PROJECT MANUAL FOR:

ALPHARETTA ELEMENTARY SCHOOL ADDITION & RENOVATION

192 MAYFIELD ROAD

ALPHARETTA, GEORGIA 30004

Owner's Project Number: RFP-401-10

OWNER:

FULTON COUNTY SCHOOLS
5270 NORTHFIELD BOULEVARD
COLLEGE PARK, GEORGIA 30349

ARCHITECT:
GOODE VAN SLYKE ARCHITECTURE
409 JOHN WESLEY DOBBS AVENUE
ATLANTA, GEORGIA 30312

CIVIL ENGINEER:
TRAVIS PRUITT & ASSOCIATES
4317 PARK DRIVE
SUITE 400
NORCROSS, GEORGIA 30093

STRUCTURAL ENGINEER:
PRUITT EBERLY STONE
1852 CENTURY PLACE, N.E., SUITE 201
ATLANTA, GEORGIA 30345

MECHANICAL, PLUMBING, FIRE PROTECTION ENGINEER:
SPENCER BRISTOL ENGINEERING, INC.
5880 LIVE OAK PARKWAY, SUITE 140
NORCROSS, GEORGIA 30093

ELECTRICAL ENGINEERING:
BOLDEN-WILLIAMS & ASSOCIATES, INC.
3066 HIGHWAY 29 SOUTH
LAWRENCEVILLE, GEORGIA 30044

SPECIFICATION CONSULTANT:
SPIKER BALDWIN ASSOCIATES, INC.
216 CHURCH STREET
DECATUR, GEORGIA 30030

100% CONSTRUCTION DOCUMENTS:

ADDENDUM #2: July 17,2009

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100% CONSTRUCTION DOCUMENTS:

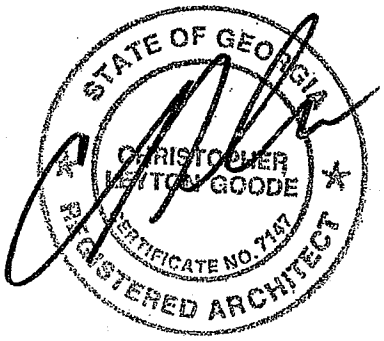
ADDENDUM #2: July 17,2009

SECTION 00900
ADDENDUMS

GENERAL

1.01 The following sets forth the format for issued Addenda.

ADDENDUM NO. 2 , dated July 17,2009



RE: Alpharetta Elementary School Addition/ Renovation RFP 401-09

FROM: OWNER: FULTON COUNTY BOARD OF EDUCATION
CONTRACTS DEPARTMENT
THE MEADOWS OPERATION CENTER
5270 Northfield Boulevard
College Park, GA 30349

Architect/Engineer Stamp & Signature

TO: ALL PROSPECTIVE BIDDERS:

This Addendum forms a part of the Contract Documents and modifies the Proposal Documents dated June 30, 2008 as noted below. Acknowledge receipt of the Addendum in the space provided on Document 00400 - Proposal Acceptance Form. Failure to do so may result in the proposal being deemed non-responsive.

The Addendum consists of **3** pages, including this one.

A. CHANGES TO PROPOSAL REQUIREMENTS TABLE OF CONTENTS: **None**

B. CHANGES TO PRIOR ADDENDUM: **None**

C. CHANGES TO PROPOSAL DOCUMENTS: **Please see below for description.**

D. CHANGES TO CONDITIONS OF THE CONTRACT: **None**

E. CHANGES TO SPECIFICATIONS:
Delete the following specification section in their entirety and substitute new sections, dated July 17, 2009:

Document 00 0110	Table of Contents
Section 04 2113	Brick Masonry
Section 05 3110	Composite Steel Floor Deck
Section 06 2000	Finish Carpentry
Section 07 2100	Thermal Insulation

Section 07 2400	Exterior Insulation and Finish System (EIFS)
Section 07 2600	Surface Applied Vapor Reduction System
Section 07 6000	Flashing and Sheet Metal
Section 08 1400	Wood Doors
Section 09 6500	Resilient Flooring
Section 10 2813	Toilet Accessories
Section 10 7316	Canopies
Section 11 5213	Projection Screens
Section 22 0000	Plumbing
Section 23 0000	Mechanical General
Section 23 0700	Thermal Insulation for Mechanical Systems
Section 23 0923	Building Automation System
Section 23 3100	Ductwork and Accessories
Section 23 3400	Exhaust Fans
Section 23 3700	Grilles, Registers and Diffusers
Section 23 7219	Energy Recovery Ventilators
Section 23 8133	Ductless Split Systems
Section 23 8146	Water Source Heat Pumps

Add the following new specification sections, dated July 17, 2009:

Section 06 6116	Solid Surfacing Fabrications
Section 09 6566	Synthetic Athletic Flooring
Section 10 2115	Plastic Toilet Compartments
Section 23 0515	Variable Frequency Speed Controllers
Section 23 7415	Packaged Rooftop Air Conditioning Units

Delete the following specification sections in their entirety:

Section 08 9119	Extruded Aluminum Louvers
Section 23 0593	Test and Balance
Section 26 2000	Service and Distribution
Section 26 3200	Emergency/Stand-By Power Systems Generator Set
Section 26 3600	Emergency/Stand-By Power Systems Transfer Switches

F. CHANGES TO DRAWINGS:

Delete the following drawings in their entirety and substitute the attached new drawings, dated July 17, 2009:
A000, C1.1, C3.1, C4.1, C4.2, C5.1, C5.2, C6.1, C6.2, C6.3, C7.1, C7.2, C8.1, C9.1, C10.1, C10.2, C10.3, C10.4, C10.5, C10.6, C10.7, C10.8, A002, A003, A004, A010, A020, A050, A051, A052, A100, A101, A102, A103, A104, A105, A106, A130, A140, A141, A142, A143, A200, A201, A202, A203, A204, A205, A206, A301, A302, A410, A411, A412, A420, A421, A500, A600, A700, S001, S002, S101, S201, S301, S302, S401, S402, S403, S404, S405, S407, M101, M102, M103, M104, M105, M201, M202, M203, M204, M205, M301, M302, M303, M304, M305, M401, M402, M501, P001, P002, P101, P102, P103, P104, P105, P201, P202, P203, P204, P205, P301, P401, E101, E102, E201, E301, E302, E303, E304, E305, E401, E402, E403, E404, E405, E501, E502, E601, E701, FP001, and FP101.

Add the following drawings:
C10.9, M206

G. OTHER CHANGES AS SET FORTH:

Responses to Pre-Proposal RFI's:

Question #1: With regard to the manufactured casework specified in Section 1232300, Paragraph 2.3 describes plywood material for the casework. Elevation details 1,2,3 and 4 on Sheet A700 reference MDF core construction. Note 1 on Sheet A700 calls for all construction to be ¾" particleboard U.N.O. What core material will be required for the casework and countertops?

Response to Question #1: All notes on A700 have been amended to reflect plywood construction, MDF for drawer and cabinet faces, and no particle board allowed.

Question #2: Would you give us an indication of the size and scope of the "Alpharetta Elementary School Addition / Renovation" and the period of time the client or County is expecting the project to begin and end?

Response to Question #2: As stated on the A000 cover sheet: PROJECT INCLUDES RENOVATION OF THE EXISTING BUILDING'S HVAC AND OTHER SYSTEMS, EXISTING RAMP RENOVATIONS, AND TWO ADDITIONS. ONE ADDITION IS AN 8 CLASSROOM ADDITION WITH TEACHER'S WORK ROOM. THE OTHER ADDITION IS A H.C. RAMP ADDITION.

As indicated on the 01010 'Phasing of the Work' specification section, the project is to start after the Bidding and Award phase. Bid Proposals are due July 30th and the Phase I Classroom Addition is scheduled to be Substantially Complete on March 19, 2010. The Phase II Interior Renovations are scheduled to be Substantially Complete on July 15, 2010.

Question #3: Page 23 of the Request for Proposal requires a schedule submitted with our proposal equivalent to Primavera P3ec V.5. Please advise if Microsoft Project is considered by Fulton County Schools to be an equivalent. Please note that preliminary schedules prior to the input of all the successful subcontractors is not as accurate as the one implemented after award of the contract.

Response to Question #3: Yes, Microsoft Project is acceptable.

Question #4: In addition, the Request for Proposal asks for qualifications of the scheduler. Please confirm if the scheduler is intended to be a 3rd party scheduler or an employee of the prime contractor.

Response to Question #3: The scheduler may be a a 3rd party or an employee of the prime contractor, as long as their qualifications are submitted.

H. Clarification or any other notice of a change in the Proposal Documents will be issued only by the OWNER Contracts Department and only in the form of a written Addendum, transmitted by fax or e-mail to all who are known by the issuing office to have received a complete set of PROPOSAL Documents. Any other purported Addenda are void and unenforceable.

END OF ADDENDUM NO. **2**

LATEST REVISION DATE

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LATEST REVISION DATE

LATEST REVISION DATE

LATEST REVISION DATE

LATEST REVISION DATE

End of Table of Contents

SECTION 04 2113

BRICK MASONRY

PART 1 - GENERAL

1.1 SUMMARY:

A. Related work specified elsewhere:
1. Concrete unit masonry.
2. Water-repellent coating.
3. Joint sealants.
4. Cast stone masonry.

B. Work installed but furnished under other sections:
1. Mortar and masonry grout.
2. Masonry accessories.
3. Steel lintels.
4. Flexible (through-wall) flashing.

C. Definition: Face brick: Exposed brick beginning two courses below finish grade.

1.2 SUBMITTALS:

A. Product data: Submit manufacturer's product data, mixing and application procedures for masonry cleaning compound.

B. Certificates: Indicate that materials supplied comply with specification requirements. Certificates shall be signed by brick manufacturer and shall state quantities and dates shipped.

C. Samples: Submit five actual bricks indicating range of color, texture and size to be expected in finished work.

1.3 QUALITY ASSURANCE:

A. Applicable standards; standards of the following, as referenced herein:
1. ASTM International (ASTM).
2. Southern Brick Institute (SBI) and Brick Institute of America (BIA).

1.4 PROJECT/SITE CONDITIONS:

A. Cold-weather construction: Implement cold weather construction provisions of ACI 530.1/ASCE 6/TMS 602, Article 1.8 C, or the following procedures, when either ambient temperature falls below 40F or temperature of masonry units is below 40°F.
1. Preparation:
a. Provide temperatures of masonry units not less than 20°F when laid in masonry. Do not lay masonry units containing frozen moisture, visible ice or snow on their surface.
b. Remove visible ice and snow from top surface of existing foundations and masonry to receive new construction. Heat these surfaces to above freezing, using methods that do not result in damage.

2. Construction: The following requirements shall apply to work in progress and shall be based on ambient temperature.
   a. Meet the following construction requirements when ambient temperature is between 40°F and 32°F:
      1) Do not heat water and aggregates used in mortar and grout above 140°F.
      2) Heat mortar sand or mixing water to produce mortar temperatures between 40°F and 120°F at time of mixing. Heat water and aggregates for grout if they are below 32° F.
   b. Meet requirements of Building Code and the following construction requirements when ambient temperature is between 32°F and 25°F:
      1) Maintain mortar temperature above freezing until used in masonry.
      2) Heat aggregates and mixing water for grout to produce grout temperature between 70°F and 120°F at time of mixing. Maintain grout temperature above 70°F at time of grout placement.
   c. Meet requirements of Building Code and the following construction requirements when ambient temperature is between 25°F and 20°F:
      1) Heat masonry surfaces under construction to 40°F.
      2) Provide wind breaks or enclosures when the wind velocity exceeds 15 miles per hour (mph).
      3) Prior to grouting, heat masonry to a minimum of 40°F.
   d. Meet requirements of Building Code and the following construction requirements when ambient temperature is below 20°F: Provide enclosures and auxiliary heat to maintain air temperature within enclosure to above 32°F.
3. Protection: Requirements of this section and Building Code apply after masonry is placed and shall be based on anticipated minimum daily temperature for grouted masonry and anticipated mean daily temperature for ungrouted masonry.
   a. When temperature is between 40°F and 25°F, cover newly constructed masonry with a weather-resistive membrane for 24 hours after being completed.
   b. When temperature is between 25°F and 20°F, cover newly constructed masonry with weather-resistive insulating blankets, or equal protection, for 24 hours after being completed. Extend time period to 48 hours for grouted masonry, unless the only cement in grout is Type III Portland cement.
   c. When temperature is below 20°F, maintain newly constructed masonry at a temperature above 32°F for at least 24 hours after being completed by using heated enclosures, electric heating blankets, infrared lamps or other acceptable methods. Extend time period to 48 hours for grouted masonry, unless the only cement in grout is Type III Portland cement.

B. Hot weather construction: Implement hot weather construction provisions of ACI 530.1/ASCE 6/TMS 602, Article 1.8 D, or the following procedures, when temperature or temperature and wind-velocity limits of this section are exceeded.
   1. Preparation: Meet the following requirements prior to conducting masonry work.
      a. Temperature: When ambient temperature exceeds 100°F, or exceeds 90°F with a wind velocity greater than 8 mph (13 km/h):
         1) Provide necessary conditions and equipment to produce mortar having a temperature below 120°F.
         2) Maintain sand piles in a damp, loose condition.
      b. Special Conditions: When ambient temperature exceeds 115°F, or 105°F with a wind velocity greater than 8 mph (13 km/h), implement requirements of Building Code, and shade materials and mixing equipment from direct sunlight.
   2. Construction: Meet the following requirements while masonry work is in progress.
      a. Temperature: When ambient temperature exceeds 100°F, or exceeds 90°F with a wind velocity greater than 8 mph (13 km/h):
         1) Maintain temperature of mortar and grout below 120°F.
         2) Flush mixers, mortar transport containers and mortar boards with cool water before they come into contact with mortar ingredients or mortar.
         3) Maintain mortar consistency by retempering with cool water.
         4) Mortar shall be used within 2 hours of initial mixing.
   3. Special conditions: When ambient temperature exceeds 115°F, or exceeds 105°F with a wind velocity greater than 8 mph, implement requirements of Building Code using cool mixing water for mortar and grout. The use of ice is permitted in mixing water prior to use. Do not use ice in mixing water when added to other mortar or grout materials.
   4. Protection: When mean daily temperature exceeds 100°F, or exceeds 90°F with a wind velocity greater than 8 mph (13 km/h), fog-spray newly constructed masonry until damp at least three times a day until masonry is three days old.

C. Protection of work:
   1. During erection, at end of each day or shutdown period, keep walls dry by covering with waterproof material, anchored and overhanging each side of wall at least 2'-0".
   2. Remove misplaced mortar or grout immediately.
   3. Protect face materials against staining.
   4. Protect sills, ledges and offsets from mortar droppings during construction.

D. Sequencing and scheduling: Do not enclose or cover mechanical or electrical work requiring inspection until such work has been accepted. Coordinate this work with work of other sections required to be built into masonry construction.

PART 2 - PRODUCTS

2.1 FACE BRICK:

A. Acceptable manufacturers:
1. Boral Bricks, Inc.
2. Cherokee Brick Co.
3. Endicott Clay Products Co.
4. Glen-Gery Corp.
5. Hanson Brick.
6. Interstate Brick.
7. Jenkins Brick Co.
8. Taylor Clay Products, Inc.
9. Tri State.
10. Lee Brick & Tile Company.
11. Palmetto Brick Company.

B. Meeting ASTM C216-07, Grade SW, Type FBS.

C. Dimensions: Standard (modular) size, 2-1/4" by 3-5/8" by 7-5/8".

D. Colors and textures: Match existing buildings, as approved by Architect.

E. Special shapes: Including, but not limited to, specially fabricated lip bricks, watertables, arches and solid units of same quality, color and texture as face brick.

2.2 ACCESSORIES:

A. Weepholes:
1. Weephole ventilators for full head joint installation at grade level.
   a. Acceptable products:
      1) Dur-O-Wal, Cell-Vent D/A 1006.
      2) Hohmann & Barnard, Inc., QV - Quadro-Vent.
      3) Wire-Bond, Cell Vent.
   b. Characteristics: Flexible ultra-violet resistant polypropylene co-polymer vent with cellular structure. Color shall be as selected by Architect.
2. Weep tubes with screens and wicks for all areas except grade level:
   a. Acceptable products:
      1) AA Wire Products Co., #AA223KW;
      2) Hohmann & Barnard, Inc., #341.
      3) Wire-Bond.
   b. Characteristics: 3/8" o.d. plastic tubes with brass screening at face and twisted synthetic rope wicks inserted in tube and extending minimum 6" at back (cavity) side.

B. Masonry cleaning compound:
   1. Product qualifications:
      a. Compound shall be certified as acceptable by brick manufacturer, meeting specified requirements, and as recommended by compound manufacturer for selected brick, to ensure proposed masonry cleaning compound causes no staining nor discoloration of brick.
      b. Products shall be specifically formulated for brick type, color, and material content. Product data shall state whether particular compound is acceptable for dark colored brick, light colored brick, brick subject to non-metallic staining or brick subject to metallic staining.
   2. Test panel: Test each type and dilution of cleaning compound on sample panel, as further specified.
   3. Formulation: Compound of organic and inorganic acids, wetting agents and inhibitors.
   4. Characteristics:
      a. Compound shall be able to cling to masonry for an average dwell period of two minutes, able to loosen mortar residue for complete removal, and shall be water-washable upon completion.
      b. Compound shall not cause acid burns or streaks.
      c. Compound shall be able to be applied, based on dilution amount, by using a soft masonry brush or low pressure (40-50 psi) airless sprayer.

C. Mortar drainage net: Refer to Masonry Accessories section.

PART 3 - EXECUTION

3.1 SAMPLE WALL PANEL:

A. Lay 6'-0" long by 4'-0" high sample wall panel of face brick using mortar as specified in Mortar and Masonry Grout section and concrete unit masonry backup as specified in other sections. Orient panel as directed by Architect.

B. Perform brick cleaning on completed sample panel, to ensure proposed masonry cleaning compound causes no staining nor discoloration of brick.

C. Indicate the following:
   1. Bonding.
   2. Mortar color.
   3. Joint tooling.
   4. Brick color and texture.
   5. Reinforcement.
   6. Workmanship.
   7. Cavity clearance.
   8. Brick cleaning.

D. Prepare panel at least 14 days prior to beginning masonry work. Should panel be disapproved, prepare additional panels until approved by Architect.

E. Maintain panel throughout work as standard of masonry work. Undamaged, approved panel may remain as part of the complete work.

3.2 INSTALLATION:

A. Workmanship: Install no cracked, broken or chipped units exceeding ASTM allowances.
1. Use abrasive power saws to cut brick. Avoid slivers less than one-third brick width.
2. Lay brick plumb, true to line and with level courses, spaced within allowable tolerances.
3. Do not furrow bed joints.
4. Stop-off horizontal run by racking back in each course; toothing is not permitted.
5. Adjust units to final position while mortar is soft and plastic.
6. If units are displaced after mortar has stiffened, remove, clean joints and units of mortar, and relay with fresh mortar.
7. Cutting and patching of finish masonry to accommodate work of other trades shall be done so as not to mar appearance of finished surface.
8. Adjust shelf angles to keep work level and at proper elevation. Provide for a 3/8" joint below shelf angle.
9. Mix units from pallets in work to diminish noticeable variation in color and texture between pallets.
10. Provide brick expansion joints with pressure-relieving pads continuous under shelf angles.
11. When joining fresh masonry to set or partially set masonry, remove loose brick and mortar, and clean and dampen exposed surface of set masonry prior to laying fresh masonry.
12. Provide solid brick units free of cores or frogs where such characteristics would be exposed in the finished work.
13. Wet brick with initial rate of absorption exceeding 30 grams/30 sq. in./min. when tested in accord with ASTM C67-07.
14. Cavity walls: Keep cavity clear of mortar and other materials which project into cavity and decrease cavity clearance to less than minimum dimension indicated.

