATE JULY 15, 2011
PROJ NO. 10ATL02-55

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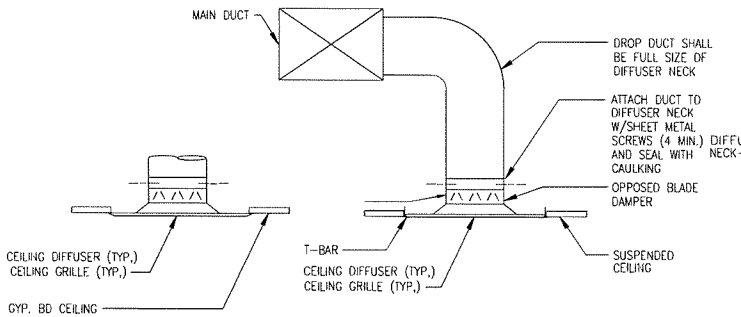

DIFFUSER CONNECTION DETAIL (1 / M2.3)

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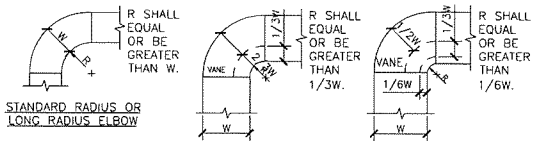

NOTE:

1. THE INTERIOR SURFACE OF ALL RADIUS ELBOWS SHALL BE MADE ROUND.
2. ALL STANDARD RADIUS ELBOWS CAN BE SUBSTITUTED WITH SHORT RADIUS ELBOWS. ALL SHORT RADIUS ELBOWS SHALL HAVE VANES. VANES SHALL BE CONSTRUCTED, SUPPORTED AND FASTENED AS RECOMMENDED BY SMACNA.

RADIUS ELBOW DUCT DETAIL (2 / M2.3)

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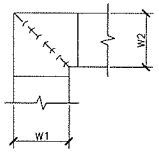

NOTE:

1. ALL VANE ELBOWS SHALL BE CONSTRUCTED AND INSTALLED AS DETAILED BY SMACNA.
2. WHEN W1 DOES NOT EQUAL W2, VANE SHALL BE SINGLE THICKNESS VANE TYPE REGARDLESS OF W DIMENSION.
3. ALL SINGLE THICKNESS VANES SHALL HAVE A 2" [50mm] RADIUS, 1 1/2" [40mm] MAXIMUM SPACE BETWEEN VANES AND A 3/4" [20mm] TRAILING EDGE.
4. WHEN W EQUALS W2 AND W1 IS GREATER THAN 20" [500mm] VANES SHALL BE DOUBLE VANE TYPE.

SQUARE ELBOW W/VANES DETAIL (3 / M2.3)

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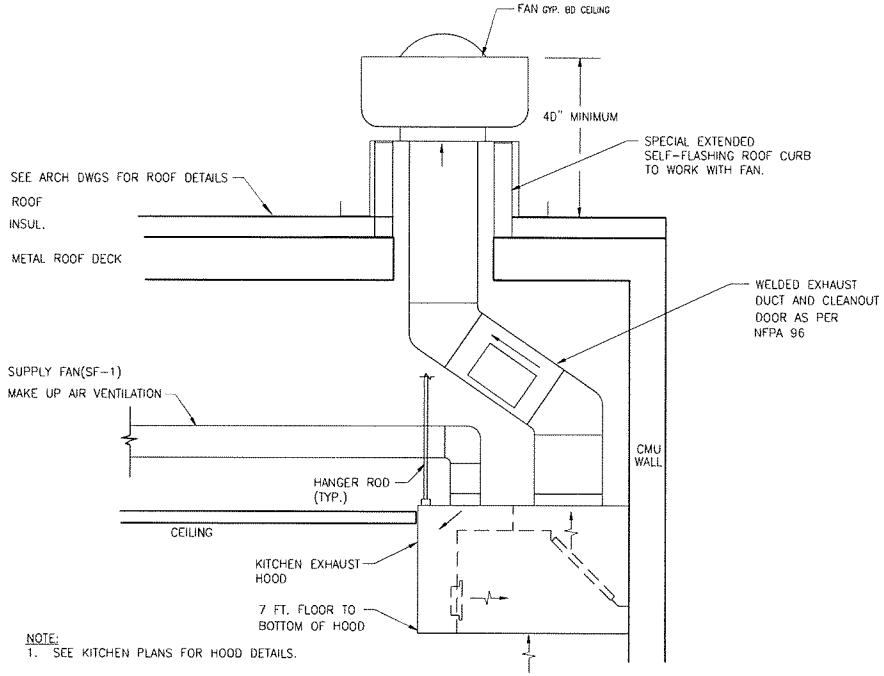

NOTE:

1. SEE KITCHEN PLANS FOR HOOD DETAILS.

KITCHEN EXHAUST HOOD DETAIL (4 / M2.3)

NOT TO SCALE

GEORGIA REGISTERED PROFESSIONAL ENGINEER — ERNEST OLOYOYE — 7/15/2011

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Fulton County Fire Department
FIRE STATION No. 11
4760 Fulton Industrial Blvd.
Atlanta, Georgia 30336

MECHANICAL

DETAILS HVAC

SHEET 51 OF 69
DWG NO. M2.3
DATE JULY 15, 2011
PROJ NO. 10ATL02-55

N:\GBRGH PROJECTS\Dwgs-Cmes\FRENDOLSF\ISSUE\ISSUE FOR PERMIT\VERSION 0\MECHANICALS\10ATL02-55M2.3_HVAC_DETAILS.dwg July 25, 2011 - 11:48pm Administrator

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AIR HANDLING UNITS

MARK	MAKE	MODEL	CFM TOTAL	CFM O.A.	EXT. S.P. IN. H2O	HP	COOLING COIL CAPACITY TOTAL MBH	SENS. MBH	LAT. MBH	GPM	HEATING COIL CAPACITY MBH	ELECTRIC MBH	ELECTRIC VOLT/PHASE	MCA	MOCP	FLA	REMARKS
AHU-1	CARRIER	40HUB13	4,000	800	0.9		130	90	10	3.50	109	18kW	208V-3PH-60	15 / 12	9		1,2,3
AHU-2	CARRIER	40HUB13	4,000	800	0.9		130	90	10	3.50	109	18kW	208V-3PH-60	15 / 12	9		1,2,3

NOTES:
1. FURNISH AND INSTALL FAN COILS WITH SPRING VIBRATION ISOLATION MOUNTING HARDWARE, FLEXIBLE DUCT CONNECTIONS, FILTERS, AUXILIARY DRAIN PAN, AND ELECTRONIC PROGRAMMABLE THERMOSTAT.
2. EQUIVALENT MANUFACTURERS: TRANE, McQUAY
3. PROVIDE MOTORIZED DAMPER AT OUTSIDE AIR INLET; THE DAMPER SHALL BE CLOSED WHEN SPACE IS UNOCCUPIED.

AIR COOLED CONDENSING UNIT

MARK	SERVICE	DESCRIPTION	MAKE	MODEL	CAPACITY(TONS)	EER	MEPR	MCA	MOCP	ELECTRIC	REMARKS
CU-1	AHU-1	HEAT PUMP	CARRIER	38AUQ	10	11	R-410A	40.8	60	208V-3PH-60	SEE NOTES
CU-2	AHU-2	HEAT PUMP	CARRIER	38AUQ	10	11	R-410A	40.8	60	208V-3PH-60	SEE NOTES

NOTES:
1. FURNISH ALL UNITS WITH COMPRESSOR, THE GUARD CIRCUIT, LOW AMBIENT START CONTROL, EVAPORATOR FREEZE THERMOSTAT, AND OUTDOOR THERMOSTAT.
2. FURNISH WITH ALL REFRIGERANT PIPING AND ACCESSORIES REQUIRED FOR COMPLETE SYSTEM INSTALLATION.
3. VERIFY REFRIGERANT PIPE SIZES WITH MANUFACTURER FOR ACTUAL FIELD INSTALLED PIPE LENGTHS.
4. EQUIVALENT MANUFACTURERS: TRANE, McQUAY

INFRA RED UNIT HEATER SCHEDULE

MARK	SERVICE	DESCRIPTION	MAKE	MODEL	OUTPUT(MBH)	LENGTH(FT)	MOUNTING HT(FT)	VENT	AMPS	ELECTRIC	REMARKS
IH-1	GARAGE	INFRARED HTR	REVERBER-RAY	HLS	75	30'-0"	8'-0"	4" DIA	4.8A	120-1PH-60	SEE NOTES
IH-2	GARAGE	INFRARED HTR	REVERBER-RAY	HLS	75	30'-0"	8'-0"	4" DIA	4.8A	120-1PH-60	SEE NOTES
IH-3	GARAGE	INFRARED HTR	REVERBER-RAY	HLS	75	30'-0"	8'-0"	4" DIA	4.8A	120-1PH-60	SEE NOTES
IH-4	GARAGE	INFRARED HTR	REVERBER-RAY	HLS	75	30'-0"	8'-0"	4" DIA	4.8A	120-1PH-60	SEE NOTES
IH-5	GARAGE	INFRARED HTR	REVERBER-RAY	HLS	75	30'-0"	8'-0"	4" DIA	4.8A	120-1PH-60	SEE NOTES
IH-6	GARAGE	INFRARED HTR	REVERBER-RAY	HLS	75	30'-0"	8'-0"	4" DIA	4.8A	120-1PH-60	SEE NOTES

NOTES:
1. STAINLESS STEEL KIT
2. PROVIDE DIRECT COMBUSTION AIR FROM SIDEWALL.
3. MANUFACTURER PROTECTIVE GUARD.
4. -

ELECTRIC UNIT HEATER SCHEDULE

MARK	SERVICE	DESCRIPTION	MAKE	MODEL	POWER (KW)	MOUNTING HT(FT)	AMPS	ELECTRIC	REMARKS
EH-1	LOFT	ELECT. HTR	Q MARK	HUH09	9	4	24	208-1PH-60	SEE NOTE
EH-2	MECH. RM	ELECT. HTR	Q MARK	HUH09	9	8'	24	208-1PH-60	SEE NOTE

NOTES:
1. INSTALL UNIT VERTICALLY PER MANUFACTURER'S SPECIFICATIONS.

AIR LOUVER SCHEDULE

MARK	MODEL	MANUFACTURER	WIDTH	HEIGHT	REMARKS
LV-1	ELF63750X	RUSKIN	30	60	1,2
LV-2	ELF63750X	RUSKIN	30	60	1,2
LV-3A,B	--	RUSKIN	30	24	1,2,3,4
LV-4	ELF63750X	RUSKIN	40	40	1,2
LV-5	ELF63750X	RUSKIN	40	40	1,2
LV-6	W91	GREENHECK	16	16	1,2,6
LV-7	W91	GREENHECK	16	16	1,2,6

REMARKS
1. PROVIDE INSECT SCREEN
2. COLOR TO BE SELECTED BY THE ARCHITECT.
3. STATIONARY LOUVER.
4. TWO LOUVERS. LOCATE ONE 12" AFF & ONE 11 6" AFF. COMBUSTION AIR LOUVERS FOR WATER HEATER.
5. COORDINATE LOUVERS WITH EXHAUST FAN
6. ROOF MOUNTED BITWIKE HOOD FOR AIR HANDLING UNIT.
7. PROVIDE DAMPER AND ROOF CURB.