B. Mortar beds:
1. Lay brick with full mortar coverage on horizontal and vertical joints in all courses.
2. Provide sufficient mortar on ends of brick to fill head joints.
3. Rock closures into place with head joints thrown against two adjacent bricks in place.
4. Do not pound corners or jambs to fit stretcher units after setting in place.
5. Where adjustment to corners or jambs must be made after mortar has started to set, remove mortar and replace with fresh mortar.

C. Mortar joints:
1. Nominal thickness: 3/8".
2. Tool joints exposed in finished work when "thumbprint" hard. Joints shall be tooled using a jointer at least 2'-0" in length.
3. Joint profile: Concave.
4. Trowel point or concave tool joints below grade.
5. Flush-cut joints not to be exposed in finished work.
6. As work progresses, trowel protruding mortar fins in cavity flat to inner face of wythe.

D. Bonding pattern: Lay brick in bonds indicated on the drawings.

E. Brick expansion joints: Install materials in accord with Masonry Accessories section. Joint size shall be same width as mortar joints.
1. Space pressure-relieving pads at expansion joints indicated on drawings.
2. Coordinate location of expansion joints in brick work with control joints in unit masonry backup.

F. Building expansion joints: Keep clean of mortar and debris. Make joints 1" wide. Stop horizontal joint reinforcement 1" each side of joint. Caulk in accord with Joint Sealants section.

G. Flashing:
1. Clean surface of masonry smooth and free from projections which might puncture flashing material.
2. Place through-wall flashing on bed of mortar and cover with mortar as specified in Flexible (Through-Wall) Flashing section.

H. Weepholes:
1. Provide weepholes in exterior wythe of masonry at spacing indicated on the drawings, maximum 2'-0" o.c. horizontally at heads and sills of openings, in exterior walls at grade and in other locations where flashing is indicated.
2. Weephole ventilators:
   a. Provide weephole ventilators at grade level.
   b. Install weephole ventilator in open head joint, flush with low edge of adjacent brick.
3. Install weep tubes at all weep holes except at grade level where weephole ventilators are installed. Install weep tubes at bottom of head joint with screening to exterior; lay extra length of wick horizontally in cavity.
4. Keep weep holes and area above flashing free of mortar droppings.
5. Install cavity mortar drainage net in cavity behind wicks. Install continuous at grade.

I. Sealant joints: Retain 1/2" wide sealant joint around outside perimeter of exterior doors, window frames and other wall openings.

J. Pointing: Cut out defective mortar joints and holes in exposed work. Repoint with new mortar.

K. Dry cleaning: Brush brick surfaces with stiff bristle brush. Do not allow mortar droppings to harden on exposed surfaces.

3.3 SITE TOLERANCES:

A. Acceptable tolerances:
1. Maximum variation from plumb:
a. In lines and surfaces of walls and arrises:
1) 1/4" in 10'-0".
2) 3/8" in any story or 20'-0" maximum.
3) 1/2" in 40'-0" or more.
b. For external corners, expansion joints and other conspicuous lines:
1) 1/4" in any story or 20'-0" maximum.
2) 3/8" in 40'-0" or more.
2. Maximum variation from level or grades for exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines:
a. 1/4" in any bay or 20'-0".
b. 1/2" in 40'-0" or more.
3. Maximum variation of linear building line from established position in plan and related portions of columns, walls and partitions:
a. 1/2" in any bay or 20'-0".
b. 3/4" in 40'-0" or more.
4. Maximum variation in cross-sectional dimensions of columns and thickness of walls: Not less than 1/4" smaller nor more than 1/2" larger than indicated.

3.4 FINAL CLEANING:

A. At least 21 days prior to application of specified cleaning solution to brick work, apply solution on half of the surface of sample panel. Should discoloration of brick or mortar joints, staining or efflorescence appear on sample panel, notify Architect and await further instructions.

B. No wet cleaning shall take place within seven days of placing masonry.

C. Apply masonry cleaning compound on brick masonry as tested on sample panel in accord with manufacturer's product data. Flush with clean water.

D. At least two hours prior to application of cleaning solution to brick work, saturate mortar joints with clean water and flush off loose debris.

E. Begin cleaning process at highest point of wall, working downward. Work in areas of 20 sq. ft., maximum. As cleaning progresses, flush wall to prevent accumulation of scum.

F. Safely discard solutions containing debris and residue.

G. Do not scrub mortar joints with cleaning solution.

H. Protect materials adjacent to brick work which are subject to corrosion from contact with cleaning solution.

I. Remove stains in accord with recommendations of the SBA/BIA, Technical Notes #20. Use cleaning agents only after pre-testing on sample panel.

End of Section

SECTION 05 3110

COMPOSITE STEEL FLOOR DECK

PART 1 - GENERAL

1.1 SUBMITTALS:

A. Shop Drawings: Indicate deck manufacturer, type and configuration including size, weight and structural characteristics. Show relationships and attachments to supporting structure.

B. Product Data: Indicate physical properties and load tables for decking.

1.2 DELIVERY, STORAGE AND HANDLING:

A. Store metal deck off the ground with one end elevated for drainage. Protect deck during storage with a water-proof covering, ventilated to prevent condensation. Reject materials that are damaged or corroded.

PART 2 - PRODUCTS

2.1 DECKING:

A. Material: Galvanized sheet steel meeting ASTM A 653-04a, having a minimum yield point of 40,000 psi. The steel sheets shall have a G-60 galvanized coating applied utilizing the hot dip process conforming to ASTM A 653-04a.

B. Floor units shall be formed with integral locking lugs or embossments to provide a mechanical lock between the steel floor and the concrete slab. Minimum depth of embossments or locking lugs shall be 0.050".

C. Floor units shall be classified by Underwriters' Laboratories, Inc. Each unit or bundle shall be labeled and marked as required by UL, indicating manufacturer, testing and inspection.

D. The steel floor units shall have a cross-sectional configuration as specified by Vulcraft or approved equal.

E. Touch-up Field Painting: Zinc rich metal primer.

2.2 FLASHING:

A. The steel floor manufacturer shall furnish sheet metal flashing to close openings between floor units and columns, and openings that occur where a change occurs in the direction of the floor span. These flashings shall be fastened in position by the steel floor erector.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Install deck with corrugations running perpendicular to supports. Lay only as much deck as can be welded during same work period. Deck sheet shall be supported by a minimum of four supports (three span condition).

B. Lay out deck with ends centered over supports. Deck ends shall be butted together. Lap side edges minimum of one corrugation.

C. Attachment: Weld deck to supporting members as follows (use min. 16 gauge welding washers when deck thickness is less than 0.028 inches):
1. At butted ends: As shown on plans.
2. Intermediate supports: As shown on plans.
3. Side Laps: At mid-span or at 3'-0", whichever is smaller. Hex head screws size #12 or crimps (button punching) can be used at side lap connections.

D. Welder shall be qualified for welding sheet steel.

E. Notify Architect for inspection of deck installation before placing concrete.

F. Provide temporary shoring as required. Prevent overloading of structure by stacks of decking during installation.

G. Following erection, wire brush welds and similar scars resulting from installation. Touch up using zinc rich metal primer.

End of Section

SECTION 06 2000

FINISH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY:

A. Work of this section includes plastic laminate and painted millwork for the project.

B. Related work: Painting and coating.

1.2 SUBMITTALS:

A. Shop drawings: Submit for finish carpentry. Indicate construction and installation details, species and grades of materials, finishes, plastic laminate selections and cabinet hardware selections.

B. Product data: Submit for cabinet hardware and similar manufactured items. Submit with shop drawings.

C. Samples: Submit as follows:
1. Plastic laminate: Manufacturer's standard color and pattern selections for selection by Architect.
2. Finish samples: Indicate selected finishes on samples of species and grade material specified.
3. Hardware items: Submit if requested by Architect. Samples will be returned to supplier. **

D. Preservative-treated wood certification: Submit for Architect's information only. Submit certification by treating plant, stating chemicals and process used, net amount of salts retained, conformance with applicable standards and moisture content after treatment.

1.3 QUALITY ASSURANCE:

A. Applicable standards; comply with the following, as referenced herein:
1. American Institute of Timber Construction (AITC).
2. American National Standards Institute (ANSI).
3. APA The Engineered Wood Association (APA).
4. ASTM International (ASTM).
5. American Wood Preservers Association (AWPA).
6. Architectural Woodwork Institute (AWI), "Architectural Woodwork Quality Standards, Guide Specifications and Quality Certification Program," 2005 Edition, herein referred to as AWI Standards. Work shall comply with applicable portions of AWI Standards.
7. Hardwood Plywood and Veneer Association (HPVA).
8. National Electric Manufacturers Association (NEMA).
9. National Fire Protection Association (NFPA).
10. Underwriters Laboratories, Inc., (UL).
11. U. S. Department of Commerce, National Institute of Standards and Testing:
    a. Lumber: PS 20.
    b. Construction and Industrial Plywood: PS 1.

B. Current grading rules of the following industry associations apply to wood products:
   1. National Hardwood Lumber Association (NHLA).
   2. Redwood Inspection Service (RIS).
   3. Southern Pine Inspection Bureau (SPIB).
   4. West Coast Lumber Inspection Bureau (WCLB).
   5. Western Wood Products Association (WWPA).

C. Grade marks: Identify lumber and plywood by official grade mark.
   1. Lumber: Grade stamp shall contain symbol of grading agency, mill number or name, grade of lumber, species or species grouping or combination designation, rules under which graded where applicable, and condition of seasoning at time of manufacture.
   2. Plywood: Appropriate grade trademark of the APA. Indicate type, grade, class, identification index and inspection and testing agency mark.
   3. Preservative-treated wood products: Preservative-treated lumber and plywood shall bear the quality standard stamp of the applicator, indicating preservative type, exposure conditions, year of treatment, treatment plant and treatment supervising agency.
   4. On components to be exposed to view, grade marks shall be located so as to be concealed in finished work.

1.4 DELIVERY, STORAGE AND HANDLING:

A. Deliver no carpentry to project site until areas are ready for carpentry installation.

B. Immediately upon delivery to job site, place materials indoors, protected from weather.

C. Store materials a minimum of 6" above ground on framework or blocking, and cover with waterproof covering providing for adequate air circulation and ventilation. Store in dry, conditioned space.

1.5 PROJECT/SITE CONDITIONS:

A. Field measurements: Take field measurements to ascertain exact millwork sizes. Indicate exact dimensions on shop drawings.

B. Install no interior finish carpentry until spaces are enclosed, dry and capable of being heated. Maintain temperature between 55 degrees F. and 80 degrees F. for 72 hours before beginning installation and afterwards until Date of Substantial Completion.

C. Maintain interior relative humidity at site between 25% and 55% before, during and after installation.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS:

A. Moisture content:
1. Interior: 8-13%.
2. Exterior: 10-15%.

B. Surfacing: Surface four sides dry (S4S-dry), unless otherwise noted.

C. Dimensions: Indicated lumber dimensions are nominal. Comply with PS 20.

D. Grades for exposed and semi-exposed finish carpentry lumber and plywood are based on AWI Standards. Grades for unexposed work are based on referenced grading rules.

E. Drying: Kiln dried.

2.2 LUMBER:

A. Species and grades:
1. Unexposed millwork framing and blocking: Standard Grade West Coast Lumber.
2. Interior semi-exposed millwork components: AWI II Grade, Poplar.
3. Interior exposed and semi-exposed painted millwork and trim: AWI II, White Pine or Poplar. **

2.3 SHEET MATERIAL:

A. Plywood:
1. Unexposed and semi-exposed millwork and general carpentry: APA B-C, Exterior, Group I; "B" face for surfaces to receive paint finish, "C" face for unexposed and semi-exposed surfaces.
2. Hardwood plywood: manufacturer's stock hardwood plywood, meeting ANSI/HPVA HP-1-2000.
3. Fire-retardant-treated plywood shall meet AWPA U1-07, T1-07 AND P17-02.

B. Medium density fiberboard:
1. Acceptable products:
a. Louisiana-Pacific, Southern FibrePine.
b. Masonite International Corp., Baraboard.
2. Type: Meeting ANSI A208.2, Grade MD-Exterior Glue; Class "C" fire hazard classification for 3/4" thickness.

C. Hardboard: 1/4" thickness, tempered.

D. Plastic laminates:
1. Acceptable products:
a. Formica Corp., Formica.
b. International Paper, Decorative Products Division, Nevamar.
c. WilsonArt International, Inc., WilsonArt.
2. Conforming to NEMA Standard LD3-2005, as follows:
a. Horizontal applications: Grade HGS.
b. Vertical applications: Grade VGS.

c. Backing sheet: Grade BKH, undecorated plastic laminate.
d. Postforming applications: Grade VGP.
e. Chemical resistant applications: Grade VGP.
f. Fire-resistant applications: Grade HGP.
g. Solid color applications: Grade HGS.

3. Colors, textures and patterns: As selected by Architect from laminate manufacturer's standard full line selection.

E. Thermoset decorative overlay: Melamine; matte surface texture. Color and pattern as selected by Architect from manufacturer's standard color selection.

2.4 TREATED WOOD PRODUCTS:

A. Pressure-preservative-treated wood:
1. Treatment type: Water-borne preservative registered with EPA.
2. AWPA standard:
a. Lumber, timber and plywood shall conform to applicable requirements of AWPA Standard U1-07 and T1-07 for species, product and end use.
b. Handling and care of pressure treated wood products shall conform to AWPA Standard M4-06.
c. Preservatives shall conform to AWPA P5-07.
3. Preservative retention: As required by treatment type in accord with AWPA Standards for below- or above-ground use.
4. Seasoning; re-dry after treatment to 19% maximum moisture content.
5. Use:
a. Wood products in contact with concrete slabs-on-grade or foundations.
b. Nailers or blocking cast or built into concrete or masonry.
c. Wood products in contact with exterior walls.
d. Blocking, nailers, plates and similar wood products in conjunction with roof decks, roofing and roof parapets.

B. Interior fire-retardant-treated wood:
1. Acceptable product; subject to compliance with specified requirements:
a. Chemical Specialties, Inc., D-Blaze.
b. Hickson Corporation, Dricon.
c. Hoover Treated Wood Products, Pyro-Guard.
2. Description: Pressure-impregnated with a chemical retardant tested and listed by Underwriters Laboratories, Inc., (UL). When tested in accord with ASTM E84-07 treated products shall have a flame spread of 25 or less and show no evidence of significant progressive combustion when the test is continued for an additional twenty minute period. In addition, flame front shall not progress more than 10'-6" beyond centerline of burners at any time during test.
3. Surface burning characteristics: F.R.-S rating in accord with Underwriters Laboratories, Inc. (UL).
4. AWPA standard: AWPA U1-07, T1-07 and P17-02.

5. Seasoning; kiln-dried after treatment to the following maximum moisture content:
   a. Lumber: 19%.
   b. Plywood: 15%.
6. Hygroscopicity: Maximum 28% equilibrium moisture content when tested in accord with ASTM D3201-07 at 92% relative humidity.
7. Use: As required by codes.

2.5 HARDWARE:

A. Door and drawer pulls:
   1. Acceptable products:
      a. Epco, Inc., #MC-402-4.
      b. Sugatsune America, Inc., #SST-30M.
      c. Stanley Works #4484, 4" long.
   2. Type: 4" long wire pull, US26D.

B. Magnetic catches:
   1. Acceptable manufacturers:
      a. Basis of design: Stanley Works #SP41.
      b. Epco, Inc.
      c. Sugatsune America, Inc.
   2. Finish: US26D satin chrome finish.

C. Concealed hinges:
   1. Acceptable products:
      a. Grass America, Inc., #3903.
      b. Julius Blum, Inc., #71.6500 Series.
      c. Sugatsune America, Inc., #H160-C.
   2. Type: 165 degree opening, self-closing.

D. Closet shelf and rod bracket:
   1. Acceptable products:
      a. Knape and Vogt Mfg. Co., #1195.
      b. Stanley Works, #7046.
      c. Johnson Hardware, Inc., #9003.
   2. Provide one for each two feet or portion thereof, minimum two per shelf.

E. Recessed shelf standards and supports:
   1. Acceptable manufacturers:
      a. Basis of design: Knape and Vogt Mfg. Co., #255 standard with #256 support.
      b. Stanley Works.
      c. Johnson Hardware, Inc.
      d. Sugatsune America, Inc.
      e. Hafele America Co.
   2. Type: Steel.
   3. Finish: Finish as selected by Architect.

F. Shelf standards and supports:
   1. Acceptable manufacturers:
      a. Basis of design: Knape & Vogt Mfg. Co., #80 standards with #180 brackets.
      b. Capitol Hardware. Inc.
      c. Garcy Corp.
      d. Stanley Works.
      e. Johnson Hardware, Inc.
   2. Type: Steel.
   3. Finish: Finish as selected by Architect.

G. Side mount drawer slides:
   1. Acceptable products:
      a. Basis of design: Accuride, #3832.
      b. Grant Hardware Co., #5632.
      c. Knape and Vogt Mfg. Co., #1429.
   2. Type: Full extension, steel ball bearing.
   3. Capacity: 100 lb. capacity:

H. Cabinet drawer/door lock:
   1. Acceptable products:
      a. Knape and Vogt Mfg. Co., #986.
      b. Sugatsune America, Inc., #3310.
      c. Timberline Supply, Ltd., Style CB-230 deadlock and Type 230 cylinder body with lock plug.
   2. Type: Nickel-plated.

I. Fasteners: Provide bolts, nails, screws, toggle bolts and similar fasteners as indicated or required to attach and secure work under this section.
   1. Fasteners for trim shall be finishing nails for attachment to wood framing and trim-head screws for attachment to metal framing.
   2. Material and finish for non-pressure treated components shall be G90 hot dip galvanized steel or Type 304 stainless steel, except nails shall be hot dip galvanized.
   3. Material and finish for pressure-treated components shall be Type 316L stainless steel.

J. Adhesives:
   1. Glue: Type: Aliphatic- or phenolic-resin wood glue recommended by manufacturer's product data for general carpentry use.
   2. Installation adhesive for foam plastic moldings: Product recommended for indicated use by foam plastic molding manufacturer.
   3. Multipurpose construction adhesive: Formulation complying with ASTM D 3498 that is recommended for indicated use by adhesive manufacturer.
   4. Sealant: Elastomeric joint sealant complying with requirements in Joint Sealants section as applicable to joint substrates indicated.

2.6 FABRICATION:

A. Quality grade for millwork shall be AWI Custom Grade for all mill-fabricated items.

B. Fabricate finish carpentry in accord with approved shop drawings.

C. Shop-assemble for delivery to site in units easily handled and to permit passage through building openings. Items which cannot be manufactured in one piece shall have joints at logical breaking points and shall be so noted on shop drawings.

D. Shop prepare and identify components for grain matching during site erection.

E. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

F. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.

G. Seal faces and edges of medium density fiberboard to be sealed or finished.

H. Perform veneer operations using hot press method using moisture-resistant, fire-retardant adhesives.

I. Apply plastic laminate sheets in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners.

J. Cap exposed plastic laminate finish edges with material of same finish and pattern.

K. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

L. Scribe, miter and accurately join members.

M. Where countertops cannot be furnished in single lengths, join using compression type fasteners.

N. Finish work shall be smooth, free from abrasion, tool marks, open joints or raised grain on exposed surfaces.

O. Shelving: 3/4" (19-mm) medium-density fiberboard shelving with solid-wood front edge.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION AND WORKMANSHIP:

A. Install work plumb, level, true and straight, without distortions. Shim using concealed shims.

B. Finish work shall be smooth, free from abrasion, tool marks, raised grain grade markings or similar defects on exposed surfaces.

C. Cut work to fit unless specified to be shop-fabricated or shop-cut to exact size. Where carpentry and millwork abuts other finished work, scribe and cut for accurate fit. Before making cutouts, drill pilot holes at corners.

D. Distribute defects allowed in the quality grade specified to the best overall advantage when installing job-assembled work.

E. Install hardware in accord with manufacturer's instructions using anchor devices furnished with hardware items.

3.2 INSTALLATION OF MILLWORK:

A. Install millwork in a manner consistent with the specified AWI Quality Grade, plumb, level, true and straight within 1/8" in 10'-0". Shim as required using concealed shims.

B. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing.

C. Scribe and cut for accurate fit to other finished work, with maximum gap of 1/32". Do not use additional overlay trim to conceal larger gaps.

3.3 FIELD FINISH:

A. Field finish: Field finish painted woodwork in accord with the requirements of the Painting and Coating section. Prior to finishing, sand using 120 to 180 grit abrasive on a smooth sanding block, to remove scuff and handling marks, raised grain, scratches and effects of moisture exposure.

3.4 CLEANING AND PROTECTION:

A. Protect finished and prefinished surfaces from work of other trades.

B. Prior to Date of Substantial Completion, examine work for damages. Repair or replace such damaged work to original condition.

C. Clean wood, metal and accessory items using a neutral cleaner. Check and correct operating mechanism for proper operation. Adjust and lubricate hinges, catches and other operating hardware.

End of Section

SECTION 06 6116

SOLID SURFACING FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY:

A. Work of this section includes:
1. Window sills.
2. Window seat.

1.2 REFERENCES:

A. Applicable standards: Standards of the following, as referenced herein:
1. American National Standards Institute (ANSI).
2. ASTM International (ASTM).

1.3 SUBMITTALS:

A. Shop drawings: Indicate dimensions, component sizes, fabrication details attachment provisions and coordination requirements with adjacent work.

B. Samples: Submit minimum 6" by 6" samples. Indicate full range of color and pattern variation. Approved samples will be retained as a standard for work.

C. Product data: Indicate product description, fabrication information and compliance with specified performance requirement.

D. Maintenance data: Submit manufacturer's care and maintenance data, including repair and cleaning instructions. Include in project closeout documents.

1.4 QUALITY ASSURANCE:

A. Job mock-up:
1. Prior to final approval of shop drawings, erect at project site, for Architect's review, one full size mock-up of each component required.
2. Should mock-up not be approved, re-fabricate and re-install until approval is secured. Remove rejected units from project site.
3. Approved mock-ups may remain as part of finished work.

1.5 DELIVERY, STORAGE AND HANDLING:

A. Deliver no components to project site until areas are ready for installation. Store indoors.

B. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.6 WARRANTY:

A. Provide manufacturer's warranty against defects in materials. Warranty shall provide for replacement material and labor for a period of ten years, beginning at Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOLID SURFACING MATERIAL:

A. Acceptable products:
1. Basis of design: E. I. du Pont de Nemours & Co., Inc., Corian.
2. Avonite, Inc., Formastone.
3. Wilsonart International, Gibralter.

B. Material: Cast, 100% acrylic resin, solid, structural surfacing material.
1. Material shall be through-patterned and homogeneous. No coated materials nor non-homogeneous materials allowed.
2. Hardness: Minimum 55 Barcol hardness, tested in accord with ASTM D2583-07, or minimum 90 Rockwell hardness, tested in accord with ASTM D785-03.
3. Tensile strength: Minimum 4,200 psi, tested in accord with ASTM D638-03.
4. Abrasion resistance: Maximum 0.4 grams at 1,000 cycles, tested in accord with ASTM C501-84(2002).
5. Fire resistance: Flame spread and smoke developed meeting ASTM E84-07, Class I rating.
6. Color stability: No change in 200 hours, tested in accord with NEMA LD3-2005.
7. Water absorption: Maximum 0.04%, tested in accord with ASTM D570-98(2005).
8. Fungal resistance: No attack when tested in accord with ASTM G21-96(2002).
9. Bacterial resistance: No attack when tested in accord with ASTM G22-76(1996)(withdrawn 2001).
10. Impact resistance: No fracture when tested in accord with NEMA LD3-2005; Section 3.3, 204" drop.
11. Superficial damage to a depth of 0.10" shall be repairable by sanding and polishing.

2.2 CHARACTERISTICS:

A. Finish: Matte (Gloss rating of 5-20).

B. Thickness: Minimum 3/4".

C. Colors: Colors as indicated on drawings or as selected by Architect from basis of design manufacturer's Group D color range.

D. Window sills and window seats:
1. Provide configurations indicated.
2. Provide backsplashes, endsplashes and aprons as indicated.
3. Provide lengths in one piece.

2.3 ACCESSORY PRODUCTS:

A. Joint adhesive: Manufacturer's standard, two-part adhesive kit to create inconspicuous, non-porous joints, with a chemical bond.

B. Sealant: Manufacturer's standard mildew-resistant, FDA/UL recognized silicone sealant in color matching surfacing or clear formulations.

2.4 FABRICATION:

A. Factory-fabricate components to greatest extent practicable, to sizes and shapes indicated, in accord with approved shop drawings.

B. Form joints between components using manufacturer's standard joint adhesive; without conspicuous joints and without voids. Attach a 2" wide reinforcing strip of solid surfacing under each joint.

C. Provide factory cutouts for plumbing fittings and bath accessories as indicated.

D. Rout and finish component edges to a smooth, uniform finish. Rout cutouts and sand edges smooth. Machine radii and contours to template. Repair or reject defective and inaccurate work.

E. Edge treatment for tops: As indicated on drawings.

2.5 SOURCE QUALITY CONTROL:

A. Allowable tolerances:
1. Variation in component size: ±1/8".
2. Location of openings: ±1/8" from indicated location.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Install components plumb, level and rigid, scribed to adjacent finishes, in accord with approved shop drawings and product data.

B. Form field joints using specified adhesive, with joints inconspicuous in finished work.

C. Provide back and end splashes as indicated. Adhere to horizontal surfaces using specified color-matched silicone adhesive.

D. Keep components clean during installation. Remove adhesives, sealants and other stains. Keep clean until Date of Substantial Completion. Replace stained components.

3.2 PROTECTION:

A. Protect surfaces from damage until Date of Substantial Completion. Repair or replace damaged work which cannot be repaired.

End of Section

SECTION 07 2100

THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY:

A. Related work:
1. Firestopping.
2. Acoustical insulation.
3. Roofing system.
4. Mechanical insulation.
5. Concrete.
6. Joint sealants.
7. Exterior insulation and finish system (EIFS).

1.2 SUBMITTALS:

A. Product data: Submit product data and installation instructions for each type installation. Include product data for manufacturer's recommended adhesive sheathing joint tape.

1.3 QUALITY ASSURANCE:

A. Applicable standards: ASTM International (ASTM), standards as specified herein.

PART 2 - PRODUCTS

2.1 BATT INSULATION:

A. Batt insulation at metal stud walls:
1. Walls:
a. Unfaced fiberglass batts complying with ASTM C665-06, Type I, rated R-19 for thermal resistance.
b. Surface burning characteristics: Flame spread of 25 or less and smoke developed 50 or less when tested in accord with ASTM E84-07.
c. Formaldehyde content: Zero.
d. Width: Equal to framing spacing.
2. Ceilings and soffits:
a. Unfaced fiberglass batts complying with ASTM C665-06, Type I; rated R-22 for thermal resistance.
b. Surface burning characteristics: Flame spread of 25 or less and smoke developed 50 or less when tested in accord with ASTM E84-07.
c. Formaldehyde content: Zero.
d. Width: Equal to framing spacing.

B. Acoustical insulation: Refer to Gypsum Board section.

C. Fasteners: Stick-clip spindle fasteners; spindle length as required for insulation thickness.

2.2 EXTRUDED POLYSTYRENE CAVITY WALL INSULATION:

A. Acceptable products; subject to compliance with specified requirements:
1. The Dow Chemical Co., Styrofoam, Cavitymate.
2. Owens-Corning, Foamular 150.
3. Pactiv Building Products, GreenGuard SB Insulation Board.

B. Characteristics:
1. Material: Extruded, closed cell polystyrene boards complying with ASTM C578-06, Type X.
2. Thickness: 2".
3. Density: 1.3 pcf, minimum.
4. Aged R value at 75 degrees F.: 5.0/in.
5. Surface burning characteristics: Flame spread of 25 or less and smoke developed 450 or less when tested in accord with ASTM E84-07.
6. Compressive strength: 15 minimum, tested in accord with ASTM D1621-04a.
7. Water vapor permeance: Maximum 1.1 perm-inch, tested in accord with ASTM E96-05.
8. Water absorption: Maximum 0.3% by volume.
9. Sizes: 1'-4" by 8'-0".
10. Edges: Square.

2.3 FOAMED-IN-PLACE MASONRY INSULATION:

A. Acceptable manufacturers; subject to compliance with specified requirements:
1. C.P. Chemical Co., Inc., Tripolymer.
2. PolyMaster, Inc., PolyMaster® R-501 Foamed-In-Place Insulation.
3. Tailored Chemical Products, Inc., Core-Fill 500™.
4. Thermal Corporation of America, THERMCO® Foam.

B. Characteristics:
1. Type: Two or three component synthetic polymer foamed-in-place insulation.
2. Properties:
a. Fire hour rating: 2 hrs. when tested in accord with ASTM E119-07.
b. Thermal conductivity: Minimum R of 4.5 at 75 degrees F mean temperature when tested in accord with ASTM C177-04.
c. Surface burning characteristics: Flame spread of 25 or less, smoke developed of 450 or less and fuel contribution of 0 when tested in accord with ASTM E84-07.
d. Water vapor transmission: 15.5 to 16.9 perms per inch when tested in accord with ASTM E96-05.
e. Shrinkage: Maximum 2 percent.
f. Toxicity: Non-Toxic when tested in accord with Federal Hazardous Substance Act.
g. Compressive strength: 32 to 45.2 when tested in accord with ASTM D1621-04a.
h. Dry density: Maximum 1.2 pcf when tested in accord with ASTM D1622-03.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. General: Comply with manufacturer's product data for each type installation. Install insulation fitted to adjacent construction and with tight joints to provide unbroken thermal barrier. Cut insulation around obstructions and protrusions; fill voids with insulation. Remove projections interfering with installation.
1. Rigid wall insulation indicated to be covered with gypsum board shall be fiberglass batt insulation.
2. Rigid wall insulation indicated to be left exposed in plenum spaces above ceiling shall be batt fiberglass type as specified.

B. Batt insulation:
1. Install batt insulation in exterior walls, soffits and ceiling areas as indicated. Friction fit.
2. Install batt insulation at exterior walls using stick-clip type fasteners. Install stick-clip fasteners using adhesive recommended by fastener manufacturer's product data. Space clips not less than 3" from edges of batts and at the rate of one fastener per two sq. ft., maximum.
3. Install batt insulation with butted joints.

C. Extruded polystyrene insulation:
1. Secure extruded polystyrene insulation to masonry using adhesive of type recommended by insulation manufacturer. Install with end and edge joints butted over clean, dry surfaces, using full application of adhesive applied in uniform thickness.
2. For cavity wall construction, secure extruded polystyrene cavity wall insulation to masonry by embedding in tacky dampproofing reinforcement with end joints butted. Seal vertical and horizontal edges with sealant or joint tape as required by insulation manufacturer.

D. Foamed-in-place masonry insulation:
1. Applicator shall be trained, certified and approved by insulation manufacturer.
2. Foam insulation into CMU cells in accord with manufacturer's product data.
3. Insulation shall completely fill CMU cavities.
4. Protect insulated walls from moisture for a minimum of 24 hours after insulation application.
5. Do not paint, cover or otherwise finish insulated CMU walls for two weeks after insulation installation.

End of Section

SECTION 07 2400

EXTERIOR INSULATION AND FINISH SYSTEM (EIFS)

PART 1 - GENERAL

1.1 SUMMARY:

A. Work of this section includes a polymer-based EIFS system consisting of:
1. Application of rigid insulation board.
2. Regular duty glass fiber mesh reinforcement.
3. Base and finish coat application.

B. Related work specified elsewhere:
1. Cold formed metal framing.
2. Flashing and sheet metal.
3. Joint sealants.

1.2 SUBMITTALS:

A. Shop drawings: Indicate details for reveals, joints, edges, corners, and other special conditions, including joint design and sealant locations.

B. Product data: Submit manufacturer's full descriptive literature and installation instructions, marked as applicable to project conditions and requirements. Include standard details and list of all accessory products. Provide comprehensive data on insulation board, including manufacturer if not by system manufacturer, and fire test data on system.

C. Intent to warrant: Submit an intent to warrant executed by authorized representative of EIFS manufacturer, indicating that manufacturer has reviewed drawings, specifications, shop drawings, conditions affecting the work and the relationship of EIFS and adjacent construction and proposes to provide warranties as referenced herein without further stipulation.

D. Certificates: Manufacturer shall submit certification that insulation provided for work of this section meets requirements as herein specified.

E. Samples: Submit minimum 1'-6" by 1'-6" sample, including sheathing material, showing selected color and texture for final approval of finish by Architect.

F. Certifications by system manufacturer; submit the following prior to delivery of materials to project site:
1. System applicator approval.
2. Approval of sealant system.
3. Expanded polystyrene insulation properties, date of manufacture, curing method and quantities shipped to job.
4. Certification of installed gypsum sheathing as acceptable insulated finish system substrate.

G. Maintenance data: Submit data on manufacturer's recommendations for cleaning and repairing damage to system.

1.3 QUALITY ASSURANCE:

A. Manufacturer qualifications: Manufacturer shall have been regularly engaged in production of systems herein specified for a minimum of ten years for projects of similar size and complexity. Manufacturer shall only sell and distribute system components to approved applicators.

B. Applicator qualifications: Applicator shall be approved by system manufacturer and shall have a minimum of five years experience in the installation of projects with similar scope and application procedures.

C. EIFS components shall be the products of a single manufacturer; or if not, specifically approved by manufacturer in writing.

D. Applicable standards:
1. Standards of ASTM International (ASTM), as referenced herein.
2. Exterior Insulation Manufacturer's Association (EIMA), Standard 101.86 Impact Test and other standards as referenced herein.

1.4 DELIVERY, STORAGE AND HANDLING:

A. Deliver materials in manufacturer's original packaging with labels intact.

B. Store materials indoors, in temperature range of 40 degrees F. to 80 degrees F. Store off floor and out of direct sunlight.

1.5 PROJECT/SITE CONDITIONS:

A. Environmental:
1. Erect and cure finish system only when temperature is at least 40 degrees F. and rising. Maintain above 40 degrees F. for 24 hours after installation.
2. Install finish system when finish will not be subject to damaging effects of rain or windblown dust and debris before system finish has cured.

B. Protection:
1. Apply mesh and base coat to insulation within two days following board installation.
2. Protect fresh finish from rain, mud, dust and other physical harm or contamination.
3. Protect exposed edges of system from water penetration behind insulation board or finish coat.
4. Install flashing and seal joints as soon as possible following system installation and curing.

C. Coordinate installation of EIFS with sheathing installation to minimize exposure of sheathing to weather.

D. Control and expansion joints: Unless otherwise indicated, provide control or expansion joints only at abutment with adjacent dissimilar materials, where structural expansion joints occur in building system and as recommended by finish system manufacturer.

1.6 WARRANTY:

A. Manufacturer shall provide a material and watertightness warranty for exterior insulated finish system against defects in materials and against bond loss, peeling, flaking, chipping, fading, discoloration and loss of water resistance. Warranty shall cover all replacement costs, including materials and labor, due to failure of the system without additional cost to Owner.

B. Warranty period shall be for five years beginning at Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 INSULATED FINISH SYSTEM:

A. Acceptable manufacturers; subject to compliance with specified requirements:
1. Basis of design: Dryvit System, Inc.
   a. Adhesives: ADEPS for wood substrates; Primus or Primus DM for other substrates.
   b. Insulation board.
   c. Reinforcing mesh:
      1) Regular duty mesh: Standard Plus Mesh, 5.7 oz./sq.yd.
      2) Medium duty mesh: Intermediate, 12 oz./sq.yd.
      3) Heavy duty mesh: Panzer Mesh, minimum 15 oz./sq.yd.
      4) Detail mesh: Detail Short Roll Mesh, 4.3 oz./sq.yd.
      5) Corner mesh: Corner Mesh, 7.2 oz./sq.yd.
   d. Basecoat: Primus or Primus DM.
   e. Finish coat: Standard DPR (Dirt Pickup Resistant).
   f. Coating for areas to receive sealant joints: Demandit or Color Prime.
2. Finestone Brand/BASF Wall Systems.
3. Master Wall, Inc.
4. Parex, Inc.
5. STO Finish Systems Div./Sto Corp.

B. General system description: Expanded polystyrene insulation adhesively applied to vertical concrete unit masonry, concrete or sheathing, reinforced with regular mesh fabric over base coat in areas as specified, and finished with textured finish coat.

C. Coating components:
1. Primer/sealer: EIFS manufacturer's standard substrate conditioner, designed to seal substrates from moisture penetration and to improve the bond between substrate of type indicated and adhesive used for application of insulation.
2. Adhesive and base coat: Polymer base cementitious, pre-mixed material for non-wood substrates; polymer base non-cementitious, pre-mixed material for wood substrates. Adhesives shall be manufactured by system manufacturer.
   a. Provide adhesives recommended by system manufacturer for attachment of insulation to concrete, concrete unit masonry and sheathing.
   b. Bond strength: Adhesives shall have been tested to withstand 180 psf negative pressure without loss of bond to substrate in accord with ASTM E330-02.
   c. Insulation Adhesive: EIFS manufacturer's standard formulation designed for indicated use; compatible with substrate; and complying with one of the following:
      1) Job-mixed formulation of Portland cement complying with ASTM C 150, Type I, and polymer-based adhesive specified for base coat.
      2) Factory-blended dry formulation of Portland cement, dry polymer admixture, and fillers specified for base coat.
      3) Factory-mixed non-cementitious formulation designed for adhesive attachment of insulation to substrates of type indicated, as recommended by EIFS manufacturer.
3. Mesh reinforcement: Alkali-resistant glass or synthetic fabric provided by system manufacturer; provide regular, detail, corner mesh.
4. Finish coat:
   a. Manufacturer's factory-blended, integral-colored synthetic finish, dirt pickup resistant.
   b. Colors and textures: As selected by Architect from manufacturer's standard selection.

D. Insulation: Provide straight and special shapes as indicated and required.
1. Type: Expanded polystyrene meeting ASTM C578-06, Type 1, manufactured or approved by system manufacturer and aged at least six weeks prior to time of cutting.
2. Minimum density: 0.9 pcf, minimum.
3. Thermal value: Aged R value of 3.25/inch or better at 75 degrees F.
4. Burning characteristics: Flame spread of 25 or less when tested in accord with ASTM E84-07.
5. Dimensional tolerances:
   a. Edges: Square within 1/32" per foot.
   b. Board thickness: ±1/16".
6. Compressive strength, 10% deformation: 10 psi, minimum.

7. Moisture resistance:
   a. Water vapor permeance: Maximum 5.0 perms/in.
   b. Absorption: 4% maximum.
8. Thickness: Minimum 1", with greater thicknesses as indicated on the drawings.

E. Trim shapes: Minimum 26 ga. roll-formed zinc alloy with expanded or solid flanges.

F. Accessories: Provide sizes and shapes as indicated on the drawings.

G. Silicone sealant:
1. Basis of design: Tremco, Inc., an RPM Company, SpecTrem 1 and SpecTrem 2.
2. Type: One-part silicone rubber; meeting ASTM C920-05, Type S, Grade NS, Class 25.
3. Colors: Standard colors as selected by Architect.
4. EIFS manufacturer's approval: Sealant shall be approved by selected EIFS manufacturer for use with EIFS materials, and for the purpose of obtaining specified warranty.

2.2 SOFFIT VENTS:

A. Soffit strip vents:
1. Acceptable products; subject to compliance with specified requirements:
   a. Air Vent Inc., SV201/SV202.
   b. Construction Metals, CEV8 Series.
   c. SEMCO, Southeastern Metals, A Gibraltar Industries Company, Aluminum Soffit Strip.
2. Characteristics:
   a. Type: Roll-formed, 0.019" thickness aluminum, louvered pattern, continuous vent strip.
   b. Size: 2" width by 8'-0" lengths.
   c. Vent openings: 1/8" wide by 1" long, finned openings providing 9 square inches of net free area per lineal foot of vent strip.
   d. Configuration: Recessed flanges, minimum 3/8" deep by 3/8" wide.
   e. Finish: White finish.