EXHAUST FANS

MARK	MAKE	MODEL	TYPE	DRIVE	CFM	EXT SP.	RPM	HP / WATTS	ELECTRICAL VOLTS/PHASE	CONTROL	REMARKS
EF-1	GREENHECK	SP10-B3-4	ROOF-BATHROOM	BELT	400	0.35"	1343	1/4	120V/1PH/60	A	1,2,3,4
EF-2	GREENHECK	SP10-B3-4	ROOF-BATHROOM	BELT	340	0.35"	1400	1/4	120V/1PH/60	A	1,2,3,4
EF-3	GREENHECK	USAF-140HP-4	KITCHEN HOOD	BELT	450	0.75"	1111	1/4	120V/1PH/60	A	1,2,3,4
EF-4	GREENHECK	SQ12-D,3,3,0-T	WALL	BELT	4,300	0.25"	1129	3/4	208/3PH/60	A	1,2,3,4
EF-5	GREENHECK	SQ12-D,3,3,0-T	WALL	BELT	4,300	0.25"	1129	3/4	208/3PH/60	A	1,2,3,4
EF-6	BROAN	350BN	ROOF-ATTIC	DIRECT	1050	0.25"	1000	3/4	208/3PH/60	A	
EF-7	BROAN	350BN	ROOF-ATTIC	DIRECT	1050	0.25"	1000	3/4	208/3PH/60	A	
EF-8	BROAN	350BN	ROOF-ATTIC	DIRECT	1050	0.25"	1000	3/4	208/3PH/60	A	

NOTES:
1. FURNISH AND INSTALL ALL FANS WITH VIBRATION ISOLATION MOUNTING HARDWARE, FLEXIBLE DUCT CONNECTIONS, AND BACKDRAFT DAMPERS.
2. ALL FANS TO BE SUPPLIED WITH DISCONNECT SWITCH BY E.C.
3. PROVIDE INSECT & BIRD SCREEN.
4. EQUIVALENT MANUFACTURERS-COOK, PENN.
5. INTERLOCK FAN WITH CARBON MONOXIDE SENSOR TO COME ON AUTOMATICALLY WHEN VEHICLE LEAVES STATION WITH MANUAL CONTROL.

CONTROL:
A. INTERLOCK WITH LIGHT SWITCH.

GRILLES, REGISTERS AND DIFFUSERS

TAG	DESCRIPTION	SIZE	BASIS OF DESIGN	DAMPER	NOTES
51	CEILING DIFFUSER	24x24 FACEBLOCK SIZE AS NOTED	TITUS TMS	NONE	1,2,4
52	CEILING DIFFUSER	24x12 FACEBLOCK SIZE AS NOTED	TITUS TMS	NONE	1,2
53	CEILING DIFFUSER	12x12 FACEBLOCK SIZE AS NOTED	TITUS TMS	NONE	1,2
54	CEILING/SIDEWALL DIFFUSER	24x12 FACEBLOCK SIZE AS NOTED	TITUS TMS	NONE	1,2,7
R1	RETURN AIR REGISTER	24x24 FACEBLOCK SIZE AS NOTED	TITUS 50F	AD-B	3
R2	RETURN AIR REGISTER	24x12 FACEBLOCK SIZE AS NOTED	TITUS 50F	AD-B	3
R3	RETURN AIR REGISTER	12x12 FACEBLOCK SIZE AS NOTED	TITUS 50F	AD-B	3
E1	EXHAUST REGISTER	24x24 FACEBLOCK SIZE AS NOTED	TITUS 50F	YES	3
E2	EXHAUST REGISTER	12x12 FACEBLOCK SIZE AS NOTED	TITUS 50F	YES	3

NOTES:
1. LAY-IN CEILING TYPE
2. PROVIDE FLANGE FOR SURFACE MOUNTING
3. PROVIDE PLENUM, HP-37
4. ALL CORNER DIFFUSERS ARE 2-WAY DEFLECTION TYPES.
5. COORDINATE COLOR WITH THE ARCHITECT.
6. RETURN GRILLE(TYP.) FOR ALL ROOMS.
7. WALL TYPE DIFFUSER.

KITCHEN EXHAUST & SUPPLY FAN SCHEDULE

MARK	MODEL	MANUFACTURER	CFM	S.P.	HP	POWER	CONTROL	REMARKS
EF-3	CUBE-101-3	GREENHECK	900	.75	1/4	115/60/1	A	1,2,3,4,5,6,10
SF-1	SAF-110-4	GREENHECK	800	0.50	1/4	115/60/1	B	10
KH-1	NS-2	CAPTIVEAIRE	900	--	-	-	-	7,8,9

REMARKS
1. PROVIDE BIRD SCREEN , ROOF CURB & DISCONNECT
2. PROVIDE ROOF CURB, COORDINATE INSTALLATION WITH ROOF OPENING.
3. FAN SHALL BE RATED FOR KITCHEN GREASE EXHAUST.
4. PROVIDE S/S DUCTING FROM EQUIPMENT TO FAN.
5. FAN MOTOR SHALL BE OUTSIDE THE AIR STREAM.
6. PROVIDE SERVICE DISCONNECT.
7. HOOD CONE COMPLETE WITH FIRE PROTECTION.
8. ETL LISTED FOR TEMP 450 , 600, 700 DEG F.
9. COORDINATE WITH ROOF MOUNTED FAN AND COOKER.
10. EXHAUST FAN AND SUPPLY FAN IN ONE PACKAGE.

CONTROL
(A) INTERLOCK WITH KITCHEN HOOD.
(B) INTERLOCK WITH EXHAUST FAN.

GEORGIA REGISTERED PROFESSIONAL ENGINEER
Ernest O'Kaye
7/16/2011
ERNEST O'KAYE

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Fulton County Fire Department
FIRE STATION No. 11
4760 Fulton Industrial Blvd.
Atlanta, Georgia 30336

MECHANICAL

SCHEDULES – HVAC

SHEET	52 OF 69
DWG NO.	M2.4
DATE	JULY 15, 2011
PROJ NO.	10ATL02-55

N:\CURRENT PROJECTS\Dwight Ernest\FIREHOUSE\11\ISSUE\ISSUE FOR PERMIT\VERSION 01\MECHANICAL\10ATL02-55M2.4_HVAC SCHEDULES.dwg July 25, 2011 - 11:45pm Administrator
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FIRE PROTECTION NOTES

1 CONTRACTOR TO VERIFY PRESSURE AT THE SITE BEFORE STARTING WORK.

2 CONTRACTOR SHALL DESIGN SYSTEM, AND SIZE PIPING, STAMP DRAWINGS AND OBTAIN APPROVALS, (BEFORE CUTTING PIPE OR ORDERING EQUIPMENT), FROM INSURANCE CO. AND AUTHORITIES.

3 THE DRAWINGS ARE GENERALLY INDICATIVE OF THE WORK TO BE INSTALLED AND DO NOT INDICATE ALL OFFSETS, FITTINGS AND SIMILAR DETAILS WHICH MAY BE REQUIRED THE CONTRACTOR SHALL CAREFULLY INVESTIGATE THE STRUCTURAL AND FINISH CONDITIONS AFFECTING ALL WORK AND ARRANGE ALL HIS WORK ACCORDINGLY, FINISHING SUCH OFFSETS, FITTINGS, VALVES AND OTHER SIMILAR DETAILS AS MAY BE REQUIRED TO MEET SUCH OFFSETS.

4 DO NOT INSTALL ANY PIPING UNDER LIGHT FIXTURES.

5 INSTALL THE RODS AT ALL JOINTS AND CHANGES OF DIRECTION IN UNDER-GROUND MECHANICAL JOINT PIPE.

6 SYSTEM AND INSTALLATION SHALL COMPLY WITH N.F.P.A.13 1996, STANDARD BUILDING AND FIRE PROTECTION CODES, CITY REQUIREMENTS, FIRE MARSHAL'S OFFICE AND INSURANCE CO. REQUIREMENTS.

7 N/A

8 THOROUGHLY READ SPECIFICATIONS BEFORE STARTING WORK OR ORDERING MATERIALS.

9 N/A

10 ELECTRICAL EQUIPMENT. SPRINKLER PROTECTION SHALL NOT BE REQUIRED IN ELECTRICAL EQUIPMENT ROOMS.

11 N/A

12 N/A

13 ALL EQUIPMENT AND SYSTEMS SHALL BE INSTALLED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.

14 ALL INSTALLATION SHALL COMPLY TO THE FACTORY MUTUAL REQUIREMENTS.

15 SPRINKLER IN BATHROOMS (55 SQ. FT. OR LESS) MAY BE DELETED IF NON-COMBUSTIBLE SHOWERS & BATHTUBS ARE PROVIDED.

16 SPRINKLER HEADS INSTALLED IN LAY-IN ACOUSTICAL TILE CEILINGS SHALL BE CENTERED IN THE CEILING TILES.

17 CONTRACTOR SHALL COORDINATE THE ELECTRICAL CHARACTERISTICS AND REQUIREMENTS OF ALL FIRE PROTECTION EQUIPMENT WITH THE ELECTRICAL DRAWINGS AND SHALL FURNISH THE EQUIPMENT WIRED FOR THE VOLTAGE SHOWN THERE IN.

18 ALL FIRE PROTECTION EQUIPMENT AND SYSTEMS SHALL BE GUARANTEED FOR A PERIOD OF ONE YEAR AFTER OWNER'S ACCEPTANCE.

19 ALL SPRINKLER SYSTEMS SHALL BE DESIGNED TO THE AVAILABLE CITY WATER SUPPLY. CONTRACTOR SHALL HAVE A CURRENT FLOW TEST PERFORMED PRIOR TO DESIGN. IF FIRE PUMP IS NEEDED, IT SHALL BE INCLUDED AS PART OF THIS BID.

20 ALL SPRINKLER SYSTEM RISERS SHALL INCLUDE AN ALARM-CHECK VALVE, WATER MOTOR GONG, FLOW SWITCH, ETC.

21 PROVIDE A COMPLETE WET PIPE SPRINKLER SYSTEM AND ESFR SPRINKLERS COMPLY WITH FACTORY MUTUAL.

22 ALL SPRINKLER SHALL BE ROUTED TO MAINTAIN MINIMUM CLEAR HEIGHTS INDICATED ON ARCHITECTURAL DRAWINGS.

23 CONTRACTOR SHALL BE RESPONSIBLE UNDER THIS SPECIFICATION FOR THE PROPER COORDINATION OF ALL WORK WITH THE RELATED WORK OF OTHER TRADES, CRAFTS CONTRACTORS, SUBCONTRACTORS, ETC. EMPLOYED ON THE PROJECT TO INSURE A COMPLETE, NEAT AND WORKMAN-LIKE INSTALLATION.

24 A FULL SET OF SPRINKLER PLANS AND HYDRAULIC CALCULATIONS SHALL BE SUBMITTED FORMALLY TO THE ENGINEER OF RECORD.
FOR REVIEW AND COMMENT PRIOR TO FABRICATION OF MATERIALS ON INSTALLATION.

25 DRIERS, ON PRESSES SHOULD BE PROVIDED WITH SAFETY VENTILATION TO PREVENT SOLVENT CONCENTRATIONS IN THE DRIER AND ASSOCIATED DUCTING FROM EXCEEDING 25% OF THE LOWER EXPLOSIVE LIMIT (LEL).