PART 3 - EXECUTION

3.1 PRE-INSTALLATION CONFERENCE:

A. Prior to installation, conduct a pre-installation job site conference with Contractor, Architect, exterior insulation and finish system installer, manufacturer's technical representative and other subcontractors involved to review Contract Document requirements, project procedures, acceptability of substrates, job conditions, time schedule, manufacturer's recommendations and coordination of other work.
1. Contractor shall notify all parties at least seven days prior to time for conference.
2. Contractor shall record minutes of meeting and distribute copies to all participants.

3.2 JOB MOCK-UP:

A. Construct minimum 100 sq. ft. mock-up of insulating finish system over sheathing, indicating color, texture and workmanship of finished work.
   1. Erect sample panel in area designated by Architect. Mock-up shall indicate typical reveals, corner and other conditions as directed by Architect.
   2. Do not proceed with work until panel has been approved by Architect.
   3. Approved, undamaged mock-up may serve as part of finished work. Approved mock-up shall serve as a standard for subsequent work.

3.3 SOFFIT VENT INSTALLATION:

A. Install soffit vents with flanges concealed and secured to framing under soffit facing material, fins oriented uniformly toward building or as required to block vision through louvers from most prominent viewed direction. Continuous lengths shall be visually straight and uniform, without gaps, voids or waviness.

3.4 INSULATION INSTALLATION:

A. Cleaning: Ensure that surfaces to receive insulation are clean and sound.

B. Placement: Install horizontally with vertical joints staggered. Cut to fit openings and projections without voids. Butt joints tight and even, but do not force or wedge boards. Where gaps occur in joints, fill with insulation slivers to fill voids.

C. Attachment: Provide full adhesive coverage using methods recommended by system manufacturer's product data. Apply sufficient adhesive thickness to ensure full contact between surfaces of insulation and substrate. Brace until adhesive sets to provide a tightly bonded, smooth surface.

D. Profiles: Cut and place insulation to form indicated profiles. Provide for panel reveals, recesses, joints, drips and other profiles indicated on the drawings. Shave edges by rasping to provide smooth plane across board joints.

3.5 MESH AND FINISH APPLICATION:

A. Base coat and mesh reinforcement:
   1. Apply trowel coating of base coat material to uniform minimum dry thickness of 1/16".
   2. Immediately embed reinforcement without wrinkles, troweling for full embedment. Apply reinforcement continuous, overlapping edges 2-1/2" minimum.
      a. Wrap all corners and edges, overlapping edges 2-1/2" minimum.
      b. Wrap reinforcing mesh a minimum of 2" behind panels at all ends and edges, in accord with manufacturer's details and product data.

c. Form corners with sharp, tight, smooth edge, within specified tolerances.

B. Finish coat: Apply to cured, reinforced base coat to give uniform texture and color, completely concealing mesh and reinforcement coat and matching approved sample in color and texture.
1. For edges and terminations to receive sealant joints, do not install finish coat at substrates to receive sealant. Stop finish coat at joint juncture and use manufacturer's recommended sealing color coat, to provide a smooth, uniform substrate for sealant application.
2. On an expanse, terminate work only at corners, expansion joints or distinct changes in plane. Maintain a wet edge on same-plane applications without cold joints and staging marks.
3. At overlapping of mesh reinforcement, feather out finish coat to ensure that overlap joints are indiscernible in finished work.
4. Apply color finish coat with same direction and texture throughout entire application.
5. Begin only as much work on an expanse as can be completed the same work period.

C. General:
1. Provide straight, sharp, true corners, edges, joints, reveals, grooves and other profiles indicated. Provide corner reinforcement in accord with system manufacturer's product data.
2. Finish all areas to receive sealant joint by applying base coat, embedded mesh and finish coat into joints and around terminations, in accord with EIFS manufacturer's details.
3. Finish exposed edges where visible and to protect insulation from moisture.
4. Comply with system manufacturer's product data in all facets of the work.
5. Finish work shall be free of projections, voids, irregularities or telegraphing of substrate.

D. Joints: Seal joints in accord with the requirements of the Joint Sealants section.

E. Finish surface tolerances:
1. In linear building lines, elevations and conspicuous lines and arrises: Maximum 3/16" in 20'-0"; maximum 3/8" in 40'-0" or more.
2. In surface plane, plumb and level: 1/8" in 10'-0" in any direction when measured with a 10'-0" straightedge.
3. Substrate joints and surface imperfections shall not be visible when surfaces are viewed from 5'-0" or greater distances at typical viewing angles with surface wet or dry.

3.6 CLEANING AND PROTECTION:

A. Cleaning:
1. Remove masking materials from adjacent surfaces.
2. Clean excess materials and droppings from application from adjacent areas.

B. Protection: Provide polyethylene sheeting or other means of protecting finish from mud and dust. Protect completed work from damage, staining, dirt and debris. Maintain protection until Date of Substantial Completion.

C. Cover tops and edges indicated using materials specified in Flashing and Sheet Metal section. Seal joints with silicone sealant.

End of Section

SECTION 07 2600

SURFACE APPLIED VAPOR REDUCTION SYSTEM

PART 1 - GENERAL

1.1 SUMMARY:

A. Work of this section includes installation of low-odor, seamless, liquid applied moisture mitigation system on existing concrete slabs in areas indicated.

1.2 SUBMITTALS:

A. Product data: Submit manufacturer's data and application instructions.

B. Samples: Submit 6" by 6" samples for Architect's selection showing smooth finish and manufacturer's standard colors.

C. Maintenance data: Submit bound brochures containing manufacturer's detailed maintenance and care instructions.

D. Test data: Submit independent testing laboratory data for product, evidencing:
1. Up ro 97% reduction of water vapor transmission (tested as per ASTM E 96-05).
2. Product is insensitive to alkaline environment up t pH 14 (tested as per ASTM D 1308-02(2007).

1.3 QUALITY ASSURANCE:

A. Applicable standards; standards of the following, as referenced herein:
1. ASTM International (ASTM).
2. American National Standards Institute (ANSI).

B. Installer and manufacturer qualifications:
1. Installer: Trained and approved in writing by flooring system manufacturer.
2. Manufacturer: Minimum five years of production and installation of specified system.
3. Products: System components furnished by same manufacturer.

1.4 DELIVERY, STORAGE AND HANDLING:

A. Deliver materials to project site in manufacturer's unopened containers with labels intact. Provide Material Safety Data sheets for each product.

B. Store materials indoors in a dry well ventilated area at minimum 50 degree F and maximum 90 degree F; protect from contamination.

1.5 PROJECT/SITE CONDITIONS:

A. Environmental requirements: Work of other trades shall be complete in installation area, to eliminate dust, dirt, damage or other deleterious conditions during installation of flooring. Maintain temperature before, during and after installation until flooring is cured, at a temperature range as recommended by flooring manufacturer's product data.

B. Provide controlled ventilation in spaces being floored. Maintain ventilation throughout curing period.

C. Coordination: Coordinate requirements for special finishing and curing of concrete floor slabs with requirements of Division 3.

D. Maintain surfaces to be sealed and surrounding air temperature at not less than 50 degree F.

E. Exercise caution when temperatures exceed 90 degree F.

1.6 WARRANTIES:

A. Installer and flooring manufacturer shall jointly warranty flooring material and application for a period of ten years, for its normal and intended use; should flooring need repair or replacement, Owner will incur no cost for repair or replacement. Warranty shall begin on Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CONCRETE FLOOR SEALER:

A. Acceptable product, subject to compliance with specified requirements:
1. Basis of design: AQUAFIN, Inc., SG-3.
2. Vapor reduction systems of similar design and composition, as manufactured by other acceptable manufacturers, may be submitted for the Architect's consideration.
3. Acceptance is subject to compliance with specified design criteria, as evidenced by submittal of specified product data, and Architect's approval.

B. Characteristics:
1. Type: One-part system consisting of a two-component, 100% solids, solvent free, moisture tolerant, high density, low odor, chemically enhanced epoxy based product which must reduce vapor emissions (MVER) to 3 lbs/24 hours/1000 SF or less and be compatible with floor finishes and adhesives approved by the manufacturer.
2. Color: As selected by Architect from manufacturer's standard colors.

C. Physical properties:
1. Component-A and B: Precise blend of clear and yellowish liquid.
2. VOC content: 0.

3. Bond/Adhesion: Greater than 220 psi (>1.5 Mpa) at 28 day old concrete as tested in accordance with ASTM D4541-02.
4. Permeance: Less than 0.5 perm ($<3.1E^{08}$ grams/Pa*s*m^2), as tested in accordance with ASTM E96-05.
5. Alkaline resistance: Up to pH 14, as tested in accordance with ASTM D1308-02
6. Vapor reduction: Up to 97%, as tested in accordance with ASTM E96-05.
7. Cured for installation of flooring: 12 hours at 73 degree F.
8. PH on cured surface: 7.

2.2 ACCESSORY MATERIALS:

A. Accessory materials: Provide accessories as required for proper installation.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Perform bond and moisture tests on subfloors in accord with ASTM F2170-02 and concrete floor sealer manufacturer's product data to determine if surfaces are acceptable to receive specified concrete floor sealer products. Correct conditions detrimental to concrete floor sealer installation prior to starting installation.

B. Examine all construction substrates and conditions under which concrete floor sealer material is to be installed. Do not proceed with the concrete floor sealer installation until unsatisfactory conditions are corrected.

C. Anhydrous Calcium Chloride Testing as per ASTM F1869-04:
1. Before installation of concrete floor sealer: Perform Calcium Chloride tests performed by independent testing agency prior to installation of concrete floor sealer.
2. After installation of concrete floor sealer: Perform Calcium Chloride tests performed by independent testing agency after installation and curing of concrete floor sealer.
3. Send test reports for each test to Architect and Owner.
4. Verify that test results after floor sealer installation meet the requirements of the floor finish manufacturer.
5. Do not install finish flooring until test results are acceptable to floor finish manufacturer.

3.2 PREPARATION:

A. Protect adjacent surfaces not designated to receive concrete floor sealer.

B. Substrate preparation:
   1. Remove existing floor coverings, coatings and adhesives down to bare concrete, curing compounds, efflorescence, dust, grease, laitance, etc. by grinding using a diamond cup blade. Acid etching is not allowed.
   2. Assure that all slabs have surface profile ICRI CSP 3-5 (ICRI, Des Plaines, IL, Guideline No. 03732) for mechanical bond (i.e. medium grit sandpaper). Smooth surfaces are not acceptable, they must be ground to a rough texture.
   3. Burn off reinforcing fibers and collect and vacuum remains.
   4. Repair defective areas such as honeycombs, cracks or other defects with a suitable repairing or manufacturer recommended mortar.
   5. Treat saw cut and expansion joints as per manufacturer's application guideline.
   6. Install leveling mortars and flash patching, on top of surface applied concrete floor sealer.
   7. Carefully rinse or pre-dampen several times all the surfaces to be treated with clean water, leave no standing water.

3.3 FLOOR SEALER INSTALLATION:

A. Mix concrete floor sealer material in proportions recommended by manufacturer.

B. Apply concrete floor sealer material in quantities as per manufacturer's specifications and recommendations.
   1. Apply in one coat at specified rate.
   2. Apply using non-shed synthetic roller or notched squeegee to the still moist substrate, and carefully scrub it into the pores with a long handled scrub brush. Follow with a non-shed synthetic roller to achieve a uniform coverage.

C. Install leveling course as per manufacturer's specifications and recommendations, where indicated on drawings.

D. After installation and curing of concrete floor sealer, perform Calcium Chloride tests as herein specified. Very that test results are acceptable to floor finish manufacturer.

E. Install floor covering as per manufacturer's specifications and recommendations, where indicated on drawings.

3.4 ACCEPTANCE:

A. Remove left over materials and any foreign material resulting from the work from the site.

B. Clean adjacent surfaces and materials.

End of Section

SECTION 07 6000

FLASHING AND SHEET METAL

PART 1 - GENERAL

1.1 SUMMARY:

A. Related work specified elsewhere:
1. Roofing system.
2. Joint sealants.
3. Self-adhering sheet flashing.

1.2 SUBMITTALS:

A. Shop drawings: Indicate material types, sizes, shapes, thicknesses, finishes, fabrication details, anchors, connections, expansion joints and relation to adjacent work. Details and profiles shall be drawn at full scale.

B. Product data: Indicate product description, finishes and installation instructions for all manufactured products, including interface with adjacent materials and surfaces.

C. Samples; submit as follows:
1. Special finishes: 6" by 6" samples for Architect's color selection.
2. Manufactured fascias, flashing reglets: 1'-0" length in style and finish specified.

D. Certification:
1. Submit manufacturer's written certification that fascias comply with requirements of ANSI/SPRI ES-1.
2. Roof membrane system manufacturer's written certification that fascia is suitable for specified roof system warranty.

E. Submittals schedule: Obtain Architect's acceptance of submittals prior to pre-roofing conference.

1.3 QUALITY ASSURANCE:

A. Applicable standards as referenced herein:
1. Aluminum Association (AA), "Aluminum Sheet Metal Work in Building Construction".
2. American Architectural Manufacturers Association (AAMA).
3. American Iron and Steel Institute (AISI), "Stainless Steel Data Manual".
4. American National Standard Institute/Single Ply Roofing Institute (ANSI/SPRI), as referenced herein.
5. ASTM International (ASTM).
6. Copper Development Association, Inc. (CDA), "Contemporary Copper in Architecture".
7. National Roofing Contractors Association (NRCA), "Roofing and Waterproofing Manual", Fifth Edition, 2001 with 2003 Update.
8. Porcelain Enamel Institute, Inc. (PEI), "Recommended Specifications for Architectural Porcelain Enamel on Aluminum for Exterior Use."

9. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA), "Architectural Sheet Metal Manual," Sixth Edition, 2003.
10. Society for Protective Coatings (SSPC), standards as referenced herein.

1.4 DELIVERY, STORAGE AND HANDLING:

A. Store materials off ground, under cover. Protect from damage and deterioration.

B. Handle materials to prevent damage to surfaces, edges and ends of sheet metal items. Damaged material shall be rejected and removed from site.

1.5 WARRANTIES:

A. Warrant flashing and sheet metal work to be free of defects in materials and workmanship. Warranty period shall be two years beginning at Date of Substantial Completion. Combine warranty with roofing warranty.

B. Finish warranty: Warrant fluoropolymer coating to remain free of checking, crazing, peeling, chalking or fading for a period of ten years, beginning at Date of Substantial Completion.

C. Fascia warranty:
1. Warrant materials to be free of defects in material and workmanship for five years. If, after inspection, manufacturer agrees that materials are defective, manufacturer shall, at their option, repair or replace them.
2. 20-Year Performance Warranty: Manufacturer shall guarantee that a standard size roof edge system, when installed per manufacturer's instructions, will not blow off, leak, or cause membrane failure, even in wind conditions up to 110 mph, or the manufacturer shall replace or repair their materials.

D. Warranty periods shall begin at Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SHEET METAL MATERIALS:

A. Galvanized metal: Commercial grade hot dip galvanized steel meeting ASTM A653-06a, Coating Designation G-90, minimum; with surfaces chemically treated for paint adhesion in accord with ASTM D2092-95(2001)e1, Method A, crystalline zinc phosphate treatment.
1. Fascias: Manufactured steel units, as further specified.
2. Gutters: Material thickness shall meet SMACNA Manual Table 1-5 requirements, minimum 20 ga., fluoropolymer finish.
3. Downspouts: Material thickness shall meet SMACNA Manual Table 1-9 requirements, minimum 24 ga., finish to match gutters.

4. Gutter brackets: Material thickness shall meet SMACNA Manual Table 1-8 size requirements, minimum 1/4" thickness by 1" wide, finish to match gutters.
5. Downspout hangers: 20 ga., finish to match downspouts.
6. Miscellaneous flashing and sheet metal: Minimum 24 ga., factory painted.
7. Finish: Fluoropolymer finish as herein specified.

B. Sheet lead: Minimum 4.0 lbs./sq. ft., hard type.

C. Soldering materials:
1. Solder: Meeting ASTM B32-04, alloy grade SN50, 50% pig lead and 50% block tin.
2. Solder flux:
   a. For hot dip galvanized metal, stainless steel and copper: Muriatic acid neutralized with zinc.
   b. For lead: Non-corrosive rosin.

D. Roofing cement: As recommended by roof membrane manufacturer.

E. Fasteners: Same material or compatible with sheet metal being fastened.
1. Nails: Flat head, needle point, not less than 12 ga. and of sufficient length to penetrate substrate 1" minimum.
2. Expansion shields: Lead or bronze sleeves.
3. Screws: Self-tapping type, with round heads.
4. Bolts: Furnished complete with nuts and washers.
5. Rivets: Round head, solid type.
6. Blind clips and cleats: Same gauge as sheet metal.

F. Medium modulus silicone sealant for concealed and lap joints:
1. Acceptable products; subject to compliance with specified requirements:
   a. Dow Corning Corp., #795.
   b. Pecora Corp., #895.
   c. General Electric Co., Silpruf Sealant.
   d. Tremco Div./RPM, SpecTrem II.
2. Type: One-part silicone rubber; meeting ASTM C920-05, Type S, Grade NS, Class 25.
3. Colors: Standard colors for exposed joints, as selected by Architect.

G. Pour grade sealant for pitch pockets:
1. Acceptable products:
   a. BASF Building Systems, Sonolastic SL-1.
   b. Mameco International, Vulkem 245.
   c. Pecora Corp., NR 201 Urexpan.
   d. Tremco, Polyroof.
2. Characteristics: Self-leveling, one-part polyurethane; grey color.

H. Waterproof membrane subflashing:
1. Acceptable products; subject to compliance with specified requirements:
   a. Carlisle Coatings and Waterproofing, Inc., WIP 300HT.
   b. Polyguard Products, Inc., Polyguard Deck Guard.

c. Grace Construction Products, Grace Ultra.

2. Characteristics:
   a. Type: Self-adhering rubberized asphalt sheet complying with ASTM D1970-01.
   b. Thickness: Minimum 30 mils when tested in accord with ASTM D3767-03, method A.
   c. Tensile strength: 250 psi minimum when tested in accord with ASTM D412-06a.
   d. Elongation: 250% when tested in accord with ASTM D412-06a, Die C Modified.
   e. Provide primers, sealants and accessories required for a waterproof installation.

I. Bituminous coating for separation of dissimilar materials: Cold-applied, asphalt roofing cement meeting SSPC-PS 9.01, minimum 30 mils thickness.

2.2 FINISHES:

A. Fluoropolymer coating finish:
   1. Two coat, shop-applied, baked-on fluoropolymer coating system based on minimum 70% Arkema Group, Kynar 500 or Solvay Solexis, Inc., Hylar 5000 resin (Polyvinylidene fluoride, PVDF), formulated by a licensed manufacturer and applied by manufacturer's approved applicator to meet AAMA 2605-05.
   2. Color: Custom color as selected by Architect.
   3. Finish on unexposed surfaces: Neutral washout.
   4. Work to receive fluoropolymer coating includes fascias, and all flashing and sheet metal exposed to view from building elevations.

2.3 EXTRUDED STEEL FASCIAS:

A. Fascias shall be approved by roof membrane system manufacturer as suitable for specified roof system warranty.

B. Acceptable products:
   1. W. P. Hickman Co., Inc., Over-Flo Fascia System.
   2. Metal-Era, Inc., Anchor-Tite Extended Fascia.

C. Characteristics:
   1. Fascia material: Minimum 24 ga. galvanized commercial grade steel.
   2. Fascia finish: Fluoropolymer coating, as specified herein.
   3. Fascia height: As indicated on drawings.
   4. Cant material: Minimum 24 ga. hot dip galvanized steel.
   5. Lengths: 10'-0" minimum.
   6. Joints: Splice plates, concealed, in accord with manufacturer's product data.

D. Accessories:
   1. Splice plates: Minimum 0.032" thickness aluminum sheet, minimum 4" width, for concealed installation. Finish shall match fascia.
   2. Prefabricated sections: Factory-assembled, mitered, welded corners, downspout starter, matching fascia in design and finish.

2.4 FLASHING REGLET SYSTEM:

A. Acceptable products:
1. Fry Reglet Corp., Springlok, SM Type.
2. W.P. Hickman, Surface-Mounted Type.

B. Characteristics:
1. Material: Hot dip galvanized steel reglet and counterflashing.
2. Finish: Factory applied fluoropolymer coating finish, colors as selected by the Architect.
3. Accessories: Prefabricated interior and exterior corners and splice plates.
4. Reglet cover: Reglet for cast-in-place concrete shall have factory-installed temporary cover to prevent migration of concrete into reglet.

2.5 ROOF EXPANSION JOINT COVERS:

A. Curb type; acceptable products:
1. Basis of design: MM Systems Corp., Model ERF.
2. GAF Materials Corporation, Metalastic Profile CMF.
3. Johns Manville, Expand-O-Flash, Style CF.

B. Roof-to-wall curb type; acceptable products:
1. Basis of design: MM Systems Corp., Model ERFL.
2. GAF MateriaLS Corporation, Metalastic Profile CTW.
3. Johns Manville, Expand-O-Flash, Style CF-EJ.

C. Description:
1. Membrane: Prefabricated flexible membrane with insulated foam bellows. Membrane shall be 60 mil EPDM.
2. Flanges: Minimum 0.032" thick mil finish aluminum.

D. Provide factory-fabricated corners, tees, crossover transitions and termination sections as required.

E. Splicing accessories:
1. Adhesive: Manufacturer's recommended splicing adhesive.
2. Splicing sheet: Sheet material furnished by expansion cover manufacturer.

F. Sizes: Size for joint widths indicated in accord with manufacturer's product data.

2.6 SHEET METAL FABRICATION:

A. Fabricate sheet metal work in accord with approved shop drawings and applicable standards. Form sheet metal work with clear, sharp and uniform arrises. Hem exposed edges.

B. Solder steel sheet metal joints with heavy, well heated coppers. Pre-tin joints not less than 1-1/2" wide. Provide 1" minimum soldered joints. After soldering, wash joints and neutralize remaining acid with alkaline solution.

C. Provide linear sheet metal items in 10'-0" to 12'-0" sections, except as otherwise noted. Form flashing using single pieces for the full width. Provide shop-fabricated, one-piece corners and transition pieces, with maximum 2'-0" long legs.

D. Make riveted joints using solid shank rivets or pop rivets as applicable. Pop rivets shall be closed end type.

E. SMACNA Manual fabrication requirements:
1. Gutters: Figure 1-2, Style A. Size gutters in accord with Tables 1-1, 1-2, 1-3 and 1-4, and Charts 1-1 and 1-2.
2. Downspouts: Figure 1-32B. Size downspouts in accord with Tables 1-1, 1-2, 1-3 and 1-4, and Charts 1-1 and 1-2. Downspout shoe as specified herein.

F. Downspout shoes:
1. Description: Cast iron downspout offset shoe.
2. Basis of design: Neenah Foundry, R-4929-013, with 5" by 7" inside top bell and 30" length. Provide R-4927 adapters to attach downspout to downspout shoe.
3. Fastening: 5/8" diameter lug slots for fastening downspout adapter to downspout shoe.
4. Field paint to match downspout. Refer to Painting and Coating section.

PART 3 - EXECUTION

3.1 SHEET METAL INSTALLATION:

A. Install work in accord with approved shop drawings and applicable standards. Sheet metal items shall be true to line, without buckling, creasing, warp or wind in finished surfaces.

B. Coordinate flashing at roof surfaces with roofing work to provide weathertight condition at roof terminations.

C. Perform field joining of lengths as specified for shop fabrication.

D. Isolate dissimilar materials to prevent electrolysis. Separate using bituminous coating.

E. Seaming: Form seams in direction of flow. Steel seams shall be flatlock with cleats soldered. Lap seams occurring in members sloping 45° or more than 4", minimum; bed in flashing cement.

F. Secure sheet metal items using continuous cleats, clips and fasteners as indicated. Perform no exposed face fastening.

G. Fastening:
1. Nails: Confine to one edge only of flashing 1'-0" or less in width. Space nails at 4" o. c., maximum. Provide neoprene washers for nails.
2. Cleats: Continuous, formed to profile of item being secured.
3. Clips: Minimum 2" wide by 3" long, formed to profile of item being secured. Space at 2'-0" o. c., maximum.

H. Form joints in linear sheet metal to allow for 1/2" minimum expansion at 12'-0" o. c., maximum, and maximum 2'-0" from corners. Provide 6" wide cover plate and 1'-0" wide backup plate at intersections. Form plates to profile of sheet metal item.

I. At joints in linear sheet metal items, set sheet metal over backup plate and set cover plate over sheet metal in two beads of specified silicone sealant, 1/4" in diameter, minimum. Extend sealant over all metal surfaces. Accurately mate components for positive seal. Allow no sealant to migrate onto exposed surfaces.

J. Where sheet metal is indicated as flashing above and below heads of doors, windows and other penetrations, extend flashing minimum 8" beyond opening, each side. Turn ends up minimum 2" to form end dams and to ensure drainage through weeps and not into cavity.

K. Install perimeter metal cap flashing in 10'-0" lengths with backup plates at joints.
1. Secure perimeter metal cap flashing in reglet with lead wedges installed at 2'-0" o. c., maximum. Hammer wedges to a depth which will not interfere with sealant or backer rod. Place wedge at each length so that wedges are within 8" of joint, without interfering with splice plates.
2. Install sealant in accord with Joint Sealants section, to form fillet bead minimizing holding of water.

L. Pitch pockets: Refer to roof membrane system section.

M. Gutters and downspouts:
1. Construct with riveted and soldered joints, lapped 1", minimum, in direction of flow. Provide 1/2" minimum expansion joints at 30'-0" o. c., maximum. Form expansion joints in accord with SMACNA Manual, Figure 1-7, butt type.
2. Hang gutters with high points equidistant from downspouts, evenly sloped toward downspouts. Support gutters in accord with SMACNA Manual, Figure 1-13 for low-slope roofs.
3. Secure downspouts to exterior walls at 6'-0" o. c., maximum, using straps and expansion type fasteners in accord with SMACNA Manual, Figure 1-35C. Lap downspout joints 1-1/2", minimum, and solder.
4. Install downspout adapter to downspout, and downspout offset shoe to downspout adapter in accord with manufacturer's recommendation. Fasten with lug bolts. Field paint to match downspouts. Refer to Painting and Coating section.
5. Where downspouts empty onto lower roof surfaces, provide splash pan in accord with SMACNA Manual, Figure 1-36; secure splash pan in bitumen, prior to spreading roof aggregate.

N. Roof penetration flashing: Refer to roof membrane system section.

3.2 EXPANSION JOINT COVER INSTALLATION:

A. Verify that flexible vapor retarder and compressible insulation have been properly installed in accord with the requirements of the Modified Bitumen Roof Membrane System section.

B. Attach manufactured expansion joint cover to wood nailer as indicated, in accord with manufacturer's product data.

C. Join lengths in accord with manufacturer's product data.

D. Accomplish changes in direction using factory-fabricated transitions.

3.3 PREFABRICATED FASCIA INSTALLATION:

A. Install prefabricated fascias in accord with manufacturer's product data and ANSI/SPRI ES-1, true to line.

B. Install retainers continuous, leaving 1/2" gap between sections for expansion; fasten at each predrilled slot. Install sealants, gaskets and concealed splice plates in accord with manufacturer's product data.

C. Install fascia covers over retainers and splice plates, with minimum 3/8" wide joints over splice plate intersections. Set fascia covers over splice plates in full bed of silicone sealant or extruded butyl tape, 1/2" from intersection edges. Mechanically fasten back edges at 1'-0" o. c.

D. Make weathertight fit, allowing for expansion and contraction as recommended by manufacturer's product data.

E. Attach materials using aluminum or stainless steel fasteners. Exposed fasteners shall match metal in finish.

3.4 REGLET INSTALLATION:

A. Install reglets as directed by manufacturer, level and true to line. Verify that through-wall flashing occurs at or above reglet locations.
1. Surface-mounted reglets: Install reglets as walls are built.
2. Masonry reglets: Install reglets as walls are built.
3. Install with top of reglet minimum of 8" above adjacent roof.

B. Terminate reglet 2" from each side of expansion and control joints in substrates to which surface-applied reglets are installed. Provide 1'-0" wide cover plate of reglet material, overlapping adjacent reglet lengths 4". Attach cover plates to provide discontinuous joints.

C. Provide factory-fabricated corners at changes in direction.

D. Following installation of roofing, install counterflashing by snapping into reglet in accord with manufacturer's product data. Overlap adjacent lengths 6", minimum, to allow for expansion and contraction. Caulk top edge of reglet using exterior silicone sealant as specified in Joint Sealants section.

End of Section

SECTION 08 1400

WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY:

A. Related work specified elsewhere:
1. Metal door frames.
2. Door hardware.
3. Glazing.

B. Definition; Category A (concealed) intumescent for positive pressure doors: Intumescent firestopping material rabbetted into edges of doors, then covered with veneer; concealed in the finished work.

1.2 SUBMITTALS:

A. Shop drawings: Submit schedules and elevations indicating door sizes, construction, swing, fire rating, undercut, and hardware locations. Dimension and detail openings for glass lites. Indicate that doors meet specified requirements, including fire ratings.

B. Product data: Submit manufacturer's product description, indicating materials, classifications and fabrication. Include manufacturer's proposed warranty. Indicate that doors meet specified requirements, including fire ratings. Include manufacturer's requirements for door installation, finishing, care, maintenance and cleaning to obtain specified warranties.

C. Samples:
1. Submit 1'-0" by 1'-0" door corner samples indicating construction for each door type.
2. Submit samples of each face veneer, approximately 1'-0" by 1'-6" in size, representative of proposed species, cut, color and grain, with finish as specified herein.

D. Intent to warrant and certifications: Submit an Intent to Warrant executed by authorized representative of door manufacturer, indicating that manufacturer has reviewed drawings and specifications, conditions affecting the work and the relationship of doors with related work, and that manufacturer proposes to provide warranties as referenced herein without further stipulation.

1.3 DELIVERY, STORAGE AND HANDLING:

A. Do not deliver doors to building until weatherproof storage space is available. Store doors in a space having controlled temperature and humidity. Stack doors flat, off floor, supported to prevent warpage and protected from damage and direct exposure to sunlight.

B. Seal edges of doors immediately after delivery, unless factory-sealed.

C. Protect doors during shipping and storage by enclosing in polyethylene bags. Replace doors in original packaging for shipment to site following machining and finishing. Hang pre-machined and prefinished doors without removal of packaging. Identify each door with door number on packaging. Maintain packaging in place until Date of Substantial Completion.

D. Do not walk or stack other materials on top of stacked doors. Do not drag doors across each other.

1.4 QUALITY ASSURANCE:

A. Allowable fabrication tolerances:
1. Overall dimension: ±1/16".
2. Width: ±1/32".
3. Maximum warp, bow, cup or twist: 1/4".
4. Squareness: Maximum 1/8" difference in diagonal measurement.
5. Hardware locations: -0", +1/32".

B. Allowable erection tolerances:
1. Variation from specified clearances: +1/32", -0.
2. Maximum variation in edge alignment, pairs of doors: 1/16".

C. Allowable color and grain variation: Doors for natural finish shall be selected for uniformity in color and grain. Joints in face veneers shall be inconspicuous. Adjacent doors and doors viewed together shall have similar color and grain.

D. Positive pressure door edges: Doors required to meet positive pressure requirements shall have Category A (concealed) intumescent edge treatment.

E. Applicable standards:
1. Standards of the following, as referenced herein:
a. ASTM International (ASTM).
b. National Fire Protection Association (NFPA).
c. Underwriters Laboratories, Inc., (UL).
2. Architectural Woodwork Institute (AWI), "Architectural Woodwork Quality Standards", 2003 Edition, herein referred to as AWI Standards.
3. Window and Door Manufacturer's Association (WDMA).

F. Fire door assemblies:
1. Door assemblies in rated walls shall have been tested in accord with NFPA 252 or UL 10C.
2. Door assemblies in corridors and smoke barriers shall have a minimum fire rating of 20 minutes and shall have been tested in accord with NFPA 252 or UL 10C without hose stream test. Assemblies shall comply with UL 1784 for draft and smoke control test; leakage may not exceed 3.0 CFM per foot of door at 0.10" of water column.

3. Fire-rated doors shall provide rating without use of salt-treated wood, or manufacturer shall provide certification that treated wood is non-hygroscopic and shall warrant door against failure or discoloration of face veneer and door finish.

G. Labeling requirements:
1. On top edge, provide each door with a label which identifies manufacturer, trade association of which he is a member, grade and type of door or industry standard with which it complies.
2. Fire-rated components shall bear factory-applied labels showing manufacturer's name, name of third-party inspection agency, fire-protection rating, and where required for doors in exit enclosures, maximum transmitted temperature end point. Permanently attach label to hinge stile of each fire-rated door.
3. Smoke and draft doors complying with UL 1784 shall be labeled as a smoke and draft control door.

H. All flush doors shall be the products of one manufacturer.

1.5 WARRANTIES:

A. Provide manufacturer's door replacement warranty against warpage, twist, delamination, telegraphing of core and manufacturing defects for the following terms: Lifetime of original installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Acceptable manufacturers; subject to compliance with specified requirements:
1. Algoma Hardwoods, Inc.
2. Eggers Industries, Inc.
3. Marshfield DoorSystems, Inc.
4. Oshkosh Architectural Door Co.

2.2 FLUSH WOOD DOORS:

A. General quality standard: WDMA I. S. 1-A, Premium Grade or AWI Custom Grade.

B. Glued particleboard core wood doors:
1. Description: Meeting AWI Standards, Section 1300, five-ply construction, AWI PC-5, particleboard core.
a. Thickness: 1-3/4".
b. Adhesive bond: Dry or wet use type for interior applications.
c. Blocking: Top and bottom rail and lock stile blocking to accommodate specified hardware, without through-bolt attachment.
2. Core: Single-piece particleboard meeting WDMA I. S. 1-A, minimum 28 pcf density.

3. Construction: Hardwood stiles and rails glued to core; core assembly sanded for uniform thickness.
4. Crossbanding: Minimum 1/16" thickness hardwood.
5. Fire resistance rating: Comply with specified requirements for tested, labeled door construction for ratings.

C. Fire-rated mineral core doors:
1. Description: Five-ply non-combustible mineral composition core construction, meeting AWI Standards, Section 1300, FD Series and label requirements scheduled.
   a. Thickness: 1-3/4".
   b. Adhesive bond: Wet use type.
2. Core: Single piece, non-combustible, asbestos-free, minimum 24 pcf density when tested in accord with ASTM C303-07, with 10 percent maximum moisture absorption by weight with core in equilibrium at 90 percent relative humidity and 70 degrees F.
3. Stiles, rails and blocking: Reinforced composition laminate to receive full mortise hinge installation, with the following minimum characteristics:
   a. Screw withdrawal resistance: 600 lbs. minimum when tested in accord with ASTM D1037-06a.
   b. Split resistance: 750 lbs. average when tested in accord with ASTM D143-94(2007).
   c. Blocking: Top and bottom rail and lock stile blocking to accommodate specified hardware, meeting label requirements scheduled, without through-bolt attachment.
4. Crossbanding: Minimum 1/16" thickness hardwood veneer, grain perpendicular to face veneer, and optional 1/20" minimum thickness hardwood backer veneer, grain perpendicular to crossbanding. Crossbanding shall be non-salt-treated or door finish shall be warranted by door manufacturer against failure or discoloration.
5. Fire resistance rating: Comply with specified requirements for tested, labeled door construction for ratings indicated.
6. Where rated door pairs require metal astragal for labeled construction, astragals shall be wrapped in veneer matching door face or concealed within door edge.

D. Facing veneer for shop-applied transparent finish:
1. Veneer species: Match doors of existing building, as selected by Architect based on approved submittals.
2. Veneer matching: Sequence matched veneers, center matched across width.
3. Veneer thickness: Minimum 1/42" before sanding and 1/52" after sanding.
4. Adhesive bond: Type II or better for interior applications.
5. Panel match: Side match veneers at meeting stiles for doors hung in pairs.
6. Quality grade: AWI Standards, Sections 200 and 1300, Custom Grade, Grade II veneers.

E. Vertical stiles:
1. Transparent finish doors not requiring fire ratings: Specified veneer or solid hardwood or lamination, with not less than outermost 1/4" matching face veneer in specie, color and graining; no exposed fingerjoints allowed.
2. Stiles for fire-rated doors: Specified veneer, solid hardwood or lamination meeting fire rating requirements; not less than outermost 1/4" matching face veneer in color and graining, with no salt impregnation treatment.
   a. 20-minute rated pairs without metal edges or astragals: As required by manufacturer to permit positive pressure "S" label per Category H.
   b. Mineral core doors required to meet positive pressure Category A (concealed) requirements: As required by door manufacturer.
   c. Pairs of fire-rated doors:
      1) With metal edges or metal edges and astragals: As required by door manufacturer's test data for required fire-ratings.
      2) Without metal edges or metal edges and astragals: As required by door manufacturer's test data for required fire-ratings.
      3) Mineral core doors required to meet positive pressure Category A (concealed) requirements: As required by door manufacturer.

F. Moldings, louvers and trim:
1. Glass lites moldings to be metal or hardwood, as selected by Architect. For wood glass lite moldings, furnish in same species as hardwood matching grain and color of face veneer for transparent finish, no fingerjoints allowed.
2. Moldings for solid core doors: Flush type with mitered corner joints.
3. Moldings for fire-rated doors: Manufacturer's standard matching solid hardwood, matching laminated wood or primed steel edge meeting fire-rating requirements.
4. Provide moldings for glass lites. Glass lites moldings to be metal or hardwood, as selected by Architect.

2.3 FACTORY FITTING, MACHINING AND FINISHING:

A. Factory fitting, machining and finishing are required for all wood doors.

B. Fitting and machining:
1. Factory fit and machine doors to clearances and bevels specified.
2. Prepare for hardware installation using hardware manufacturer's templates. Locate in accord with WDMA I. S. 1.7, unless otherwise indicated.
3. Seal edges of doors and cutouts immediately following fitting and machining.

C. Openings:
1. Cut openings to receive glass lites in accord with WDMA I. S. 1.5.
2. Seal edges of cutout immediately following cutting using one coat of solvent type sealer.
3. Glazing for full cutout doors: Field glazing as further specified.
4. Glazing for other doors: Install glass lites without looseness or rattle. Trim shall have mitered corner joints and shall conceal edges of cutout and door core.
5. Protect door faces from damage during cutting.
6. Prepare and glaze openings in fire-rated doors in accord with NFPA and UL requirements.

D. Clearances and bevel:
1. Hinge stile: 1/8".
2. Lock stile: 1/8".
3. Top: 1/8".
4. Bottom: 1/4" above floor finish or threshold, except where undercutting is indicated on approved shop drawings. Confirm installed floor covering thickness before cutting door bottom edges.
5. Meeting stiles, pairs of doors: 1/8".
6. Bevel: 1/8" in 2".

E. Factory transparent finish: Doors shall be factory-finished in accord with AWI Standards, Section 1500, Custom Grade, Conversion Varnish or Catalyzed Polyurethane, filled finish. Color and sheen shall match doors of existing building, as selected by Architect based on approved submittals.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Acclimatization: Allow doors to become acclimated to finished space conditions a minimum of 72 hours before hanging.

B Preparation: Verify that framed openings are properly installed within specified tolerances. Do not install doors in frames which are not installed within size and plumbness tolerances.