26 CONTROL OF EACH SPRINKLER SYSTEM SHALL BE BY EXTERNAL POST INDICATOR VALVES.

27 ALL APPLICALBE EQUIPMENT AND MATERIALS SHALL BE FACTORY MUTUAL RESEARCH APPROVED.

28 FLEXOGRAPH PRESS CONTROL ROOMS SHALL BE PROTECTED WITH AN AUTOMATIC GASEOUS AGENT EXTINGUISHING SYSTEM.

29 ON FIRE DETECTION OR ON FIRE PROTECTION SYSTEM ACTUATION, ALL IHK SUPPLY SHUT-OFF VALVES AND, OR POSITIVE DISPLACEMENT PUMPS SHALL BE SHUT OFF.

NOTE: IT IS THE CONTRACTOR'S RESPONSIBILITY TO VISIT THE SITE AND PERFORM A CERTIFIED FLOW TEST, CONSULT WITH THE LOCAL AUTHORITY HAVING JURISDICTION, OR OTHERWISE OBTAIN POSITIVE CONFIRMATION OF THE AVAILABLE WATER SUPPLY PRIOR TO THE COMMENCEMENT OF HYDRAULIC CALCULATIONS AND DESIGN. CONTRACTOR SHALL SUBMIT WRITTEN DOCUMENTATION ANY FLOW TEST DATA OBTAINED THROUGH THIS PROCEDURE. FIRE FLOW TESTS PERFORMED AT THE SITE SHALL BE WITNESSED BY AN INDEPENDENT THIRD PARTY KNOWLEDGEABLE OF THESE MATTERS, AND ATTESTING THERETO IN WRITING, BY A REPRESENTATIVE OF THE OWNERS' FIRE INSURANCE UNDERWRITER OR BY THE LOCAL AUTHORITY.

THIS CONTRACTOR SHALL BE RESPONSIBLE FOR THE DESIGN, FABRICATION, AND INSTALLATION OF A FINISHED SPRINKLER SYSTEM WHICH WILL DELIVER THE SPECIFIED DESIGN DENSITY OVER THE SPECIFIED AREA OF APPLICATION, WITH SUITABLE ALLOWANCES FOR INSIDE AND OUTSIDE HOSE STREAMS, PIPE, VALVE AND FITTING LOSSES, CHANGES IN ELEVATION, SPRINKLER FLOW COEFFICIENTS, EXCESS FLOWS FOR HYDRAULIC BALANCING, AND ANY OTHER NECESSARY ADJUSTMENTS PECULIAR TO THIS PARTICULAR SYSTEM TO ACHIEVE THE FINISHED DESIGN TO COMPLY WITH THESE REQUIREMENTS.

IF THERE IS ANY QUESTION ABOUT ANY OF THE ABOVE REQUIREMENTS, CONTACT THE OWNER IMMEDIATELY FOR CLARIFICATION OR FURTHER INFORMATION.

OTHERWISE, AS SPECIFIED IN GENERAL PROVISIONS, SUBMITTAL OF A BID SHALL INDICATE CONTRACTOR HAS EXAMINED SITE AND DRAWINGS AND HAS INCLUDED ALL REQUIRED ALLOWANCES IN HIS BID. NO ALLOWANCES SHALL BE MADE FOR ANY ERROR RESULTING FROM CONTRACTOR'S FAILURE TO VISIT JOB SITE AND REVIEW DRAWINGS. BID SHALL INCLUDE COSTS FOR ALL REQUIRED DRAWINGS AND CHANGES AS OUTLINED ABOVE.

A.SANCTUARY : 0.10gpm/sq.ft. OVER 1500 sq.ft USING 165°F, 1/2in. SPRINKLERS MAX 225 sq.ft./HD.

B. MECHANICAL AREAS: 0.20 gpm/sq.ft. OVER 3,000 sq.ft., 1/2in. MAX 100sq.ft./hd.

C HOSE DEMANDS SHOULD BE FOR 500 gpm EXCEPT FOR OFFICE AREAS WHERE 250 gpm IS ACCEPTABLE.

D. 30 gpm/sq.ft. OVER THE MOST REMOTE 5,000 sq.ft. OR ENTIRE ROOM WHICHEVER IS LESS USING 17/32in. OR ELO(EXTRA LARGE ORIFICE 0.64in.) 286°F RATED SPRINKLERS MAX SPACING OF 100 sq.ft., PLUS 500 gpm FOR HOSES.

E. ADDITIONAL SPRINKLERS WILL BE NEEDED UNDER ANY DUCTWORK OVER 4ft. WIDE AND ANY OTHER INSTRUCTIONS TO THE CEILING SPRINKLERS SUCH AS MEZZANINE, ETC. FOR MEZZANINES THE SPRINKLER DESIGN SHOULD BE FOR THE MOST REMOTE 6 HEADS FLOWING 22 gpm EACH.

FIRE PROTECTION SYSTEM NOTES

1. FIRE PROTECTION SYSTEM PLANS ARE DESIGNED FROM PIPE SCHEDULE METHODS, AND ARE SHOWN AND INCLUDED FOR GENERAL INFORMATION AND PRICING ONLY. FIRE PROTECTION CONTRACTOR SHALL BE RESPONSIBLE FOR THE COMPLETE DESIGN.
2. ENTIRE BUILDING FIRE PROTECTION SYSTEM SHALL BE HYDRAULICALLY DESIGNED AND INSTALLED BY CERTIFIED FIRE PROTECTION SYSTEM DESIGNER/CONTRACTOR. SYSTEM DESIGN AND INSTALLATION SHALL BE IN STRICT ACCORDANCE WITH BOCA BUILDING CODE 1996, NFPA-13, 14 AND 20 AND ALL STATE OF ALABAMA AND LOCAL ORDINANCES, CITY OF GREENVILLE, AND BUILDING CODES.
3. FIRE PROTECTION CONTRACTOR SHALL SUBMIT ALL CALCULATIONS AND PLANS TO PROPER BUILDING AND FIRE DEPARTMENT AUTHORITIES FOR APPROVAL PRIOR TO START OF WORK.
4. N/A
5. FIRE PROTECTION CONTRACTOR SHALL COORDINATE EXACT ROUTING OF ALL PIPING AND LOCATION OF ALL EQUIPMENT WITH ALL STRUCTURAL CONDITIONS AND WITH WORK OF ALL OTHER TRADES. PROVIDE ALL CHANGES IN LOCATION, DIRECTION, ROUTING, ETC., AS MAY BE REQUIRED WHETHER SPECIFICALLY INDICATED OR NOT AND AT NO ADDITIONAL COST TO THE OWNER.
6. FIRE PROTECTION CONTRACTOR SHALL COORDINATE ALL DEVIATIONS IN FIRE AND JOCKEY PUMP DESIGN AND HORSEPOWER BASED ON THE HYDRAULIC SYSTEM DESIGN WITH THE ELECTRICAL CONTRACTOR.
7. COORDINATE EXACT LOCATION OF ALL SPRINKLER HEADS WITH ARCHITECTURAL REFLECTED CEILING PLANS AND WITH WORK OF ELECTRICAL AND HVAC CONTRACTORS. WHERE HEADS OCCUR IN LAY-IN CEILINGS, HEADS SHALL BE CENTERED WITHIN GRID MODULE. HEADS LOCATED IN SIDE WALL SOFFITS SHALL BE CENTERED IN ROOMS BEING SERVED WHERE EVER POSSIBLE.

WATER FLOW TEST INFORMATION

FIRE PROTECTION CONTRACTOR SHALL FIELD VERIFY FLOW TEST DATA OF THE WATER SUPPLY PRIOR TO DESIGN.

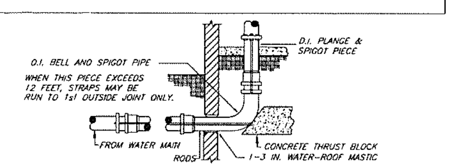
SYSTEM DESIGN INFORMATION

(PIPE SCHEDULE METHOD)

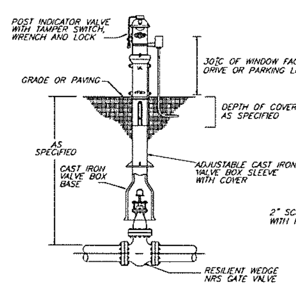
- FLOW OF 500 GPM = (1) RISER @ 250 GPM, PLUS (1) RISER @ 250 GPM
- MOST REMOTE 2-1/2" CONNECTION = 65 PSI RESIDUAL
- MAXIMUM PRESSURE = 175 PSI RESIDUAL

FIRE PROTECTION LEGEND

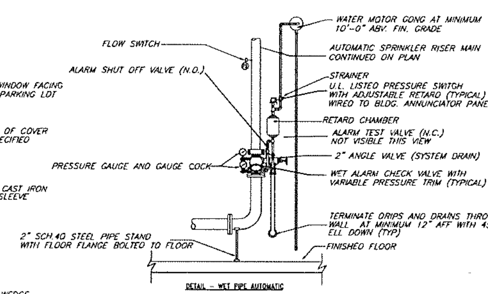
Symbol	Description
—SP—	SPRINKLER PIPING
—F—	FIRELINE PIPING
	CONTROL VALVE W/ TAMPER SWITCH
	FLOW SWITCH
o	PENDENT SPRINKLER HEAD
•	CONCEALED SPRINKLER HEAD
◁	SIDEWALL SPRAY EXPOSED SPRINKLER HEAD
◀	"DRYTYPE" SIDEWALL SPRAY EXPOSED SPRINKLER HEAD



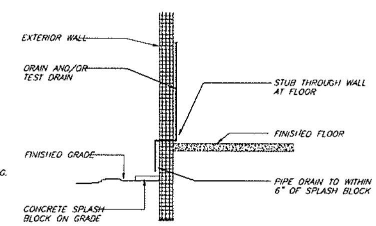
1 FP-0.0 FIRE SERVICE ENTRANCE DETAIL



2 FP-0.0 POST INDICATOR VALVE DETAIL (WITH TAMPER SWITCH)



3 FP-1.0 SPRINKLER RISER DETAIL



4 FP-0.0 TYPICAL DRAIN DISCHARGE DETAIL (WITH TAMPER SWITCH)

DSI	KHAFRA ENGINEERING CONSULTANTS, INC. 225 PEACHTREE STREET, SUITE 1600 ATLANTA, GEORGIA 30303 404-525-2120 FAX 404-522-2941	DSGN DB			
		DR ML			
		CHK WDT			
		APVD DB	NO. DATE	REVISION	BY APVD

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Fulton County Fire Department
FIRE STATION No. 11
4760 Fulton Industrial Blvd.
Atlanta, Georgia 30336

FIRE PROTECTION
FIRE PROTECTION NOTES AND DETAILS

SHEET 59 OF 69
DWG NO FP0.1
DATE JULY 15, 2011
PROJ NO 10ATL02-SS

GEORGIA REGISTERED PROFESSIONAL ENGINEER ERNEST OKOYE 7/16/2011

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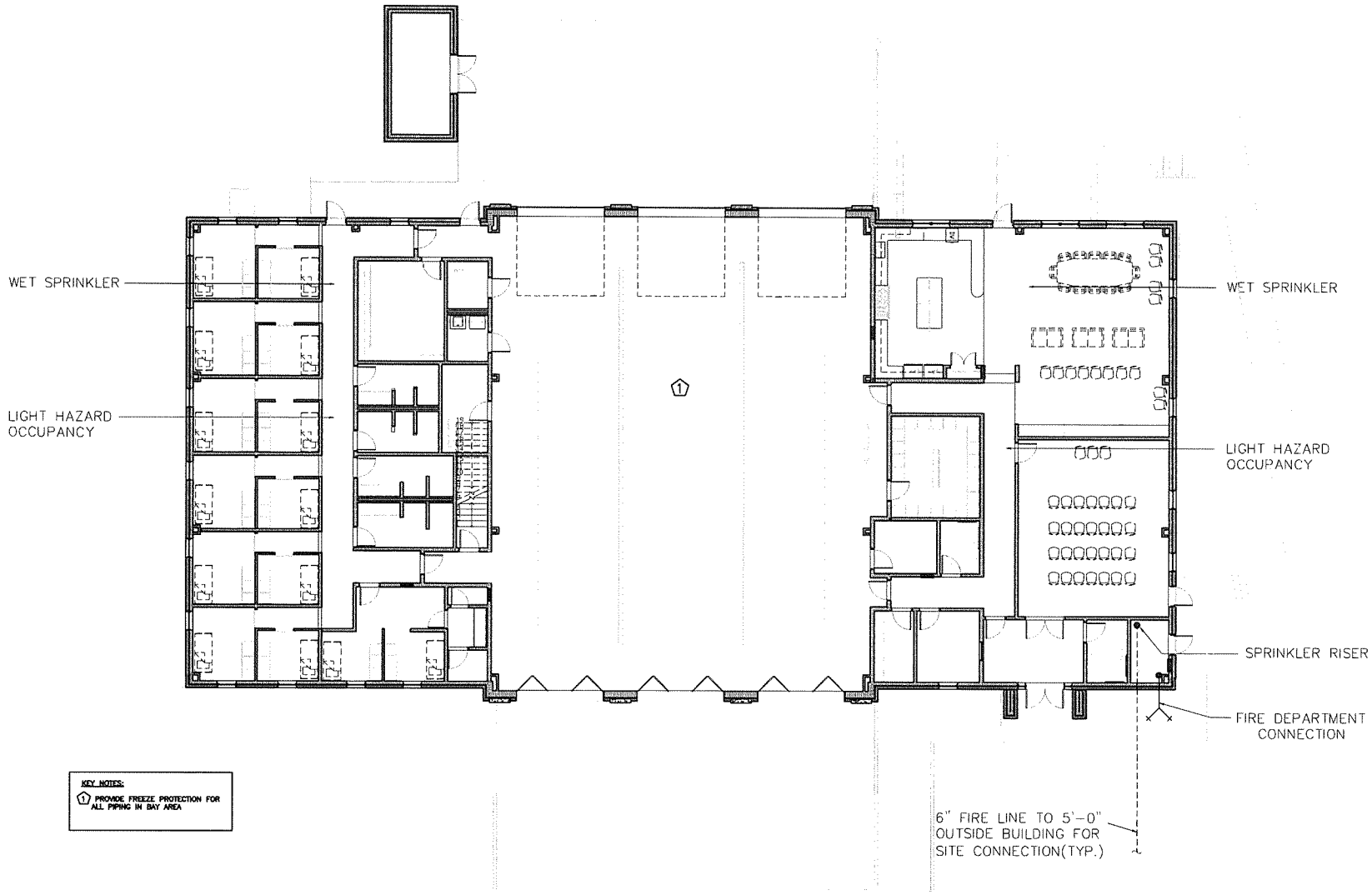

KEY NOTES:

1. PROVIDE FREEZE PROTECTION FOR ALL PIPING IN BAY AREA

1 FIRE PROTECTION PLAN

GEORGIA REGISTERED PROFESSIONAL ENGINEER Ernest Orange 7/15/2011 ERNEST ORANGE

DSI

KHAFRA ENGINEERING CONSULTANTS, INC.
725 KEAGLEBY STREET, SUITE 1600
ATLANTA, GEORGIA 30303
404-575-2120 FAX 404-522-7941

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FULTON COUNTY

Fulton County Fire Department
FIRE STATION No. 11
4760 Fulton Industrial Blvd.
Atlanta, Georgia 30336

FIRE PROTECTION

FIRE PROTECTION PLAN

SHEET 60 OF 69
DWG NO. FP1.1
DATE JULY 15, 2011
PROJ NO. 10ATL02-55

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EXHIBIT 3

REPORT OF
SUBSURFACE EXPLORATION
FIRE STATION NO. 11
FULTON INDUSTRIAL BOULEVARD
AND ROBINSON DRIVE
ATLANTA, GEORGIA

S&ME Project No. 1801-11-208, Report No. 411757

Prepared for:
Fulton County General Services Department
Building Construction Division
3977 Aviation Circle
Atlanta, Georgia 30336

Prepared by:
S&ME, Inc.
11420 Johns Creek Parkway
Duluth, Georgia 30097

April 18, 2011

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April 18, 2011

Fulton County General Services Department
Building Construction Division
3977 Aviation Circle
Atlanta, Georgia 30336

Attention: Mr. Joe Davis

Subject: Subsurface Exploration
Fire Station No. 11
Fulton Industrial Boulevard and Robinson Drive
Atlanta, Georgia 30336
S&ME Job No. 1801-11-208, Report No. 411757

Gentlemen:

1.0 INTRODUCTION

S&ME, Inc. has completed a subsurface exploration for the referenced project. The primary purpose of the exploration was to obtain subsurface data to evaluate foundation and slab support characteristics of the on-site soils and assess other geotechnical engineering aspects of site development. This report presents our understanding of the project, the subsurface conditions encountered, and our recommendations for foundations, general earthwork procedures, floor slab and pavement subgrade preparation; and IBC 2006 Seismic Site Class.

2.0 PROJECT INFORMATION

Our understanding of the proposed construction is based on information gathered during a brief tour of the site with Mr. Joe Davis with Fulton County on March 17, 2011. We were also provided with the following drawings: Boundary and Topographical Survey, dated March 16, 2011, prepared by Mactec Engineering and Consulting, Inc.; and Civil Site and Grading and Drainage plans, dated April 5, 2011, prepared by Khafra Engineering Consultants, Inc.

For simplicity, we have designated "Job North" as parallel to Robinson Drive heading towards Fulton Industrial Boulevard. The existing fire station facility (building and pavements) will be demolished and replaced with a new fire station facility. The new building will be rectangular is shape and oriented generally north to south in its longest dimension in the central portion of the site. The new building will encompass approximately 12,000 square feet. We expect the building to be of steel frame and masonry construction with brick veneer. We have not been provided with structural loading information. We anticipate column loads on the order of 75 kips or less and wall loads of 3 to 4 klf. Floor slab loads have been assumed to have been 250 psf or less.

Pavement areas will be located along the east, west, and south sides of the new building with two exit/entrance driveways extending to Robinson Drive.

The grading plan indicates that up to approximately 6 feet of fill will need to be placed in the northern portion of the building pad to reach the planned finished floor elevation of 848 feet. An approximate 6- to 9-foot tall slope will be constructed beyond the north end of the building to accommodate grade change. The remainder of the site will remain near its current elevation with only minor leveling cuts and fills on the order of 2 feet or less.

3.0 EXPLORATION AND TESTING PROCEDURES

Field sampling and testing by S&ME, Inc. are in general accordance with ASTM procedures and established geotechnical engineering practice. The Appendix contains brief descriptions of field procedures as well as the data obtained.

Our project engineer made a site reconnaissance to observe pertinent site features. During the reconnaissance, our engineer located ten soil test borings by estimating right angles and pacing distances from existing features indicated on the provided site plan. Ground surface elevations at the boring locations were interpolated from the provided topographic map. Because of the methods used, the boring locations shown on the Boring Location Plan and the elevations shown on the Test Boring Records in the Appendix are approximate. If more precise locations are desired a registered surveyor should field locate the borings.

The exploratory borings were made by mechanically twisting hollow-stem augers into the soil. Soil samples were obtained at the surface and at 2 ½- to 5-foot vertical intervals thereafter with a standard 1.4-inch I.D. 2-inch O.D. split-barrel sampler. The sampler was first seated 6 inches and then driven an additional foot with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the final foot was recorded and is designated the “standard penetration resistance” with units of blows per foot (bpf). The standard penetration test provides an indication of soil consistency and an intact sample for visual classification of the soil. Very dense residual materials described as partially weathered rock were found in three of the borings. In these materials, 50 hammer blows drove the sampler less than 12 inches and the Test Boring Records show the penetration for 50 blows as 50/3”, 50/2”, etc.

An automatic trip drop hammer was used for the standard penetration testing. The automatic hammer has a higher efficiency than a manual hammer, and thus yields lower standard penetration resistance values. We recognize this reduction and compensate for it in our evaluation. However, the consistency descriptions on our Test Boring Records are based on traditional relationships between soil consistency and recorded standard penetration test values.

The samples obtained during standard penetration testing were returned to our laboratory and reviewed by our project engineer. The purposes of this review were to check the field descriptions, visually estimate the relative percentages of the soils' constituents (sand,

clay, etc.), determine soil origin, and identify pertinent structural features such as foliation planes and slickensides. The stratification lines shown on the Test Boring Records represent the approximate boundaries between soil types, but the transitions may be more gradual than shown.

4.0 SITE AND SUBSURFACE CONDITIONS

4.1 Existing Conditions

The proposed site is located in the southeast quadrant of the Fulton Industrial Boulevard and Robinson Drive intersection. There is an existing fire station on-site. The fire station consists of a building in the central portion of the site and associated concrete pavements with two exit/entrance driveways extending to Robinson Drive. There are tall, mature trees in the northeast part of the site and along the southern property line. Grass, sidewalks, landscaping bushes, etc. cover most of the remainder of the property not occupied by a building, pavements, or trees.

There is a tall 15+ foot slope along the eastern property line that ascends from the subject site to the adjacent property. The slope is covered with mature trees and there is a fence along the base of the slope.

Existing ground surface topography generally slopes downward from south to north with elevations ranging from approximately 855 to 834 feet. There are manmade slopes within the southern and northern parts of the site that accommodate grade change. The southernmost slope separates the existing concrete parking lot from the existing fire station building and is approximately 7 feet tall. The northern slope is more gradual, separating the fire station building from Fulton Industrial Boulevard.

There is also a cell phone tower and associated maintenance building in the southeast corner of the site and a radio tower near the north side of the existing building.

4.2 Area Geology

The project site is in Georgia's Piedmont physiographic province. The soil overburden of this area was formed by in-place weathering of the parent metamorphic and igneous rocks. A typical upland Piedmont soil profile consists of a thin layer of topsoil underlain by a clayey soil stratum that transitions with increasing depth into less clayey, coarser grained soils with varying mica content. Separating the completely weathered soil overburden from the unaltered parent rock is a transition zone of very high consistency materials locally referred to as *partially weathered rock*. Partially weathered rock retains much of the appearance and fabric of the parent rock formations, and may consist of alternating layers of high consistency soil and rock. Partially weathered rock exhibits standard penetration resistances in excess of 100 blows per foot (bpf).

The weathering processes that formed the overburden soils and partially weathered rock were extremely variable, depending on such factors as rock mineralogy, past groundwater conditions, and the tectonic history (joints, faults, igneous intrusions, etc.) of the specific

area. Differential weathering of the rock mass has resulted in erratically varying subsurface conditions, evidenced by abrupt changes in soil type and consistency in relatively short horizontal and vertical distances. Furthermore, depths to rock can be irregular and isolated boulders, discontinuous rock layers, or rock pinnacles can be present within the overburden and transition zones.