C. Installation:
1. Glazing of full cutout doors: Install glass lites without looseness or rattle. Trim shall have mitered corner joints and shall conceal edges of cutout and door core.
2. Install doors using scheduled hardware. Install using threaded-to-the-head wood screws furnished by hardware manufacturer.
3. Drill pilot holes for all screws.
4. Securely anchor hardware in correct position and alignment.

5. Adjust hardware and door for proper function and for smooth, free operation, latching without force or excess clearance, within specified clearances and tolerances.

D. Fire-rated doors: Install in accord with UL requirements and NFPA No. 80 and No. 105.

E. Replace doors with defects in finish, material, fit or machining.

End of Section

SECTION 09 6500

RESILIENT FLOORING

PART 1 - GENERAL

1.1 SUBMITTALS:

A. Product data: Indicate product characteristics and installation requirements, including manufacturer's recommended adhesives and maintenance instructions.

B. Samples:
1. Submit full size samples for each type, color and pattern of flooring and accessory required. Colors shall be as specified herein and as selected by the Architect from manufacturer's standard full line selections.
2. Submit samples of all adhesives, underlayments and floor patch materials proposed for use on this project. Samples shall be clearly labeled and shall be submitted in smallest original container available from the manufacturer.

1.2 QUALITY ASSURANCE:

A. Applicable standards, as referenced herein: ASTM International (ASTM).

1.3 JOB CONDITIONS:

A. Environmental requirements:
1. Maintain temperature in space to receive resilient materials at not less than 65 degrees F. and not more than 90 degrees F. for not less than 24 hours before and 48 hours after installation.
2. Maintain minimum temperature of 55 degrees F. after flooring is installed, except as specified above, for duration of project.
3. Contractor shall notify Architect and Owner if the building temperature does not conform to these requirements.
4. Materials shall be stored on the jobsite under installation conditions for a minimum of 48 hours prior to installation.
5. Comply with manufacturer's recommendations for floor preparation and installation requirements.

B. Protection:
1. Protect finished flooring, base and accessories from staining, marring or other physical damage as work progresses. Cover or mask surfaces as required.
2. Protect the building, paving, utilities and other construction from damages due to the work of this section.
3. Restore all damaged areas to original condition.

C. Coordination: the Contractor shall be required to coordinate the work in accordance with the following:
   1. Scheduling:
      a. The Contractor shall prepare a tentative schedule of activities after receipt of the "notice of award", for review by the Owner. The Contractor shall make any reasonable modifications to this schedule requested by the Owner.
      b. The Contractor shall coordinate with the Owner prior to commencing the work, so testing and work to be performed by the Owner or his forces can be scheduled.

D. Asbestos prohibited: The use of asbestos-containing materials or products in the construction and/or renovation of buildings for Fulton County Schools is expressly prohibited per CFR 126 1101 (b) (definitions). Asbestos includes Chrysotile, Amosite, Crocidolite, Tremolite, Anthophylite, Actinolite asbestos.
   1. By signing this Contract, the Contractor warrants that all materials and products used in the prosecution of the work for this project are asbestos-free.
   2. Should it be determined, at any time, that the Contractor installed asbestos-containing materials or products, the Contractor shall be required to remove and replace all such items at his own expense.
   3. Replacement work shall be accomplished in a timely manner on a schedule acceptable to the Owner.

PART 2 - PRODUCTS

2.1 VINYL COMPOSITION TILE:

A. Acceptable manufacturers:
   1. Armstrong World Industries, Inc.
   2. Tarkett, Inc.
   3. Mannington Commercial Flooring.

B. Type: Armstrong Imperial Texture Standard Excelon, Imperial Series, or similar of other acceptable manufacturers, meeting the requirements of ASTM F1066-04.

C. Size: 1'-0" by 1'-0" face size by 1/8" thickness.

D. Colors: As selected by Architect from manufacturer's standard selections.

E. Fire test data:
   1. Critical radiant flux: Class I, 0.45 watts/cm^2, when tested in accord with ASTM E648-08.
   2. Smoke development of 450 or less in accord with ASTM E662-06.

F. Accessory materials:
   1. Tile adhesive: Armstrong S-515 water-based/latex-resin tile adhesive.

2. Tile underlayments:
   a. Armstrong S-194 Portland cement based patch, tile underlayment and leveler.
   b. Armstrong S-183 Fast Setting Portland cement based tile underlayment and floor patch.
3. Primer: Armstrong S-185 water-based/latex primer.
4. For products of other acceptable manufacturers specified herein, provide equivalent types of adhesive, underlayment and primer as recommended in the manufacturer's product data.

2.2 RUBBER BASE:

A. Acceptable manufacturers:
1. Basis of design: Armstrong World Industries, Inc., Extruded Rubber Cove Base.
2. Allstate Rubber Corp.
3. Burke Mercer Flooring Products, a Div. of Burke Industries.
4. Roppe Corp.

B. Characteristics:
1. Type: Minimum 48% rubber, 100% vulcanized; meeting ASTM F1861-02, Group 1, Type TS Thermoset Vulcanized Rubber SBR.
2. Length: 4'-0" sections, minimum.
3. Finish: Satin.
4. Thickness: 1/8".
5. Height: 4".
6. Style: Coved.
7. Colors: As selected by Architect from manufacturer's standard selection.

C. Corners: Preformed outside corners. Preformed corners shall match base in color, sheen and overall appearance.

D. Fire test data:
1. Critical radiant flux: Class I, 0.45 watts/cm^2, when tested in accord with ASTM E648-08.
2. Smoke development of 450 or less in accord with ASTM E662-06.

E. Adhesives: Armstrong S-725. For products of other acceptable manufacturers specified herein, provide equivalent types of adhesive as recommended in the manufacturer's product data.

2.3 ACCESSORIES:

A. Acceptable manufacturers:
1. Burke Mercer Flooring Products, a Div. of Burke Industries.
2. Marley Flexco (USA), Inc.
3. Nora Rubber.
4. Johnsonite, Inc.
5. R. C. Musson Rubber Co.
6. Roppe Corp.

B. Thresholds:
1. Basis of design: Burke Mercer Flooring Products, a Div. of Burke Industries.
   a. VCT to carpet: No. 710.
   b. VCT to painted or other limited thickness flooring: No. 633.
2. Molded or extruded rubber.
3. Lengths as required for opening dimensions, without joints.
4. Colors: As selected by Architect from manufacturer's full line colors.

C. Reducers:
1. Basis of design: Burke Mercer Flooring Products, a Div. of Burke Industries.
   a. VCT to carpet: No. 710.
   b. VCT to painted or other limited thickness flooring: No. 633.
2. Material: Rubber.
3. Thickness: Same as abutting floor materials.
4. Width: As indicated or as selected by Architect.
5. Edges: Tapered.
6. Colors: As selected by Architect from manufacturer's full line colors.

D. Stair treads:
1. Type: Roppe, Standard Profile, Raised Design Series, with flexible nose or similar design of other acceptable accessory manufacturers, meeting ASTM F2169-02.
2. Material: Rubber.
3. Style: Non-slip, square nose.
4. Colors: As selected by Architect from manufacturer's standard colors.

E. Stair risers:
1. Type: Roppe, Risers, or similar design of other acceptable accessory manufacturers.
2. Material: Rubber.
3. Style: Top-set; coved.
4. Size: 7" high by stair width. Cut height to match stair.
5. Colors: As selected by Architect from manufacturer's standard colors.

F. Landing materials:
1. Type: Roppe, Raised Circular Design, or similar design of other acceptable accessory manufacturers.
2. Material: Rubber.
3. Size: 19-11/16" by 19-11/16"; 9/64" thickness excluding profile.
4. Profile height: 3/64".
5. Colors: As selected by Architect from manufacturer's standard colors.

G. Stair stringers:
1. Type: Roppe, Stringers, or similar design of other acceptable accessory manufacturers.
2. Material: Rubber.
3. Smooth finish.
4. Height: 12".
5. Colors: As selected by Architect from manufacturer's standard colors.

2.4 ACCESSORY MATERIALS:

A. Adhesives: Types and brands of non-solvent-based adhesive recommended by flooring material manufacturer's product data for installation conditions indicated.

B. Floor finish materials; NO SUBSTITUTIONS ALLOWED:
1. Floor stripper: Spartan's Shineline Emulsifier Plus.
2. Floor sealer: Spartan's Shineline Seal.
3. Floor polish: Spartan's Dura Gloss.

C. Leveling compound; acceptable products:
1. Armstrong S-194.
2. Armstrong S-183.
3. Euclid EUCO Polypatch.
4. Flintkote Latex Underlayment.
5. GAF Leveling and Patching Compound.
6. Tamms Floorstone with Latex Liquid.

PART 3 - EXECUTION

3.1 SAMPLE FLOOR:

A. Install a sample floor consisting of one entire classroom at location directed by Architect, for the purpose of establishing the acceptable level of quality for each phase of the work. Include the following:
1. Preparation of subfloors.
2. Installation of underlayment and leveler.
3. Installation of adhesive.
4. Installation of tile.
5. installation of base and accessories.
6. Cleaning, waxing and protection.

B. Do not begin any other resilient flooring work until sample floor has been reviewed and approved by Architect. If sample floor is not approved, re-install until Architect's approval is obtained.

C. Undamaged, approved sample floor may be incorporated into the final work, and shall serve as a standard of quality for the remainder of the work.

D. Sample floor shall be done to exhibit the stages of the work, as follows:
1. Stage 1: Adhesive from work not approved by Architect shall be completely removed from floor slabs and walls by scraping, grinding or other mechanical means.

2. Stage 2: Prepare concrete subfloor as herein specified. When preparation is complete, request the Owner to arrange for one Alkalinity Test and one Surface Moisture Test per floor. Test results will be made available to the Contractor.
3. Stage 3: Install tile and accessories, and perform cleaning, waxing and protection of the finished floor as herein specified. When this work is complete, request the Owner to arrange for one Surface Moisture Test. Test results will be made available to the Contractor.

E. Inspections: Notify Owner and Architect when each stage of the sample floor is complete and ready for inspection. Should any stage of the sample floor fail to be approved, perform the following:
1. Stage 1: Repeat cleaning process until approval is obtained.
2. Stage 2: For minor subfloor preparation problems, repeat preparation work until approval is obtained. For major subfloor preparation problems, as directed by Architect or Owner, remove applied materials and repeat applications until approval is obtained. In the event that test results do not fall within specified limits, take the following actions:
   a. Alkalinity: Netralize subfloor with a solution of acetic or muriatic acid, and flush thoroughly with potable water. Allow floor to dry thoroughly and contact Owner to request re-testing. Repeat this procedure until test results fall within specified, acceptable limits. Additional testing and cleaning shall be performed at no additional cost to the Owner.
   b. Surface moisture: Wait 48 hours and contact the Owner to request re-testing. Should results of the second test fail to fall within specified, acceptable limits, arrange a meeting with the Owner, Architect, Contractor, and floor tile manufacturer and installer to determine remedial action.
3. Stage 3: For minor tile, base, and accessory installation problems, repeat failed portions of the work until approval is obtained. For major tile, base, and accessory installation problems or cleaning and finish problems, as directed by Architect or Owner, remove applied flooring materials and/or finish process and repeat installation, cleaning and finishing until approval is obtained. In the event that test results do not fall within specified limits, take the following actions:
   a. Surface moisture: Wait 48 hours and contact the Owner to request re-testing. Should results of the second test fail to fall within specified, acceptable limits, arrange a meeting with the Owner, Architect, Contractor, and floor tile manufacturer and installer to determine remedial action.

F. Preparation of sub-floors: Prepare all sub-floors for resilient flooring in accord with the following:
1. Thoroughly examine all surfaces and notify the Contractor in writing with copies to the Architect and Owner of any conditions that would prevent the successful completion of the work. Starting preparation work shall indicate acceptance of sub-floor conditions.
2. Prepare and test subfloors as follows:
a. Sweep surfaces thoroughly with a wire brush to remove all dusty, chalky, or flaky concrete. Follow sweeping with thorough vacuum cleaning.
b. Tests:
1) The Owner shall secure and pay for the services of an independent testing laboratory to perform the tests listed below. The Owner sill determine the quantity and locations of tests.
2) Alkalinity: The subfloor shall be tested for alkalinity. Subfloors with a pH reading of 9 or greater shall be neutralized with either an acetic or muriatic acid solution followed by a thorough rinsing with water. Furnish copy of test results to the Owner prior to starting floor preparation work.
3) Surface moisture: The subfloor shall be tested for surface moisture. Surface moisture shall not exceed underlayment, adhesive and flooring manufacturers' recommendations. As a minimum, moisture shall not exceed 3 lbs./1000 s.f./24 hours as measured by means of a "Calcium Chloride Test", ASTM F1869-04. Furnish copy of test results to the Owner prior to starting floor preparation work.
4) Subfloor preparation work as herein specified shall not proceed until test results indicate cleaned subfloor is withing specified limits of the Alkalinity and moisture tests.
c. Tolerances: Subfloor surfaces shall not vary more than 1/8" in any ten-foot dimension. Neither shall they vary at a rate greater than 1/16" per running foot. Grind or install leveling compounds until this tolerance is achieved.
d. Remove sub-floor ridges and bumps. Prior to the installation of any leveling compound, the sub-floor shall be broom clean, mopped and dust mopped to remove all deleterious materials.
e. Prior to installation of any leveling compound, subfloor shall be broom clean, mopped and dust mopped to remove all residue and deleterious materials that would impede proper bonds.
f. Allow floor to dry thoroughly prior to installing leveling compounds. Surface moisture shall not exceed adhesive manufacturer's recommendations. Compounds shall be installed in accord with compound manufacturers written instructions.

g. Fill slab control joints, minor low spots, cracks, holes and other defects with specified leveling material to achieve smooth, flat and hard surfaces.
h. When the thickness of the leveling compound required to level the floor exceeds 1/4", the Contractor shall install multiple layers. Installed layer shall be allowed to dry thoroughly prior to the installation of subsequent layers. Each layer shall not exceed 1/4" in thickness.
i. Prohibit foot traffic until underlayments are cured.

3. After the preparation work is completed, the sub-floor shall be broom clean, mopped and dust mopped until all materials that could telegraph through the new flooring are removed.

G. Subfloor inspection:
1. Concrete slab shall be smooth, sound, dry, clean and free of dirt and all other foreign matter that interfere with a good bond.
2. Contractor shall inspect sub-flooring before installation of tile. Floor shall be completely dry prior to adhesive and tile installation.
a. Surface Moisture Test: Notify Owner when prepared subfloor is smooth, sound, dry, clean and ready for testing. Testing shall be performed prior to application of primers and/or adhesives.
b. Owner's testing agency will perform testing as herein specified.
c. Donot proceed with the work until test results indicate prepared subfloor is within specified and acceptable limits of Surface Moisture Test.
3. Contractor shall apply primer as specified herein where concrete floor slab surface shows conditions that might prevent proper bonding of adhesive. This shall be done in accord with adhesive manufacturer's recommendations.

3.2 PREPARATION:

A. Remove dirt, oil, grease or other foreign matter from surfaces to receive floor covering or accessories. Grind down high areas. Level depressions using specified leveling compound.

B. Store resilient materials in installation areas at minimum 68 degrees F for a minimum of 72 hours before installation.

C. Perform bond and moisture tests on subfloors in accord with ASTM F2170-02 and resilient flooring manufacturer's product data, to determine if surfaces are acceptable to receive specified resilient flooring products. Correct conditions detrimental to resilient flooring installation prior to starting installation.
   1. Compare results of moisture test to acceptable moisture levels indicated in flooring manufacturer's and adhesive manufacturer's product data.
   2. Submit comparisons to Architect for information only.

3.3 APPLICATION OF ADHESIVES:

A. Mix and apply adhesives in accord with manufacturer's product data. Apply with notched trowel or other tools as recommended by adhesive manufacturer. Do not exceed adhesive working time. Do not install materials in areas of the work unprotected from demolition, floor preparation or other construction activities that would contaminate the adhesive with dirt, dust or debris.

B. Provide safety precautions during mixing and applications as recommended by adhesive manufacturer.

C. Apply adhesive to only that area which can be covered by resilient material within the recommended working time of the adhesive.
   1. Remove adhesive which dries or films over.
   2. Do not soil walls, bases or adjacent areas with adhesives.
   3. Remove spilled or misplaced materials.

3.4 TILE INSTALLATION:

A. Lay tile beginning at center of room or space, working toward perimeter. Cut border tile to fit within 1/32" of abutting surfaces.

B. Fit flooring material into breaks and recesses, against bases, around pipes and penetrations, under saddles or thresholds and around permanent cabinets and equipment.

C. Lay tile with grain or pattern running in same direction between adjacent tiles.

3.5 INSTALLATION OF BASE:

A. Workmanship:
   1. Unroll base material and allow to relax for 24 hours, minimum, prior to installation. Cut into lengths for minimum number of joints. Double-cut adjoining lengths.
   2. Install with tight butt joints with no joint widths greater than 1/64".

B. Top-set base:
   1. Apply adhesive and adhere to vertical surfaces.

2. Press down so that bottom edge follows floor profile.
3. Form internal corners by coping and bending sufficient length around corner for anchorage.
4. Form external corners using premolded corners.
5. Scribe base to abutting materials.

3.6 STAIR COVERING INSTALLATION:

A. Workmanship:
1. Cut each piece of covering material to length.
2. Allow to flatten prior to installation.
3. Match grain and color between adjacent pieces.
4. Install with butt joints with no joint width greater than 1/64".

B. Treads: Apply adhesive and epoxy nose filler and adhere material to substrate. Install in single lengths, without joints. Tape leg of nose to riser until epoxy filler cures.

C. Risers and stringers:
1. Install prior to tread material.
2. Apply adhesive and adhere material to substrate.
3. Roll for firm bond and to work out wrinkles and air pockets.

3.7 ACCESSORY INSTALLATION:

A. Cut materials to lengths and sizes indicated.

B. Resilient thresholds and reducers:
1. Apply adhesives and bond to substrate.
2. Center thresholds and reducers in door openings.
3. Fit edge to door frame jambs without visible gaps or cracks.
4. Fit edges to abutting floor materials for flush fit.

3.8 CLEANING:

A. Upon completion of resilient flooring and base installation clean the floors of all dirt and debris that could interfere with proper floor finish application. Remove excess adhesive from floor, base and all wall surfaces without damaging finishes.

B. Do not wet wash, scrub or strip VCT floor for at least five (5) days following installation.

C. The Contractor will enter into a contract with a Specialty Contractor who will be engaged to clean, apply sealer and finish, and high-speed burnish all resilient flooring throughout the building.

D. Scrub the new floor tile to remove the factory-applied sealer with a blue scrubbing pad and a water-mix solution of Spartan's Shineline Emulsified Plus stripper, diluted per the manufacturer's instructions.
1. Thoroughly remove dirty solution with a wet/dry vacuum after scrubbing action is complete.

2. Thoroughly rinse the floor with (2) rinses of clear water.
3. Allow floor to dry completely.

E. Apply two (2) coats of Spartan's Shineline Seal in accordance with manufacturer's specifications.
1. Allow adequate drying time between coats, as specified by the manufacturer.
2. Force drying by fans or any other means is prohibited.

F. Apply four (4) coats of Spartan's Dura Gloss floor finish.

G. After the floor finish has cured in accordance with the manufacturer's specifications, burnish the floor finish with a high-speed burnisher to harden the floor finish surface and produce a "wet look" sheen.

H. The Contractor shall notify Fulton County Board of Education during the cleaning, scrubbing, sealing and waxing stages of the floor finishing process for assistance and consultation as required to achieve the specified finish.

I. Upon completion of the contractor's Resilient Flooring work, the Design Professional and Fulton County Board of Education will conduct a "Punch List" documenting work to be finished, work not in compliance with the Contract Documents, work damaged, etc. Fulton County Board of Education will move furniture into the rooms.

J. Upon completion of the moving of furniture and equipment, the Specialty Contractor will clean, scrub (lightly) and apply two (2) additional coats of Spartan's Dura Gloss floor finish on all corridors and high speed burnish to achieve a "wet-look" sheen.

3.9 MAINTENANCE MATERIAL:

A. Furnish additional floor tile of each type, color and pattern of tile as maintenance material. Furnish at the rate of one carton for each 1000 sq. ft. of floor surface or fraction thereof. Store where directed by Owner.

B. Furnish additional base and premolded corners as maintenance material. Furnish in the amount of 160 linear feet of base and 20 premolded outside corner units for each color of base selected.

End of Section

SECTION 09 6566

SYNTHETIC ATHLETIC FLOORING

PART 1 - GENERAL

1.1 DESCRIPTION:

A. Work of this section includes installation of synthetic sports surfacing system, including striping.

B. Related work:
1. Cast-in-place concrete.
2. Concrete finishing.
3. Vapor retarder.

1.2 SUBMITTALS:

A. Product data: Indicate product characteristics and installation requirements, including manufacturer's recommended adhesives and maintenance instructions.

B. Samples: Submit samples for each type, color and pattern of flooring and accessory required. Colors shall be as specified herein and as selected by the Architect from manufacturer's standard full line selections.

C. Maintenance instructions: Upon completion of floor installation, submit flooring manufacturer's care and maintenance instructions.

E. Installer approval: Installer shall be approved by Connor. Submit verification indicating installer (Floor Contractor) is approved to install proposed sport flooring system.

1.3 QUALITY ASSURANCE:

A. Reference standards; standards of the following as referenced herein:
1. ASTM International (ASTM).
2. DIN (Deutsche Norm).
3. Other Standards:
   a. EN 434.
   b. NF P 90 203.
   c. NF P 90102.
   d. NF P90-104.
   e. NF EN 12235.

B. Installer qualifications:
1. Installer shall be approved for work of this project by flooring manufacturer.
2. Installation of the flooring system, as described in these specifications, shall be carried out by an experienced installer, and the work shall be performed in accordance with current flooring manufacturer's installation instructions.
3. Installer shall be liable for all matters related to the installation for a period of one year after the floor has been installed and completed.

1.4 DELIVERY, STORAGE AND HANDLING:

A. Materials shall be delivered in manufacturer's original, unopened and undamaged packaging with identification labels intact. Material shall not be delivered until all related work is finished and/or proper storage facilities can be guaranteed.

B. Store the material protected from exposure to harmful weather conditions on a clean, dry, flat surface protected from possible damage. Store sports flooring rolls on their side. Do not stack rolls of material.

C. Storage conditions shall be 60°F to 80°F.

D. Protection:
1. Protect finished flooring, base and accessories from staining, marring or other physical damage as work progresses. Cover or mask surfaces as required.
2. Restore all damaged areas to original condition.

1.5 PROJECT CONDITIONS:

A. Concrete moisture vapor emission and pH testing: Moisture vapor emission and pH of concrete shall be tested. Moisture vapor emissions shall not exceed three (3) pounds per 1000 square feet per 24 hours as verified using Calcium Chloride test ASTM F1869-04. Concrete pH level should be in the range between 7 and 8.5.

B. Concrete subfloors: Contractor shall furnish and install the concrete subfloors. The slab shall be steel troweled and finished smooth to a tolerance of 1/8" in any 10' radius. Floor flatness and floor levelness (FF and FL) numbers are not recognized. High spots shall be ground level and low spots filled with approved leveling compound.

C. No concrete curing, hardening or sealing agents shall be applied or mixed with the concrete subfloor.

D. Synthetic materials specified herein shall not be installed until all masonry, painting, plaster, tile, marble and terrazzo and similar work is completed, and overhead mechanical trades and painters have finished in the synthetic floor areas. The building shall be enclosed and weather tight.

E. Permanent heat, light and ventilation shall be installed and operating during and after installation. Subfloors shall be clean, dry and free from dirt, dust, oil, grease, paint, alkali, concrete curing agents, hardening and parting compounds, old adhesive residue or other foreign materials. Moderate room temperature between 65°F and 80°F, and relative humidity under 50% shall be maintained for one week prior to, during, and for 72 hours after installation.

F. The installation areas shall be closed to all traffic and activity until flooring is completed and cured.

G. Environmental limitations:
1. Comply with flooring manufacturer's requirements.
2. Adhere to all MSDS requirements for materials employed in the work. Protect all persons from exposure to hazardous materials at all times.

H. After synthetic floors are installed and the game lines painted, traffic shall be prohibited in the area to allow curing time for the flooring system and adhesives.

1.6 WARRANTY:

A. Provide flooring manufacturer's standard material warranty of fifteen (15) years. Warranty shall begin at Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Acceptable manufacturers:
1. Basis of design: Connor SportGrain Plus.
2. Johnsonite/Tarkett, AmeriSport.
3. Robbins Sports Surfaces, Pulastic Sport VinylPro 70 FD.

B. Characteristics:
1. Description: Prefabricated sport surface minimum 5/16" (7.5mm) thickness with heat-welded seams, maple flooring design.
a. Design: Printing of maple wood design shall closely replicate standard maple strip flooring in size, color, board length and grain appearance.
b. Protective topcoats: The maple design shall be protected by a clear layer of pure PVC (Polyvinyl Chloride) and top coated with a factory applied polyurethane finish.
c. Backing: Reinforced, expanded closed-cell foam.
d. Anti-bacterial protection: Flooring shall contain anti-bacterial treatment.
2. Colors: Maple design, with colors as selected by Architect.
3. Physical properties:
a. Weight: 1.19 lbs/sf.
b. Dimensional stability (EN 434): < = 0.1%.
c. Thermal resistance (DIN 52612): 0.07.
d. Fire resistance (ASTM E-648 Radiant Panel Test): Exceeds Class 1.
e. Slip resistance: (ASTM D-2047) >0.5; NFP 90 203 97.
f. Abrasion resistance (NFP 90102): 0.04 gr
g. Force reduction (DIN 18032): 31%.
h. Shock absorption (NF P90-104): 78G.
i. Ball bounce (NF EN 12235): 98%.
j. Vinyl classification (ASTM F-1303-99): Type 1, Grade 1.
k. Static load limit (ASTM F-970): 200 psi.
l. Standard roll length: 20.5 m (67.25 ft.).

m. Standard roll width: 2 m (6'-6")

B. Vinyl welding thread for seams: Matching vinyl supplied by flooring manufacturer.

C. Adhesive: One-component acrylic or two-component polyurethane supplied by flooring manufacturer.

D. Game line paint: Two-component polyurethane supplied by flooring manufacturer, colors as selected by Architect.

E. Base: Vinyl wall base 4" high; colors as selected by Architect.

F. Leveling compound; acceptable products:
1. Euclid EUCO Polypatch.
2. Flintkote Latex Underlayment.
3. GAF Leveling and Patching Compound.
4. Tamms Floorstone with Latex Liquid.

PART 3 - EXECUTION

3.1 INSPECTION:

A. Inspect concrete slab for proper tolerance and dryness. Grind high areas and fill depressions with leveling compound where required to produce smooth installation and for proper alignment of flooring with adjacent flooring materials.

B. Perform bond and moisture tests on subfloors in accord with ASTM F2170-02 and flooring manufacturer's product data, to determine if surfaces are acceptable to receive specified flooring products. Correct conditions detrimental to flooring installation prior to starting installation.
1. Compare results of moisture test to acceptable moisture levels indicated in flooring manufacturer's and adhesive manufacturer's product data.
2. If moisture level exceeds manufacturer's requirements, inform flooring manufacturer, Architect and Contractor, and provide solutions to mitigate high moisture levels. Do not proceed with flooring installation until moisture level is acceptable to flooring manufacturer.

C. Concrete slab shall be broom clean, free of dirt, oils, curing compounds and other deleterious materials. Verify that no curing compounds and/or sealers have been applied to the concrete.

D. Installer shall document all working conditions provided in General Specifications prior to commencement of flooring installation.

3.2 INSTALLATION:

A. Prepare concrete to receive flooring material in accord with flooring manufacturer's product data and installation instructions.

B. Unroll flooring and allow to relax.

C. Workmanship:
1. Install flooring in accord with flooring manufacturer's product data.
2. Cut sheet material in lengths and sizes required.

D. Apply acrylic adhesive directly to concrete with notched trowel in accord with flooring manufacture's installation instructions. Total flooring surface shall be fully adhered.

E. Install flooring into applied adhesive.

F. Roll flooring surface with a 100 lb segmented roller to remove entrapped air.

G. Join side and end seams by hot welding. Route seams to receive vinyl welding thread. Use vinyl welding thread as supplied by flooring manufacturer. Comply with installation instructions for complete preparation and installation recommendations.

H. Game lines:
1. Mask off game line marking using masking tape approved by flooring manufacturer.
2. Follow installation instructions for preparation and application of game line paint.
3. Install game lines as indicated on drawings.

I. Wall base: Install vinyl base anchored to walls with base cement.

J. Cleanup: Remove all excess and waste materials from the work area. Dispose of empty containers in accordance with federal and local statutes.

End of Section

SECTION 10 2115

PLASTIC TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY:

A. Related work specified elsewhere:
1. Toilet accessories.
2. Rough carpentry.
3. Gypsum board.

1.2 SUBMITTALS:

A. Shop drawings: Indicate plans and elevations of compartments, construction and fabrication details, anchoring and leveling details, plastic manufacturer, thickness, colors and patterns, hardware accessories and fastenings. Include manufacturer's installation and maintenance instructions.

B. Samples:
1.Plastic: Submit samples of manufacturer's standard colors and patterns for Architect's selection.
2. Panel: Submit 1'-0" by 1'-0" sample of panel showing core construction with two sides and two edges, including one finished corner condition.
3. Hardware: Submit actual sample of each hardware item.

1.3 QUALITY ASSURANCE:

A. Applicable standards; standards of the following, as referenced herein:
1. American Iron and Steel Institute (AISI).
2. American National Standards Institute (ANSI), A117-1, 1986.

1.4 PROJECT/SITE CONDITIONS:

A.Coordinate gypsum board walls to receive toilet compartments so that blocking is attached between studs at points where toilet compartment mounting brackets will be located.

B. Install toilet compartments after plumbing fixtures and floor, wall and ceiling finishes have been installed.

PART 2 - PRODUCTS

2.1 SOLID PHENOLIC PLASTIC COMPARTMENTS:

A. Acceptable manufacturers; subject to compliance with specified requirements:
1. Accurate Partitions Corp.
2. American Sanitary Partition Corp.
3. Ampco Products, Inc.
4. Bobrick Washroom Equipment, Inc.
5. Bradley Corp.
6. Flush-Metal Partition.
7. General Partitions Mfg. Corp.

9. Global Steel Products, Corp.
10. Knickerbocker Partition Corp.
11. Metpar Corp.
12. Rockville Partitions, Inc.
13. Tex-Lam Manufacturing, Inc.

B. Type: Floor-supported, overhead-braced compartments.

C. Characteristics:
1. Materials: Solid phenolic plastic core with high pressure melamine surfacing both faces, matte finish, colors as selected by Architect from manufacturer's standard, full color selection.
2. Edges: Exposed phenolic core, beveled and smooth surfaced.
3. Minimum thicknesses:
a. Pilasters and doors: 3/4".
b. Panels: 1/2".
4. Fabrication: Cut and pre-drill panels in shop for hardware and toilet accessory items.

2.2 HARDWARE AND FITTINGS:

A. General: Provide heavy-duty, vandal-resistant hardware.

B. Overhead brace: Extruded satin finish anodized aluminum, tubular section, anti-grip design, through-bolted to pilaster.

C. Pilaster shoes: AISI Type 302/304 stainless steel, 3" high, hemmed top and bottom edges, die-formed to fit pilaster, polished finish.

D. Hinges: Chrome-plated, non-ferrous metal or stainless steel, polished finish. Surface-mounted pivot design with stainless steel pivot pins and nylon, self-oiling graphite-bronze or thrust-frictionless bearings for moving parts. Hinges shall be mounted within door structure and adjustable so as to return door by gravity to a preset position when not latched.

E. Wall brackets: Provide continuous wall brackets at panel-to-wall conditions. Brackets shall be chrome-plated, non-ferrous metal, heavy duty type, polished finish; for attachment of panels to wall and panels to pilasters, unless concealed type fasteners are used.

F. Pilaster base: Manufacturer's standard galvanized anchorage device for attachment of pilaster to supporting floor and for leveling of partition. Base consists of threaded rods, saddle, lock washers, leveling nuts and brass or lead expansion shields. Anchors shall penetrate floor at least 1-1/2" for overhead-braced partitions; 2" for floor-braced partitions.

G. Latch, bumper and keeper: Chrome-plated, non-ferrous metal, polished finish, with resilient cushion stop.

H. Door pull for out-swinging doors: Chrome-plated, non-ferrous metal or stainless steel, polished finish.

I. Combination bumper/coat hook for in-swinging doors: Chrome-plated, non-ferrous metal, polished finish with rubber bumper.

J. Coat hook for out-swinging doors: Chrome-plated, non-ferrous metal, polished finish. Mount to partition at 4'-6" above finished floor to meet handicapped accessibility requirements.

K. Wall bumper for out-swinging doors: Polished, chrome-plated, non-ferrous metal, with rubber bumper; wall-mounted.

L. Partition anchors:
1. Non-corrosive, threaded sleeved anchors (sex-bolts) matching hardware finish, bolted through panels, tamper-resistant type.
2. Provide stainless steel backing plate matching hardware finish where hardware is not of wraparound design.

M. Clothing hooks: Toilet compartments: Manufacturer's standard, chrome-plated, non-ferrous metal, polished finish; one per compartment located back-to-back toward rear of side divider compartments.

PART 3 - EXECUTION

3.1 PREPARATION:

A. Confirm dimensions, clearances, wall construction and plumbing fixture locations prior to partition installation.

B. Install compartments after all finishes within area are complete and plumbing fixtures are installed.

3.2 INSTALLATION:

A. Install compartments straight, plumb and anchored rigid to structure, complying with manufacturer's product data and approved shop drawings.

B. Conceal evidence of cutting, drilling and fitting occurring on compartments, walls and floors.

C. Clearances:
1. Between panels and pilasters: 1/4" to 1/2".
2. Between doors and pilasters: 1/8" nominal.
3. Between panels and walls: 1/4" to 1/2".

D. Anchorage:
1. Attach pilaster to floor with two sleeve anchors penetrating floor at least 2". After leveling, tighten base fasteners and secure shoe in position against finished floor.
2. Secure overhead brace to walls using brackets attached with at least two sleeved anchors. Through-bolt brace to pilasters using two bolts per stile.

3. Attach panels and end pilasters to walls using a minimum of three brackets each, or continuous extruded aluminum bracket, anchored using through-bolts and sleeved anchors. Space individual brackets near top, bottom and center of panels.
4. Attach benches back-to-back where possible.
5. Locate brackets so that holes for wall anchors occur in masonry or tile joints where possible.
6. Attach urinal screens using not less than three stainless steel brackets, spaced not over 1'-4" o. c., or continuous extruded aluminum bracket.

3.3 ADJUSTMENT AND CLEANING:

A. Adjust doors to align with pilasters and overhead brace, operate freely without excessive force and stop 15 degrees from closed position when unlatched. Out-swinging handicapped partition doors shall return to closed position.

B. Clean compartments and hardware using methods approved by panel manufacturer.

C. Coordinate installation of accessories specified in another section.

D. Tighten anchors to ensure rigid installation.

End of Section

SECTION 10 2813

TOILET ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY:

A. Related work specified elsewhere:
1. Concrete unit masonry.
2. Gypsum board.

1.2 DESIGN CRITERIA:

A. In order to be acceptable, products shall comply with the following criteria:
1. All accessories shall be products of a single manufacturer.
2. Keying: Keyed accessories shall be keyed alike, unless otherwise specified.
3. Operation: Control and operating mechanisms shall be operable with one hand, without tight grasping, pinching, or twisting of wrist, and with a maximum force of 5 lbf.
4. Cabinet construction:
a. Material: Entire cabinet shall be constructed of 18-8 S, Type 304 stainless steel, minimum 22 ga., except that doors of flush face cabinets shall be minimum 18 ga.
b. Finish: Satin finish, vertical grain stainless steel; matching in color and graining within the same cabinet.
c. Unit construction: Seamless or welded; all welds ground smooth prior to finishing on exposed surfaces. Cabinets shall have full, continuous backs and sides. Flush face units shall be seamless construction.
d. Hinges: Doors shall be hung on continuous stainless steel piano hinges.
e. Stops: Doors shall have spring or cable stops located inside cabinet to limit opening to 120 degrees maximum.
f. Bumpers: Doors shall have rubber bumpers to cushion door closing.
g. Exposed edges: Hemmed, returned or flanged; sharp edges not allowable.
h. Waste receptacle liners: Rigid, leakproof, molded plastic.
i. Paper towel dispensers: Adaptable to dispense C-fold, multi-fold or single-fold towels without use of additional towel trays.
j. Feminine napkin/tampon vendors: Changeable coin mechanisms and coin slot identification; lockable coin box keyed differently from other accessories.
k. Combination towel/waste units: Capable of mounting such that towel dispenser is located at 3'-4" above finish floor, while allowing at least 4" base below unit.

5. Soap dispensers:
   a. Valves: All-purpose dispensing type; piston and exposed components of Type 302/304 stainless steel or chrome-plated brass.
   b. Lavatory-mounted dispensers: Capable of being filled from top, without removal of container.
   c. Lavatory dispenser container: Minimum 32 oz. capacity, rigid polyethylene.

1.3 SUBMITTALS:

A. Product data: Include catalog cuts and data sheets indicating size, material and finish, complete parts list and installation procedures for each accessory. Where manufacturer's standard products vary with design criteria, indicate compliance with design criteria.

1.4 QUALITY ASSURANCE:

A. Applicable standards; comply with the following as referenced herein: Americans with Disabilities Act (ADA).

1.5 PROJECT/SITE CONDITIONS:

A. Protection: Maintain manufacturer's protective covering on accessories until final cleanup of installation.

B. Coordinate this work with work of other trades into which accessories are to be installed.

1.6 WARRANTY:

A. Mirrors: Warrant mirrors for five years against silver spoilage.

PART 2 - PRODUCTS

2.1 TOILET ACCESSORIES:

A. Acceptable manufacturers; subject to compliance with specified design criteria:
   1. A & J Washroom Accessories.
   2. American Specialties, Inc. (ASI).
   3. Bobrick Washroom Equipment, Inc.
   4. Bradley Washfountain Co.

B. Semi-recessed towel dispenser and waste receptacle (for 4" minimum recess):
   1. A & J #U650.
   2. ASI #0469 with adapter.
   3. Bobrick #B-3944.
   4. Bradley #234.

C. Recessed feminine napkin/tampon dispenser (for 4" minimum recess):
   1. A & J #U510.
   2. ASI #0468.
   3. Bobrick #3500.
   4. Bradley #4017.

D. Recessed feminine napkin disposal cabinet (for 4" minimum recess):
1. A & J #U581.
2. ASI #0473.
3. Bobrick #B-353.
4. Bradley #4731-15.

E. Recessed paper towel dispenser (for 3-3/4" minimum recess):
1. A & J #U2304.
2. ASI #6452.
3. Bobrick #B-36203.
4. Bradley #2447.

F. Recessed waste receptacle (for 4" minimum recess):
1. A & J #U410.
2. ASI #0458.
3. Bobrick #B-3644.
4. Bradley #344.

G. Double-roll toilet tissue dispenser:
1. A & J #U806-LCD.
2. ASI #0264-1A.
3. Bobrick #B-2740.
4. Bradley #5241-50.

H. Surface-mounted feminine napkin disposal cabinet:
1. A & J #U582.
2. ASI #0473A-1.
3. Bobrick #B-254.
4. Bradley #4722-15.

I. Framed mirror units:
1. A & J #U711 Series.
2. ASI #0620-A Series.
3. Bobrick #B-165 Series.
4. Bradley #720 Series.

J. Surface-mounted soap dispenser:
1. A & J #U124.
2. ASI #0342.
3. Bobrick #B-4112.
4. Bradley #6542.

K. Mop and broom holder (3'-0" length):
1. A & J #UJ13B.
2. ASI #8215-4.
3. Bobrick #B-223 X 36.
4. Bradley #9954.

L. Grab bars, sizes and configurations as shown on the drawings; 1-1/2" diameter, satin finish, concealed mounting:
1. A & J #UG30 Series.
2. ASI #3200 Series.
3. Bobrick #B-6806 Series.
4. Bradley #812 Series.