The naturally developed upland soil profile can be altered through the activities of man such as excavation and fill placement. Fill soils have been placed at this site likely during past grading operations/construction of the existing fire station. Fill can be composed of variable materials including soil, rock, or debris. The engineering properties of fill soils depend primarily on the degree of compaction, composition, and moisture content. To the best of our knowledge no documentation (density tests, etc,) exists relative to the placement of the existing fill. If such data do exist, they should be provided to us for review.

4.3 Subsurface Conditions

Ten soil test borings (plus two offset borings) were performed to explore the subsurface conditions at the site. Borings 3, 4, 6, 7, and 8 were performed in or near the proposed building footprint and the remaining borings were performed in planned pavement areas.

Borings 1 and 1A were drilled in the concrete pavement area east of the proposed building. Each initially penetrated about 4 inches of Portland cement concrete. The remaining borings initially encountered approximately 3 inches of topsoil. Beneath the topsoil, Borings 5, 6, 8, 9, and 10 encountered fill to depths ranging from 1 to 8 feet below the ground surface. The fill was generally comprised of orange-brown or red-brown clayey silty fine to medium sand that exhibited standard penetration resistance values ranging from 3 to 17 blows per foot (bpf). Some of the fill contained small amounts of topsoil, roots, and/or rock fragments. Some of the samples were assessed to be very moist or wet of their estimated standard Proctor optimum moisture content.

Beneath the fill, or beneath the concrete or topsoil in the remaining borings were Piedmont residual soils. An exception to this was in Borings 3 and 9 which encountered partially weathered rock directly beneath the fill or topsoil. The residual soil was generally comprised of orange-brown and black or tan, gray and white silty fine to medium sands. Some of the samples also contained quartz fragments. Standard penetration resistance values in the residual soils ranged from 5 to 37 bpf. With the exception of Borings 1, 3, and 9 each of the borings were terminated in residual soils at their planned depths of 10 or 15 feet below the ground surface.

Borings 1, 3, and 9 encountered partially weathered rock at depths ranging from 4 inches to 8 feet below the ground surface (approximate Elevations 836 to 845 feet). The partially weathered rock was sampled as very dense gray and white or tan and black silty fine sand. Boring 9 was terminated in the partially weathered rock at a depth of 9 feet below the ground surface.

Borings 1 and 3 encountered auger refusal materials below the partially weathered rock at depths of 2 ½ feet and 1 foot, respectively (approximate Elevations 844 ½ and 844 feet). Both of these borings were then offset a short distance from their original location and re-drilled (Borings 1A and 3A). Borings 1A and 3A both encountered auger refusal materials at a depth of 1 foot below the ground surface (approximate Elevations 846 and 845 feet).

We also performed two hand auger borings in the slope between the building and the southern pavement area. These borings encountered approximately 1 to 1 ½ feet of topsoil which was underlain by residual soils similar to those described above.

Groundwater was not encountered in any of the borings at the time of drilling. Delayed groundwater measurements were not taken because the boreholes were backfilled immediately after drilling for safety reasons. We not that groundwater levels will fluctuate with seasonal and yearly rainfall variations and thus may be encountered within the depths of this exploration in the future.

The preceding is a generalized description of the subsurface conditions as encountered by the borings of this exploration. Please refer to the individual Test Boring Records in the Appendix for more detailed descriptions at each boring location.

5.0 LIMITATIONS OF CONCLUSIONS AND RECOMMENDATONS

This report is for the exclusive use of Fulton County General Services Department for specific application to the subject project as discussed in the Project Information section of this report. Our conclusions and recommendations have been prepared using generally accepted standards of geotechnical engineering practice in the State of Georgia. No other warranty is expressed or implied. This company is not responsible for the conclusions, opinions, or recommendations of others based on these data.

Our conclusions and recommendations are based on the limited design information furnished to us, the data obtained from this subsurface exploration, the assumptions outlined herein, and our past experience. They do not reflect variations in the subsurface conditions which are likely to exist between our borings and in unexplored areas of the site resulting from the inherent variability of the subsurface conditions in this geologic region as well as past site use and grading (fill placement, etc.). If such variations become apparent during construction, it will be necessary for us to re-evaluate our conclusions and recommendations based upon on-site observation of the conditions.

If the overall design, elevation, or location, of the planned building and pavements are changed, the recommendations contained in this report must not be considered valid unless the changes are reviewed by our firm and our recommendations modified or confirmed in writing. When design is finalized, we should be given the opportunity to review the foundation plan, grading plan, and applicable portions of the project specifications. This service will allow us to determine whether these documents are consistent with the intent of our recommendations.

Subsequent report sections include comments about geotechnical aspects of the proposed construction. The recommendations contained herein are not intended to dictate construction methods or sequences. They are based on findings from this subsurface exploration and are furnished solely to help designers understand subsurface conditions related to foundation and earthwork plans and specifications.

Field observations, monitoring, and quality assurance testing during earthwork and foundation installation are an extension of the geotechnical design. We recommend that the owner retain these services and that we be allowed to continue our involvement in the project through these phases of construction. Our firm is not responsible for interpretation of the data contained in this report by others, nor do we accept any responsibility for job site safety which is the sole responsibility of the contractor.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 General Discussion

Five of the borings of this exploration encountered fill soils to depths of up to 8 feet, which were underlain by residual materials. High consistency partially weathered rock or rock (refusal) were encountered in the northeast portion of the site at depths ranging from 4 inches to 2 ½ feet below the ground surface. The remaining borings encountered Piedmont residual soils throughout their depth. We expect that any compaction tests or other quality control test reports that may have been generated during grading of the site are not available. However, if any exist, we request the opportunity to review them.

The majority of the fill material encountered in our borings appeared to be relatively clean soils with the exception of a few samples which contained traces of topsoil or roots. Further, the standard penetration resistance values in the fill ranged from 3 to 17 bpf with most values ranging from 8 to 13 bpf, the lowest values were typically at the surface. With the exception of some low surface values we consider these standard penetration values to be consistent with fill material that was placed with some compactive effort. If our data are representative of fill throughout the building area, then the foundations and floor slab could be supported by these materials after limited remedial subgrade preparation, provided the owner is aware of and willing to accept the inherent risks involved with support of the structure on old fills because our exploratory borings representative a very small percentage of the overall fill mass. Soft soils or buried debris may exist between our borings or in unexplored areas of the site that may cause poor foundation and/or slab performance due to settlement of the fill.

To elimination any risk would require complete removal and replacement of the fill. One option is to accept some risk and perform construction evaluations to help identify potential areas of problematic soils to reduce the risk of poor foundation and slab performance. To this end, we recommend observation of backhoe excavated pits either prior to or at the start of construction to further assess the consistency and composition of the fills. At this time it would also be advisable to perform density testing. A thorough

subgrade evaluation at the start of construction by proofrolling with heavily loaded construction equipment is also recommended. Finally, thorough evaluation of excavated footings including fairly closely spaced hand auger borings will help determine if favorable subsurface conditions exist at shallow depths below individual footings. If any soft or otherwise unsuitable conditions are encountered during these evaluations the problematic soils should be removed and replaced with structural fill. We expect the need to remove some soft soils, particularly where new construction will extend into currently landscaped areas.

The high consistency partially weathered rock and rock encountered in the northeast portion of the site (Borings 1, 1A, 3, 3A) should be taken into account when planning utility alignments. Additionally, although these materials were encountered below planned grades, it is possible that high consistency materials could be encountered at higher elevations in areas intermediate of our borings. Furthermore, we expect these materials will be encountered during foundation installation and will require extraordinary excavation effort. Where these materials are encountered during mass grading, utility and/or footing installation, blasting or concentrated effort with large tracked excavators or use of pneumatic tools will likely be required for removal.

6.2 Earthwork Recommendations

To prepare the site for construction, the existing structure, including foundation and slab elements, should be demolished and all construction debris should be removed from the site. The existing pavement, vegetation, roots, and topsoil should be stripped from within and to 10 feet outside the planned building area. Where landscape areas will become future pavement areas, any vegetation, roots, and topsoil should be stripped from these areas as well. Any existing utilities and associated backfill should be removed to at least 10 feet outside the building area.

In areas that are at grade or in areas to be filled, our engineer should observe the stripped subgrade and evaluate its firmness and stability. The evaluation should include observation of proofrolling of the surface with a loaded tandem-axle dump truck. As discussed previously, excavation of several shallow test pits will be prudent in areas where fill soils are exposed at the surface unless the pits are excavated prior to the time of construction. Any soils that are found to be soft or unstable should be undercut if they cannot be aerated, dried and compacted to a stable condition.

Structural fill can be placed after the subgrade evaluation and any associated remediation has been completed. Structural fill is defined for this project as inorganic natural soil with a maximum particle size of 4 inches and a Plasticity Index of 30 or less. Structural fill should be placed in relatively thin (4- to 8-inch) layers and compacted to at least 95 percent of the soil's maximum dry density as determined by the standard Proctor compaction test (ASTM D698). Because floor slab and pavement support characteristics of Piedmont soils typically improve with greater density, we suggest requiring a slightly higher degree of compaction (98 percent) in the upper 12 inches beneath planned pavements.

Excavated on-site soils should generally be satisfactory for use as structural fill. Soil moisture contents will vary with weather conditions immediately preceding and during construction; thus, drying or wetting of excavated on-site soils may be necessary to achieve the recommended compaction criteria. As previously discussed, some of the existing fill soils were assessed to be very moist or wet. These soils will likely required drying in order to achieve a high degree of compaction.

In-place density testing must be performed to check that the recommended compaction criteria are achieved. A suggested part time testing frequency is one test for every 2,500 square feet of mass fill in the building area, one test per 5,000 square feet in pavement areas, and one test for every 100 linear feet of utility trench backfilled. Density tests should be performed at vertical intervals of 2 feet or less as the fill is being placed. The tests should be performed by a qualified technician working under the direction of a geotechnical engineer.

6.3 Excavation Conditions

The site generally consists of moderate consistency fill and residual soils. Two of our borings in the northeast portion of the site encountered partially weathered rock and rock (refusal) at shallow depths (approximate Elevations 845 to 847 feet). The fill and residual soils encountered in our borings can be excavated in the mass graded areas using conventional earthmoving equipment such as front-end loaders, backhoes, and motor-graders. Foundation and utility trench excavations in the fill and residual soils can routinely be performed using moderate sized rubber-tired or tracked backhoes.

Removal of partially weathered rock will require concentrated effort with large front-end loaders or large tracked excavators such as a Caterpillar 320 or larger to be removed. Excavation below the auger refusal level of our borings will likely require blasting or the use of pneumatic tools depending on the depth and length of rock necessary to be removed. We suggest that the location and elevation of rock encountered in our borings be considered when planning utility alignments. Where partially weathered rock or rock is encountered during mass grading, we recommend overexcavating to about 6 inches below foundation or underslab utility elevations and backfilling with structural fill. Then foundations and utilities can be installed using conventional backhoes. Where partially weathered rock and rock is exposed at foundation subgrade levels, it should be overexcavated and backfilled with soil fill to help reduce the effect of differential settlement where foundation support transitions from the dense materials to softer soils.

Due to the irregular geologic conditions in the project area, it is possible to encounter rock at depths more shallow than those identified during this exploration. For this reason, we suggest that the project budget contain a contingency for rock excavation outside the area where rock was identified and above the elevations where it is shown. The project specifications should include a performance type definition of rock. A sample definition is included in the Appendix.

6.4 Foundation Recommendations

The findings of the exploration indicate that the proposed fire station can be supported by shallow footings bearing on residual soil, existing fill (with associated risks), or new compacted structural fill after completion of site preparation as discussed in this report. We recommend use of a maximum net allowable soil bearing pressure of up to 2,500 psf to size column and strip footings supported by these materials.

Although computed footing dimensions may be less, column footings should be at least 24 inches wide and strip footings should be at least 18 inches wide. These dimensions facilitate densification and hand cleaning of footing subgrades disturbed by the excavation process as well as the placement of reinforcing steel. They also reduce the potential for localized punching shear failure. If turned-down slab foundations are employed, these minimum width recommendations do not apply, but the recommended bearing pressure must not be exceeded. All exterior footing bottoms should be at least 12 inches below the lowest adjacent exterior grade to prevent damage from frost penetration.

All footing excavations must be evaluated by a representative of our firm to check for soil conditions compatible with our design recommendations. This evaluation should include performance of shallow hand auger borings coupled with portable cone penetrometer tests. We can provide geotechnical recommendations to the contractor and/or designers should unforeseen soil conditions be encountered during construction. These evaluations are very important at this site due to the existence of old fill. Where fill is present, an auger boring should be drilled through the fill at all column locations and at spacings of 25 to 50 feet or less along wall footings.

Footing excavation often produces a thin veneer of disturbed soil at the footing subgrade. We recommend that this disturbed soil be hand cleaned prior to placing reinforcing steel. Furthermore, the footing bottoms should be free of all fall-in prior to placing concrete. Where rock or partially weathered rock is removed during excavation all overbreakage should be removed, and if necessary, the footing subgrade should be leveled with structural fill, compacted crushed stone, or lean concrete.

The strength properties of soil exposed at the footing subgrade will change if exposed to wetting, drying, or freezing. Every effort should be made to place concrete the same day as the excavation is completed. If subgrades are to be left open for more than one day, they should be covered with polyethylene sheeting. If inclement weather is expected and the excavations have been approved, a lean (1,000 psi) concrete veneer about 3 inches thick should be placed on the exposed subgrade. Excavation of disturbed soil may be required if these protective measures are not implemented.

6.5 Floor Slab Recommendations

The floor slab can be supported by residual soil, existing fill (with associated risks), or new structural fill after site preparation/remediation as previously discussed. Because some minor differential settlement is possible, the floor slab should be structurally separate from the building column and wall foundations to reduce the chance for slab

cracking. Alternately, the transition from the slab-on-grade to these structural elements can be reinforced.

Because no groundwater was encountered in the borings, we believe that an underslab drainage layer is optional. The floor slab should, however, be underlain by an effective and durable vapor barrier in order to reduce the possibility of slab dampness due to upward migration of soil moisture. Groundwater levels will fluctuate with seasonal and cyclical temperature and precipitation changes in the future, may be encountered within the depths of this exploration.

Between completion of grading and slab construction, floor slab subgrades are often disturbed by weather, footing and utility line installation, and other construction activities. For this reason, the subgrade should be evaluated by a geotechnical engineer immediately prior to placing an underslab drainage layer and/or the slab. Areas judged by the geotechnical engineer to be soft or loose should be undercut and replaced with compacted crushed stone or soil fill compacted to at least 98 percent of its standard Proctor maximum dry density in the upper 12 inches.

6.6 Earth Slopes

Permanent cut and fill slopes should be inclined no steeper than 2H:1V and temporary slopes should be no steeper than 1½ H:1V. The building area should be set back at least 10 feet from any slope crest. Where the building setback is less than 10 feet, the footings should be lowered to bear below a 3H:1V line project upward from the slope's toe or such that the leading edge of the footing is at least 8 feet from the face of the slope. Pavement curbs should not be constructed within 3 feet of any slope crest.

6.7 Seismic Site Classification

The 2006 International Building Code states that where soil properties are not known to sufficient depth (100 feet or auger refusal), a Site Class D may be assumed provided that there are no indications that soils requiring classification of E or F could be present on site. Based on the boring data from our geotechnical exploration, we judge that the default Seismic Site Class D may be used for the project.

6.8 Pavement Subgrade Recommendations

We recommend that the pavement subgrade be evaluated by proofrolling with a loaded tandem-axle dump truck immediately prior to placing the base course. The evaluation should be performed by a representative of our firm. Any areas judged to perform unacceptably should be selectively undercut and replaced with structural fill compacted to at least 98 percent of its standard Proctor maximum dry density or with additional graded aggregate base compacted to meet the pavement base course compaction criterion.

We have not performed a site-specific pavement design study. If requested, we can perform such a study after being provided with traffic information and obtaining soil samples for performance of California Bearing Ratio (CBR) tests.

7.0 ACKNOWLEDGEMENT

S&ME, Inc. appreciates being selected to participate in this phase of the project. Please contact us if you have any questions regarding this report or if we can be of further service. We are available to perform testing and engineering evaluation services during the construction phase.

Respectfully Submitted,

S&ME, Inc.

Sarah E. Bohmann, P.E.
Project Geotechnical Engineer
Reg. Ga. 32185

Richard Mockridge, P.E.
Principal Geotechnical Engineer
Reg. Ga. 12692

SEB/RM/mg

APPENDIX

BORING LOCATION PLAN

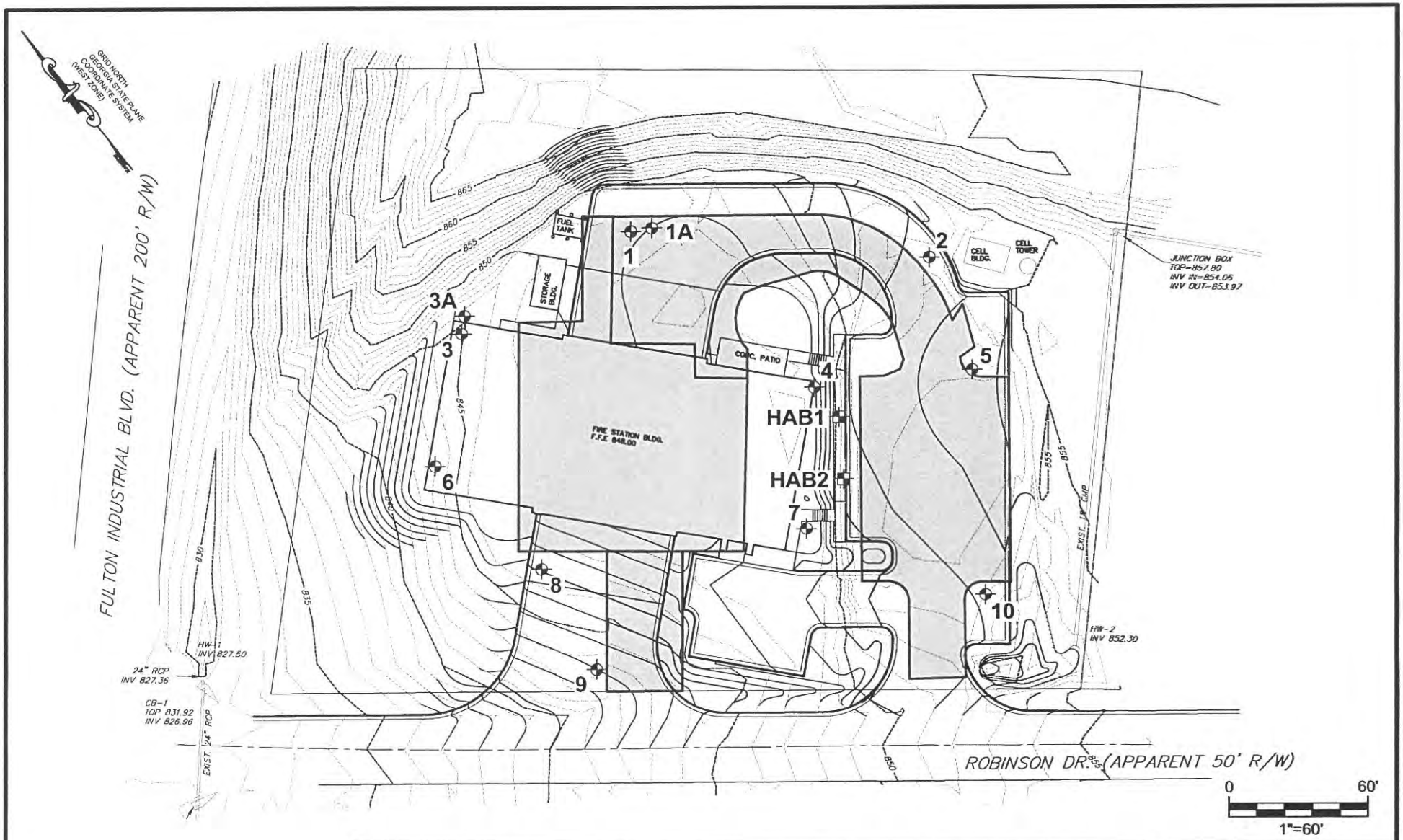
TEST BORING RECORDS

HAND AUGER BORING RECORDS

ROCK DEFINITION

PROCEDURES

ASFE – INFORMATION ABOUT GEOTECHNICAL ENGINEERING REPORT



LEGEND:

- APPROXIMATE SOIL TEST BORING LOCATION
- APPROXIMATE HAND AUGER BORING LOCATION
- SHADED AREA = EXISTING BUILDING & PAVEMENT

SOURCE: BASEPLAN BY KHAFRA ENGINEERING CONSULTANTS, INC., GRADING & DRAINAGE PLAN, DWG. NO. C-05, DATED 04-05-11.

PROJECT NO.:	REPORT NO.:	DATE:	VERTICAL SCALE:	HORIZONTAL SCALE:	CAD FILE:	DRAWN BY:	REVIEWED BY:	PLATE NO.:
1801-11-208	411757	04-12-11	N/A	1"=60'	A1.DWG	KRW	S.BOHMANN	1

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BORING LOCATION PLAN

FIRE STATION NO. 11
4760 FULTON INDUSTRIAL BOULEVARD
FULTON COUNTY, GEORGIA

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TEST BORING RECORD

BORING NO: 1

PROJECT: Fire Station No. 11	JOB NO: 1801-11-208	REPORT NO: 411757
PROJECT LOCATION: Fulton Industrial Boulevard and Robinson Road, Atlanta, Georgia		
ELEVATION: 847.0	BORING STARTED: 4/11/2011	BORING COMPLETED: 4/11/2011
DRILLING METHOD: HSA	RIG TYPE: Diezrich V120	HAMMER: Automatic
GROUNDWATER: Not Encountered	BORING DIAMETER (IN): 7	SHEET 1 OF 1

Remarks:

G	ELEV. (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION	L	S	R	STANDARD PENETRATION RESISTANCE (N) 0 10 20 30 40 50 60 70 80 90 100	BLOWS /6"
	847.0	0						
	846.7		**CONCRETE** (4 INCHES)					
			RESIDUUM - MEDIUM-DENSE GRAY AND BROWN SILTY FINE SAND				●	7 - 9 - 10
	845.5		**PARTIALLY WEATHERED ROCK**					
	844.5						>>●	50/5"
			AUGER REFUSAL					
		5						
		10						
		15						
		20						

BORING_RECORD S&ME 411757.GPJ QOR_CORP.GDT 4/14/11

BORING NO: **1A**

TEST BORING RECORD

PROJECT: Fire Station No. 11	JOB NO: 1801-11-208	REPORT NO: 411757
PROJECT LOCATION: Fulton Industrial Boulevard and Robinson Road, Atlanta, Georgia		
ELEVATION: 847.0	BORING STARTED: 4/11/2011	BORING COMPLETED: 4/11/2011
DRILLING METHOD: HSA	RIG TYPE: Diezrich V120	HAMMER: Automatic
GROUNDWATER: Not Encountered	BORING DIAMETER (IN): 7	SHEET 1 OF 1

Remarks: Offset approximately 8 feet east of Boring 1

G	ELEV. (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION	L	S	R	STANDARD PENETRATION RESISTANCE (N) 0 10 20 30 40 50 60 70 80 90 100	BLOWS /6"
	847.0	0						
	846.7		**CONCRETE** (4 INCHES)					
	846.0		**AUGER BORING** - NO SAMPLES OBTAINED					
			AUGER REFUSAL					
		5						
		10						
		15						
		20						

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TEST BORING RECORD

BORING NO: **2**

PROJECT: Fire Station No. 11	JOB NO: 1801-11-208	REPORT NO: 411757
PROJECT LOCATION: Fulton Industrial Boulevard and Robinson Road, Atlanta, Georgia		
ELEVATION: 852.0	BORING STARTED: 4/11/2011	BORING COMPLETED: 4/11/2011
DRILLING METHOD: HSA	RIG TYPE: Diezrich V120	HAMMER: Automatic
GROUNDWATER: Not Encountered	BORING DIAMETER (IN): 7	SHEET 1 OF 1

Remarks:

G	ELEV. (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION	L	S	R	STANDARD PENETRATION RESISTANCE (N) 0 10 20 30 40 50 60 70 80 90 100	BLOWS /6"
	852.0 / 851.8	0	**TOPSOIL** (2 INCHES)					
			RESIDUUM - LOOSE ORANGE-BROWN, GRAY, AND WHITE SILTY FINE SAND					3 - 3 - 3
	850.5		MEDIUM-DENSE ORANGE-BROWN AND BLACK SILTY FINE SAND					7 - 9 - 10
	849.0		MEDIUM-DENSE GRAY AND WHITE SILTY FINE TO MEDIUM SAND					7 - 9 - 9
		5						6 - 7 - 11
	844.0		MEDIUM-DENSE BLACK MICACEOUS SILTY FINE SAND					11 - 13 - 16
	842.0	10	BORING TERMINATED					
		15						
		20						

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TEST BORING RECORD

BORING NO: **3**

PROJECT: Fire Station No. 11	JOB NO: 1801-11-208	REPORT NO: 411757
PROJECT LOCATION: Fulton Industrial Boulevard and Robinson Road, Atlanta, Georgia		
ELEVATION: 845.0	BORING STARTED: 4/11/2011	BORING COMPLETED: 4/11/2011
DRILLING METHOD: HSA	RIG TYPE: Diezrich V120	HAMMER: Automatic
GROUNDWATER: Not Encountered	BORING DIAMETER (IN): 7	SHEET 1 OF 1

Remarks:

G	ELEV. (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION	L	S	R	STANDARD PENETRATION RESISTANCE (N) 0 10 20 30 40 50 60 70 80 90 100	BLOWS /6"
	845.0	0						
	844.7		**TOPSOIL** (4 INCHES)					
	844.0		**PARTIALLY WEATHERED ROCK** - SAMPLED AS VERY DESNE GRAY AND WHITE SILTY FINE SAND				>>●	50/5"
			AUGER REFUSAL					
		5						
		10						
		15						
		20						

BORING NO: **3A**

TEST BORING RECORD

PROJECT: Fire Station No. 11	JOB NO: 1801-11-208	REPORT NO: 411757
PROJECT LOCATION: Fulton Industrial Boulevard and Robinson Road, Atlanta, Georgia		
ELEVATION: 846.0	BORING STARTED: 4/11/2011	BORING COMPLETED: 4/11/2011
DRILLING METHOD: HSA	RIG TYPE: Diezrich V120	HAMMER: Automatic
GROUNDWATER: Not Encountered	BORING DIAMETER (IN): 7	SHEET 1 OF 1

Remarks: Offset 6 feet north of Boring 3

G	ELEV. (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION	L	S	R	STANDARD PENETRATION RESISTANCE (N) 0 10 20 30 40 50 60 70 80 90 100	BLOWS /6"
	846.0	0	**AUGER BORING** - NO SAMPLES OBTAINED					
	845.0		AUGER REFUSAL					
		5						
		10						
		15						
		20						

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TEST BORING RECORD

BORING NO: **4**

PROJECT: Fire Station No. 11	JOB NO: 1801-11-208	REPORT NO: 411757
PROJECT LOCATION: Fulton Industrial Boulevard and Robinson Road, Atlanta, Georgia		
ELEVATION: 848.0	BORING STARTED: 4/11/2011	BORING COMPLETED: 4/11/2011
DRILLING METHOD: HSA	RIG TYPE: Diezrich V120	HAMMER: Automatic
GROUNDWATER: Not Encountered	BORING DIAMETER (IN): 7	SHEET 1 OF 1

Remarks:

G	ELEV. (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION	L	S	R	STANDARD PENETRATION RESISTANCE (N) 0 10 20 30 40 50 60 70 80 90 100	BLOWS /6"
	848.0	0						
	847.8		**TOPSOIL** (3 INCHES)					
			RESIDUUM - LOOSE TAN, GRAY, AND WHITE SILTY FINE TO COARSE SAND					2 - 2 - 3
								4 - 4 - 5
	845.0		MEDIUM-DENSE BROWN, WHITE AND BLACK SILTY FINE SAND					
								10 - 13 - 13
		5						
								10 - 11 - 11
	840.0		MEDIUM-DENSE TO DENSE WHITE, GRAY AND BROWN SILTY FINE TO MEDIUM SAND WITH SOME QUARTZ FRAGMENTS					
								13 - 14 - 15
		10						
								7 - 7 - 8
	833.0	15	BORING TERMINATED					
		20						

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TEST BORING RECORD

BORING NO: **5**

PROJECT: Fire Station No. 11	JOB NO: 1801-11-208	REPORT NO: 411757
PROJECT LOCATION: Fulton Industrial Boulevard and Robinson Road, Atlanta, Georgia		
ELEVATION: 853.0	BORING STARTED: 4/11/2011	BORING COMPLETED: 4/11/2011
DRILLING METHOD: HSA	RIG TYPE: Diezrich V120	HAMMER: Automatic
GROUNDWATER: Not Encountered	BORING DIAMETER (IN): 7	SHEET 1 OF 1

Remarks:

G	ELEV. (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION	L	S	R	STANDARD PENETRATION RESISTANCE (N) 0 10 20 30 40 50 60 70 80 90 100	BLOWS /6"
	853.0	0						
	852.8		**TOPSOIL** (3 INCHES)					
			FILL - LOOSE BROWN AND GRAY CLAYEY SILTY FINE SAND WITH TRACE ROOTS (WET)				●	2 - 3 - 3
	851.5		**RESIDUUM** - MEDIUM-DENSE TAN, GRAY AND WHITE SILTY FINE TO MEDIUM SAND WITH SOME QUARTZ FRAGMENTS				●	5 - 6 - 7
							●	5 - 7 - 8
		5						
							●	6 - 6 - 7
							●	7 - 8 - 9
	843.0	10	BORING TERMINATED					
		15						
		20						

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TEST BORING RECORD

BORING NO: **6**

PROJECT: Fire Station No. 11	JOB NO: 1801-11-208	REPORT NO: 411757
PROJECT LOCATION: Fulton Industrial Boulevard and Robinson Road, Atlanta, Georgia		
ELEVATION: 843.0	BORING STARTED: 4/11/2011	BORING COMPLETED: 4/11/2011
DRILLING METHOD: HSA	RIG TYPE: Diezrich V120	HAMMER: Automatic
GROUNDWATER: Not Encountered	BORING DIAMETER (IN): 7	SHEET 1 OF 1

Remarks:

G	ELEV. (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION	L	S	R	STANDARD PENETRATION RESISTANCE (N) 0 10 20 30 40 50 60 70 80 90 100	BLOWS /6"
	843.0	0						
	842.8		**TOPSOIL** (3 INCHES)					
			FILL - FIRM ORANGE-BROWN SANDY CLAYEY SILT WITH SOME ROOT AND TOPSOIL					2 - 4 - 4
	841.5		**RESIDUUM** - STIFF RED-RBOWN SANDY CLAYEY SILT WITH SOME QUARTZ FRAGMENTS					5 - 5 - 6
	840.0		MEDIUM-DENSE TAN-ORANGE-RBOWN SILTY FINE TO MEDIUM SAND WITH SOME QUARTZ FRAGMENTS					6 - 6 - 7
		5						
								5 - 6 - 8
	835.0		MEDIUM-DENSE GRAY-RBOWN AND WHITE SILTY FINE TO MEDIUM SAND					5 - 6 - 7
		10						
								4 - 5 - 6
	828.0	15	BORING TERMINATED					
		20						

BORING_RECORD S&ME 411757.GPJ QOR_CORP.GDT 4/15/11

BORING NO: 7

TEST BORING RECORD

PROJECT: Fire Station No. 11	JOB NO: 1801-11-208	REPORT NO: 411757
PROJECT LOCATION: Fulton Industrial Boulevard and Robinson Road, Atlanta, Georgia		
ELEVATION: 848.0	BORING STARTED: 4/11/2011	BORING COMPLETED: 4/11/2011
DRILLING METHOD: HSA	RIG TYPE: Diezrich V120	HAMMER: Automatic
GROUNDWATER: Not Encountered	BORING DIAMETER (IN): 7	SHEET 1 OF 1

Remarks:

G	ELEV. (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION	L	S	R	STANDARD PENETRATION RESISTANCE (N) 0 10 20 30 40 50 60 70 80 90 100	BLOWS /6"
	848.0	0						
	847.8		**TOPSOIL** (3 INCHES)					
			RESIDUUM - LOOSE BROWN AND BLACK SILTY FINE SAND					1 - 3 - 3
								3 - 5 - 5
	845.0		MEDIUM-DENSE TO DENCE ORANGE-BROWN AND BLACK SILTY FINE SAND					
								5 - 7 - 9
		5						
								15 - 18 - 19
								7 - 7 - 7
		10						
	837.0		MEDIUM-DENSE WHITE AND GRAY SILTY FINE TO COARSE SAND					
								8 - 10 - 11
	833.0	15	BORING TERMINATED					
		20						

BORING NO: **8**

TEST BORING RECORD

PROJECT: Fire Station No. 11	JOB NO: 1801-11-208	REPORT NO: 411757
PROJECT LOCATION: Fulton Industrial Boulevard and Robinson Road, Atlanta, Georgia		
ELEVATION: 846.0	BORING STARTED: 4/11/2011	BORING COMPLETED: 4/11/2011
DRILLING METHOD: HSA	RIG TYPE: Diezrich V120	HAMMER: Automatic
GROUNDWATER: Not Encountered	BORING DIAMETER (IN): 7	SHEET 1 OF 1

Remarks:

G	ELEV. (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION	L	S	R	STANDARD PENETRATION RESISTANCE (N) 0 10 20 30 40 50 60 70 80 90 100	BLOWS /6"
	846.0	0						
	845.8		**TOPSOIL** (3 INCHES)					
			FILL - VERY LOOSE TO LOOSE TAN-ORANGE-BROWN CLAYEY SILTY FINE TO MEDIUM SAND WITH TRACE ROOTS (VERY MOIST)				●	1 - 1 - 2
							●	2 - 3 - 4
							●	3 - 4 - 4
		5						
	840.0		**FILL** - MEDIUM-DENSE ORANGE-BROWN CLAYEY SILTY FINE SAND WITH SOME ROCK FRAGMENTS				●	5 - 8 - 9
	838.0		**RESIDUUM** - MEDIUM-DENSE TAN-ORANGE AND BLACK SILTY FINE TO COARSE SAND				●	10 - 12 - 12
		10						
	835.0		MEDIUM-DENSE TAN AND WHITE SILTY FINE SAND				●	4 - 5 - 6
	831.0	15	BORING TERMINATED					
		20						

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TEST BORING RECORD

BORING NO: **9**

PROJECT: Fire Station No. 11	JOB NO: 1801-11-208	REPORT NO: 411757
PROJECT LOCATION: Fulton Industrial Boulevard and Robinson Road, Atlanta, Georgia		
ELEVATION: 844.0	BORING STARTED: 4/11/2011	BORING COMPLETED: 4/11/2011
DRILLING METHOD: HSA	RIG TYPE: Diezrich V120	HAMMER: Automatic
GROUNDWATER: Not Encountered	BORING DIAMETER (IN): 7	SHEET 1 OF 1

Remarks:

G	ELEV. (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION	L	S	R	STANDARD PENETRATION RESISTANCE (N) 0 10 20 30 40 50 60 70 80 90 100	BLOWS /6"
	844.0	0						
	843.8		**TOPSOIL** (3 INCHES)					
			FILL - LOOSE TO MEDIUM-DENSE RED-BROWN CLAYEY SILTY FINE TO MEDIUM SAND WITH SOME ROCK FRAGMENTS AND TOPSOIL (VERY MOIST)					3 - 4 - 4
								4 - 4 - 5
								5 - 6 - 7
		5						
								4 - 5 - 8
	836.0		**PARTIALLY WEATHERED ROCK** - SAMPLED AS VERY DESNE TAN AND BLACK SILTY FINE SAND					
	835.0		BORING TERMINATED				>>	50/3"
		10						
		15						
		20						

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TEST BORING RECORD

BORING NO: **10**

PROJECT: Fire Station No. 11	JOB NO: 1801-11-208	REPORT NO: 411757
PROJECT LOCATION: Fulton Industrial Boulevard and Robinson Road, Atlanta, Georgia		
ELEVATION: 853.0	BORING STARTED: 4/11/2011	BORING COMPLETED: 4/11/2011
DRILLING METHOD: HSA	RIG TYPE: Diezrich V120	HAMMER: Automatic
GROUNDWATER: Not Encountered	BORING DIAMETER (IN): 7	SHEET 1 OF 1

Remarks:

G	ELEV. (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION	L	S	R	STANDARD PENETRATION RESISTANCE (N) 0 10 20 30 40 50 60 70 80 90 100	BLOWS /6"
	853.0	0	**TOPSOIL** (6 INCHES)					
	852.5		**FILL** - RED-BROWN SANDY CLAYEY SILT WITH SOME ROOTS				●	2 - 3 - 5
	852.0		**RESIDUUM** - FIRM RED-BROWN CLAYEY SILT					
	851.0		VERY STIFF ORANGE-BROWN SANDY SILT				●	5 - 7 - 9
	850.0		MEDIUM-DENSE ORANGE-BROWN AND WHITE SILTY FINE TO COARSE SAND WITH SOME MICA				●	10 - 13 - 17
		5					●	12 - 15 - 18
	845.0		MEDIUM-DENSE BROWN AND BLACK SILTY FINE SAND WITH SOME MICA				●	10 - 15 - 15
	843.0	10	BORING TERMIANTED					
		15						
		20						

HAND AUGER BORING RECORD

FIRE STATION NO. 11
4760 FULTON INDUSTRIAL BOULEVARD
Fulton County, Georgia
S&ME Job No. 1801-11-208, Report No. 411757

Boring No.	Depth (feet)		DESCRIPTION
	From	To	
HAB-1	0	1	Topsoil
	1	3	Residuum - white, tan, and gray silty fine to medium sand
		3	Boring Terminated
HAB-2	0	1 ½	Topsoil
	1 ½	3	Residuum – orange-brown clayey sandy silt
		3	Boring Terminated

ROCK DEFINITION

We suggest that *Rock* be defined as the following:

General Excavation:

Any material which cannot be excavated with a single-tooth ripper drawn by a crawler tractor having a draw bar pull rated at not less than 56,000 pounds (Caterpillar D8K or equivalent) or excavated by a front-end loader with a minimum bucket breakout force of 25,600 pounds (Caterpillar 977 or equivalent).

Trench Excavation:

Any material which cannot be excavated with a backhoe having a bucket curling force rated at not less than 33,010 pounds (Caterpillar 225B or equivalent).

INTRODUCTION

S&ME, Inc. performs most all tests in general accordance with the American Society for Testing and Materials (ASTM) or the United States Army Corps of Engineers procedures. These procedures are generally recognized as the basis for uniformity and consistency of test results in the geotechnical engineering profession. All work is initiated and supervised by qualified engineers. Our tests are performed by skilled technicians trained in either ASTM or Corps procedures. Our equipment is well maintained, and our laboratory equipment is calibrated at least yearly.

Subsequent portions of this Appendix present brief descriptions of our testing procedures. Where applicable, we have referenced these procedures to either ASTM or the Corps of Engineers. Reference should be made to the following publications for specific descriptions of apparatus, procedures, reporting, etc.

Annual Book of ASTM Standards, Section 4, Volume 4.08: Soil and Rock: Building Stones. American Society for Testing and Materials, Latest Edition

EM 1110-2-1803. Subsurface Investigations, Soils, Chapter 3. U.S. Army Corps of Engineers, 1972.

EM 1110-1-1801, Geological Investigations. U.S. Army Corps of Engineers, 1978.

EM 1110-2-1907, Soil Sampling. U.S. Army Corps of Engineers, 1972.

EM 1110-1-1802, Geophysical Exploration. U.S. Army Corps of Engineers, 1979.

EM 1110-2-1906, Laboratory Soils Testing. U.S. Army Corps of Engineers, 1970.

PROCEDURES

SOIL TEST BORING, ASTM D-1586

The borings were made by rotary drilling in which a viscous bentonite drilling fluid is used to flush the cuttings and stabilize the hole. At regular intervals, the drilling tools were withdrawn from the borehole and soil samples obtained with a standard 1.4-inch I.D., 2.0-inch O.D., split tube sampler.

The sampler was initially seated 6 inches to penetrate any loose cuttings; then driven an additional foot with blows of 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the final foot was recorded and is designated as the *standard penetration resistance*. Penetration resistance, when properly evaluated, is an index to the soil's strength and density.

The samples were classified in the field by the driller as they were obtained. Representative portions of each soil sample were then sealed in containers and transported to our laboratory. The samples were examined by a graduate geotechnical engineer or engineering geologist to visually check the field classification. All boring data, including sampling intervals, penetration resistances, soil classifications, and groundwater level are presented on the attached Test Boring Records.

CORRELATION OF STANDARD PENETRATION RESISTANCE WITH RELATIVE COMPACTNESS AND CONSISTENCY

Sand and Gravel

Standard Penetration Resistance Blows/Foot	Relative Compactness
0-4	Very Loose
5-10	Loose
11-30	Medium Dense
31-50	Dense
Over 50	Very Dense

Silt and Clay

Standard Penetration Resistance Blows/Foot	Consistency
0-2	Very Soft
3-4	Soft
5-8	Firm
9-15	Stiff
16-30	Very Stiff
31-50	Hard
Over 50	Very Hard

PROCEDURES

AUGER REFUSAL MATERIALS

Auger refusal is a term that describes subsurface materials sufficiently competent to prevent further penetration by our $5^5/_8$-inch O. D. hollow-stem augers. Our criteria for auger refusal is the inability of our 125-horsepower drill rig to advance the augers while operating in second gear. Typically, refusal materials exhibit penetration resistances in excess of 100 blows per foot. Refusal materials can be hard cemented soil, soft weathered rock, coarse gravel or boulders, rubble or other hard debris, thin rock seams, or the upper surface of sound continuous rock. Core drilling procedures are required to determine the character and continuity of refusal materials.

Important Information About Your Geotechnical Engineering Report

Variations in subsurface conditions can be a principal cause of construction delays, cost overruns and claims. The following information is provided to assist you in understanding and managing the risk of these variations.

Geotechnical Findings Are Professional Opinions

Geotechnical engineers cannot specify material properties as other design engineers do. Geotechnical material properties have a far broader range on a given site than any manufactured construction material, and some geotechnical material properties may change over time because of exposure to air and water, or human activity.

Site exploration identifies subsurface conditions at the time of exploration and only at the points where subsurface tests are performed or samples obtained. Geotechnical engineers review field and laboratory data and then apply their judgment to render professional opinions about site subsurface conditions. Their recommendations rely upon these professional opinions. Variations in the vertical and lateral extent of subsurface materials may be encountered during construction that significantly impact construction schedules, methods and material volumes. While higher levels of subsurface exploration can mitigate the risk of encountering unanticipated subsurface conditions, no level of subsurface exploration can eliminate this risk.

Scope of Geotechnical Services

Professional geotechnical engineering judgment is required to develop a geotechnical exploration scope to obtain information necessary to support design and construction. A number of unique project factors are considered in developing the scope of geotechnical services, such as the exploration objective; the location, type, size and weight of the proposed structure; proposed site grades and improvements; the construction schedule and sequence; and the site geology.

Geotechnical engineers apply their experience with construction methods, subsurface conditions and exploration methods to develop the exploration scope. The scope of each exploration is unique based on available project and site information. Incomplete project information or constraints on the scope of exploration increases the risk of variations in subsurface conditions not being identified and addressed in the geotechnical report.

Services Are Performed for Specific Projects

Because the scope of each geotechnical exploration is unique, each geotechnical report is unique. Subsurface conditions are explored and recommendations are made for a specific project. Subsurface information and recommendations may not be adequate for other uses. Changes in a proposed structure location, foundation loads, grades, schedule, etc. may require additional geotechnical exploration, analyses, and consultation. The geotechnical engineer should be consulted to determine if additional services are required in response to changes in proposed construction, location, loads, grades, schedule, etc.

Geo-Environmental Issues

The equipment, techniques, and personnel used to perform a geo-environmental study differ significantly from those used for a geotechnical exploration. Indications of environmental contamination may be encountered incidental to performance of a geotechnical exploration but go unrecognized. Determination of the presence, type or extent of environmental contamination is beyond the scope of a geotechnical exploration.

Geotechnical Recommendations Are Not Final

Recommendations are developed based on the geotechnical engineer's understanding of the proposed construction and professional opinion of site subsurface conditions. Observations and tests must be performed during construction to confirm subsurface conditions exposed by construction excavations are consistent with those assumed in development of recommendations. It is advisable to retain the geotechnical engineer that performed the exploration and developed the geotechnical recommendations to conduct tests and observations during construction. This may reduce the risk that variations in subsurface conditions will not be addressed as recommended in the geotechnical report.

Portion obtained with permission from "Important Information About Your Geotechnical Engineering Report", ASFE, 2004
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