M. Double robe hook:
1. A & J #UX112.
2. ASI #7345-S.
3. Bobrick #6727.
4. Bradley #9124.

N. Recessed hand dryer; 230 volt, white color, automatic operation (for 4" maximum recess):
1. A & J #U1600 EA-120/230.
2. ASI #0125.
3. Bobrick #B-750.

O. Pipe Insulation; premoulded PVC insulating covers for drain and supply lines:
1. Brocar Products, Inc., Trap Wrap.
2. Truebro, Inc., Handi Lav-Guard

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Check opening scheduled to receive recessed or semi-recessed accessories for correct dimensions, depth, plumbness of blocking or frames, and preparation that would affect installation of accessories.

3.2 INSTALLATION:

A. Install accessories level, plumb and in indicated location. Installation methods shall be as indicated in product data for substrates encountered. Securely attach to blocking or framing members.

B. Mounting heights: As indicated on drawings and meeting ADA accessibility requirements.

C. Grab bars:
1. Secure grab bars to wood by direct attachment to studs or to blocking installed between studs.
2. Secure grab bars to metal stud partition by direct attachment to steel studs, using 1/4" diameter toggle bolts, or using minimum 12 ga. by 3" wide steel anchor plates, continuous length required for attachment of grab bar flanges.
   a. Attach anchor plates to studs on grab bar side of wall, using self-tapping sheet metal screws.
   b. Where grab bar flanges mount on separate walls, anchor plate shall be of length to span between studs at individual flange locations.
   c. Attach grab bars to anchor plates using stainless steel machine screws.
3. Attach grab bars to masonry walls using concealed mounting plate, minimum 1/4" diameter through-bolt and minimum 10 ga. steel backup plate.
4. Attach grab bars to concrete walls using 1/4" diameter stainless steel machine screws and metal expansion shields.
5. Attach grab bars to toilet partitions using wing tapped steel spacers and stainless steel machine screws.

D. Conceal evidence of drilling, cutting and fitting to adjacent finishes.

3.3 ADJUSTING AND CLEANING:

A. Adjust operating parts of accessories for proper operation.

B. Clean and polish exposed surfaces prior to Date of Substantial Completion.

C. Deliver accessory schedule, keys and parts manual as part of project closeout documents.

End of Section

SECTION 10 7316

CANOPIES

PART 1 - GENERAL

1.1 SUMMARY:

A. Work of this section includes pre-fabricated, simple-span aluminum canopy construction at locations indicated on drawings.

1.2 PERFORMANCE REQUIREMENTS:

A. Thermal movement: Completed canopy systems shall be capable of withstanding expansion and contraction of components caused by an ambient temperature range of 120 degrees F and material surface temperature change of 180 degrees F without buckling, excess stress on framing structure or adjacent structures, anchors or fasteners. Base design calculation on actual surface temperatures of materials due to both solar heat gain and nighttime sky heat loss.

B. Structural performance:
1. Complete canopy system shall withstand wind uplift forces and loading in accord with ** local codes.
2. Maximum allowable deflection of framing: L/240.

C. Anchors: Capable of transmitting design loads and thermal expansion loads assigned to a single anchor; with a safety factor of 2.5.

1.3 SUBMITTALS:

A. Shop drawings: Indicate canopy structure in elevation and plan with sections and details at full scale. Include metal thicknesses, joining details, field connections, anchorage, provisions for expansion, fastening and sealing methods and metal finishes. Indicate relationships with adjacent and interfacing work. Shop drawings shall bear the seal of a professional engineer registered in the State of Georgia. **

B. Product data: Include full system and material description, finish and installation instructions.

C. Samples:
1. Submit minimum 1'-0" length of typical support members, beams, fascia and decking components.
2. Submit minimum 6" by 6" samples, finished as specified, indicating range of finish color and texture to be expected in the finished work.

D. Structural design calculations: Submit for canopy system. Indicate compliance with specified design criteria. Design calculations shall bear seal of same engineer as shop drawings.

E. Test certification: If requested by Architect, submit certification and results of independent tests verifying compliance with design criteria.

F. Maintenance data: Submit as part of contract closeout documents. Give instructions for general maintenance and repair of surfaces and finishes.

1.4 QUALITY CRITERIA:

A. Applicable standards: Standards of the ASTM International (ASTM); as referenced herein.

B. Fabricator qualifications: Fabricator shall be a firm with minimum ten years experience successfully producing canopies similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in the work.

C. Installer qualifications: Erection shall be performed by manufacturer or by an erector with minimum five years experience installing prefabricated canopies.

D. Engineer qualifications: Engineering shall be performed by a professional engineer licensed in the State of ** Georgia ** and experienced in providing engineering services of the kind indicated that have resulted in successful installation of canopies of similar material, design and extent to that indicated for this Project.

1.5 DELIVERY, STORAGE AND HANDLING:

A. Do not deliver canopy systems to site until time for installation.

B. Erect canopy systems following completion of adjacent construction.

C. Protect materials from physical damage, staining or other harm to material or finish.

1.6 SEQUENCING:

A. Coordinate installation of canopy with adjacent construction required to be built into building structure. Secure templates or lay out to rough dimensions provided by canopy manufacturer.

1.7 WARRANTY:

A. Manufacturer's warranty: Provide a two year written warranty covering work performed under this section. Warranty shall cover defective materials including workmanship and performance and shall provide for the prompt repair of canopy system at no additional cost to the Owner. Warranty period shall begin at the Date of Substantial Completion.

B. Finish warranty: Provide manufacturer's five year finish warranty covering refinishing of fluoropolymer coating due to checking, crazing, peeling, chalking or fading, beginning at the Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PREFABRICATED CANOPY SYSTEM:

A. Acceptable manufacturers, subject to compliance with specified characteristics:
1. Dittmer Architectural Aluminum Co., U-bent configuration with Stretch 60 Aluminum Deck.
2. E.L. Burns Company, Inc.
3. Mapes Industries, Inc.
4. Peachtree Protective Covers.
5. Perfection Architectural Systems, Inc.

B. Column supported canopy system:
1. Extruded aluminum structural and decking system in length to span minimum two bays. Roll-formed sheet decking and accessory components will not be acceptable. Decking components shall interlock without visible joint lines on horizontal surfaces.
2. System shall drain to continuous fascia-gutter sections providing a minimum 6" depth and ten square inches of gutter area.
3. Gutter shall drain through tubular columns containing baffle plates to divert water into storm drainage system. Refer to Civil for boot connection.
4. Provide internal concealed splices and factory mitered and welded corners.

C. Aluminum materials:
1. Aluminum extrusions: 6063-T6 aluminum alloy meeting ASTM B221-06 minimum 0.125" wall thickness for structural components, and as indicated by approved engineering design.
2. Aluminum sheet: 5005-H34 aluminum alloy meeting ASTM B209-06; minimum 0.050" thickness.
3. Fasteners: Hardened aluminum or stainless steel. Exposed fasteners shall be countersunk and shall match canopy in color.

D. Fluoropolymer coating finish:
1. Two coat, shop-applied, baked-on, fluoropolymer coating system based on minimum 70% Arkema Group, Kynar 500 or Solvay Solexis, Inc., Hylar 5000 resin (Polyvinylidene fluoride, PVDF), formulated by a licensed manufacturer and applied by manufacturer's approved applicator to meet AAMA 2605-05.
2. Color: Custom color as selected by Architect.

2.2 FABRICATION:

A. Form work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to radius of approximately 1/32". Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

B. Form profiles without waves or buckling in metal surfaces. Form glazing battens continuous.

C. Provide anchorage and superstructure of type shown on approved shop drawings and coordinated with supporting steel structure. Fabricate and space anchoring devices as indicated.

D. Fabricate flashings, closures and similar components indicated to cover structural steel as part of this work.

PART 3 - EXECUTION

3.1 PREPARATION:

A. Inserts and anchorage: Provide inserts and anchoring devices which must be preset in concrete on timely basis to avoid delay in the work. Set at locations indicated on approved shop drawings.

B. Coordinate setting drawings, diagrams, templates and instructions for installation of concrete inserts, anchor bolts and miscellaneous items having integral anchors cast in concrete construction.

3.2 ERECTION:

A. Verify location and alignment of preset anchors. Report deviations and proposed method for correction to Architect prior to proceeding.

B. Fastening to in-place construction: Provide anchorage devices and fasteners for securing items to in-place construction, including threaded fasteners for concrete inserts. Anchor bolts and erection bolts of types and sizes indicated on approved shop drawings.

C. Placement: Set work in location, alignment and elevation, plumb and level within specified tolerances, true and free of rack; measured from established lines and levels. Install work in accord with approved shop drawings.

D. Protection: Protect components from contact with dissimilar materials by separating with concealed neoprene gaskets or bituminous coating. Protect finishes from damage or scratching during installation.

E. Connections: Provide connections as indicated on approved shop drawings. Join dissimilar metal by bolting with galvanic separators.

F. Caulk perimeter of canopies using silicone sealant as specified in Joint Sealants section. Flash to abutting walls for watertight connection.

G. Drainage system: Connect canopy downspouts to underground storm drainage system. Refer to Civil drawings and specifications for connections.

H. Site tolerances:
1. Maximum variation from plumb, level, or designated position: 1/8" in 10'-0" vertical or 1/8" in 20'-0" horizontal.

2. Maximum offset in alignment between two consecutive members in line, end to end: 1/16".
3. Maximum offset between framing members at corners of glazing pocket: 1/32".

3.3 CLEANING:

A. Cleaning: Maintain canopy assembly in reasonably clean condition during construction period. Immediately remove stains or materials having adverse effect on materials and finishes. Remove excess sealant compounds.

B. Final cleaning: Just prior to Date of Substantial Completion, clean entire canopy assembly using pretested detergent and water. Flush with clean water. Repair or replace work which cannot be cleaned or which has been damaged during construction operations.

3.4 PROTECTION:

A. Protection: Protect prefinished surfaces from damage or staining. Provide protective covering following installation for duration of project.

End of Section

SECTION 11 5213

PROJECTION SCREENS

PART 1 - GENERAL

1.1 SUBMITTALS:

A. Product data: Indicate material types, finishes and sizes, fabrication and installation details.

1.2 JOB CONDITIONS:

A. Protection: Protect prefinished surfaces from damage or staining.

PART 2 - PRODUCTS

2.1 WALL-MOUNTED MANUALLY-OPERATED PROJECTION SCREEN:

A. Acceptable products:
1. Bretford Manufacturing, Inc., Series 500.
2. Da-Lite Screen Co., Inc., Model C.
3. Draper Screen Co., Inc., Luma 2.

B. Characteristics:
1. Type: Manually operated spring roller screen in manufacturer's standard steel case, 22 ga. minimum, painted or wood grain vinyl finish.
2. Screen fabric: Flame-retardant, mildew-resistant fiberglass fabric with matt white vinyl finish and black border; screen fabric attached to metal roller using manufacturer's standard system.
3. Screen size: As indicated on drawings.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Install manually-operated screens in locations indicated on drawings, secured to wall construction using manufacturer's standard mounting brackets and hardware as indicated on approved product data submittal. Mount units level and centered above markerboards. Adjust for correct operation, extension, retraction and flush closing of case trap doors.

B. Protect screen surfaces from damage or staining. Clean screen surfaces using mild detergent; rinse and dry using soft lint-free cloths. Replace screens with soiled or blemished surfaces.

End of Section

SECTION 22 0000

PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. The requirements of the General Conditions, Special Conditions and Section 23 0000, Mechanical General, apply to all work specified in this section.

1.2 DESCRIPTION:

A. Include all necessary apparatus, excavating, controls, valves and fittings required for a complete sanitary plumbing system.

1.3 UTILITIES AND SERVICES:

A. Sanitary: Provide a sanitary drainage system, connecting from all plumbing fixtures to 5'-0" outside the footprint of the building. The civil engineering drawings detail the connections to the existing sanitary drainage system.

B. Storm: Provide a roof drainage system extending from the roof drains to 5'-0" outside the footprint of the building. The civil engineering drawings detail the connections to the existing storm drainage system.

C. Water: Provide a domestic (City) water system, extending to 5'-0" outside the footprint of the building. The civil engineering drawings detail the connection to the existing water main.

D. Natural gas: Utilize existing natural gas service, connecting to the existing natural gas meter/mains. Coordinate with local gas company for changes in existing natural gas load and for any required changes in the natural gas service including meter, pressure regulator and any other devices required by the Utility. Pay all fees associated with the modification to the existing gas service.

PART 2 - PRODUCTS

2.1 PIPING:

A. Domestic hot and cold water piping:
1. Above grade: Hard drawn type "L" copper tubing.
2. Below grade:
   a. 1 inch and smaller: Soft temper type "K" copper tubing.
   b. 1-1/4 inch and larger: Hard drawn type "K" copper tubing.
3. Protect all uninsulated copper piping below grade with

a Bitumen coating.

B. Soil, drain, waste and vent piping:
1. Interior above grade: Service weight cast iron soil pipe, no-hub pattern. Only piping products made in the USA will be acceptable.
2. Below grade and exterior: Service weight cast iron soil pipe, hub and spigot pattern, tar coated. Only piping products made in the USA will be acceptable.

C. Storm drain piping:
1. Interior above and below grade to 5 feet outside of the footprint of the building: Service weight cast iron soil pipe, no-hub pattern. Only piping products made in the USA will be acceptable.

D. Gas piping:
1. Schedule 40 black steel, screw type for piping 2 inch and smaller per ASTM A-120, weld type for piping 2-1/2 inch and larger per ASTM A-53.
2. Buried steel pipe in contact with the earth shall be metallic arc welded and coated with high density "X-Tru-Coat" polyethylene and with polyethylene tape coat joints.

2.2 PIPE FITTINGS:

A. Domestic hot and cold water piping: Sweat type, wrought copper fittings. Provide reducing fittings to reduce pipe size. Bushings will not be acceptable.

B. Cast iron piping fittings shall be cast iron corresponding to the pipe (hub and spigot or no-hub). Below grade fittings shall be tar coated. Only pipe fittings made in the USA will be acceptable.

C. Gas piping:
1. High pressure gas piping fittings shall be standard weight butt weld manufactured per ASTM A-234 standards.
2. Low pressure gas piping fittings shall be threaded black malleable iron, Class 150 per ANSI B16.3 standards. Galvanized fitting shall not be approved and shall be removed from the system.

2.3 PIPE JOINTS:

A. Solder joints (2-1/2" and smaller) in Type L copper tubing and on all copper waste piping: Tin-antimony/silver solder, totally lead free, in accordance with manufacturer's recommendations.

B. Brazed joints (3" and larger) in Type L copper tubing and all Type K copper tubing: Lead free brazing alloy having a melting point at or above 1,000 deg. F. During brazing procedure, purge all oxygen from the piping with nitrogen to

prevent oxidation from occurring inside the piping.

C. Joints in cast iron piping:
1. Joints for hub and spigot piping shall be one piece elastomeric compression-type gaskets made of neoprene. Gaskets shall be marked with ASTM C564 and the "CI" symbol of the Cast Iron Soil Pipe Institute. Gaskets shall completely fill the hub.
2. Joints for no-hub soil piping shall be heavy duty no-hub couplings constructed of 304 stainless steel with four stainless steel bands and a minimum shield thickness of 0.015 inches. Couplings shall be manufactured by Husky SD 4000, Clamp-All, Tyler, Charlotte, Alpha, Mission or approved equal, contingent upon full compliance with all criteria.

D. Joints in gas piping:
1. High pressure gas piping joints shall be metallic arc weld or gas weld with oxygen and acetylene. Welders shall be qualified per ASA B31-1 code for pressure piping.
2. Low pressure gas piping joints shall be threaded. All burrs shall be removed, pipe ends shall be reamed or filed out to size of bore, and all chips shall be removed. Pipe joint compound shall be used only on male threads.

2.4 GRADES:

A. Horizontal drainage piping less than 3 inch diameter shall be installed with fall of not less than 1/4 inch per ft. Drainage piping 3 inch diameter and larger shall be installed with fall of not less than 1/8 inch per foot unless otherwise shown on the drawings.

2.5 VALVES AND SPECIALTY ITEMS:

A. Refer to Section 23 0523, Valves, for requirements.

2.6 HANGERS AND SUPPORTS:

A. Refer to Section 23 0529, Pipe Hangers and Supports, for requirements.

2.7 PIPING INSULATION:

A. Refer to Section 23 0700, Thermal Insulation for Mechanical Systems, for requirements.

2.8 FLOOR AND ROOF DRAINS:

A. Drains shall be manufactured by Josam Manufacturing Company or equal by Zurn Industries, Inc., Wade Manufacturing Company or Smith. All drains shall be of the same manufacturer.

B. Roof drains shall be painted cast iron, minimum 4 inch size with deck clamps and sump pan, arranged for inside caulking. Josam Series 21000 or approved equal, contingent upon full compliance with all criteria..

C. Floor drains shall be coated cast iron floor drain, two-piece body with double drainage flange, flashing collar, weepholes, bottom outlet, inside caulk connection, adjustable satin nikaloy strainer and cast iron P-trap. Strainer top shall be two sizes larger than the drain size. Josam or approved equal, contingent upon full compliance with all criteria.

D. Floor sinks shall be Josam Series 49040AS square cast iron, 3/8" deep, acid resistant interior finish, bottom outlet with aluminum internal dome strainer, weepholes, inside caulk connection, nikaloy anti-tilting grate and cast iron P-trap. Coordinate with the kitchen equipment supplier for providing partial grates for indirect wastes.

2.9 TRAP PRIMERS:

A. Provide trap primers on all floor drains and floor sinks. Connect trap primer to domestic cold water piping at least 12" above the traps to ensure proper flow. Trap primers shall be accessible and shall be installed above ceiling space in areas where lift out tile suspended ceilings are present. Provide access panels in areas with non-removable ceilings.

B. Trap primers shall be manufactured by Precision Plumbing Products model SP-500-24V, Sloan, Zurn or approved equal, contingent upon full compliance with all criteria.

2.10 CLEANOUTS:

A. Cleanouts shall consist of cast iron ferrule and heavy brass cleanout plug with square head.

B. Cleanouts in floors shall have inside caulk outlet, coated cast iron internal cleanout with lead seal, brass rim, and Nikaloy cover plate for light traffic, secured to plug by countersunk screw for installation flush with finished floor. Josam, Zurn, Wade, J.R. Smith or approved equal, contingent upon full compliance with all criteria.

C. Where piping is concealed in walls install cleanouts with counter-sunk plugs and chrome plated or stainless steel covers on the surface of the wall. For cleanouts in floors with vinyl composition tile (VCT) provide cover plate with depression for inset in the VCT. Provide carpet marker in carpeted areas

2.11 WATER HAMMER ARRESTORS:

A. Field fabricated air chambers will not be acceptable.

B. Select and size water hammer arrestors in strict accordance with Standard PDI - WH201.

C. Arrestors shall be manufactured by Josam 75000, Zurn, Smith, Wade, Precision Plumbing Products or approved equal, contingent upon full compliance with all criteria.

2.12 WATER PRESSURE REDUCING VALVE:

A. Where the pressure of water service exceeds 70 psig, provide a water pressure reducing valve. Water pressure reducing valve shall be high capacity regulator, Watts Series 223-S rated for 250 psig inlet, and set for 65 psig outlet or approved equal, contingent upon full compliance with all criteria. For pipe sizes larger than 2-1/2 inch, use dual pressure reducing valves piped in parallel.

B. When a pressure reducing valve is not required, provide on the incoming water service a main shut off valve and strainer with a pressure gauge on each side of the strainer. Watts 77 Series with strainer or approved equal, contingent upon full compliance with all criteria.

2.13 HOSE BIBBS:

A. Interior hose bibbs (non-freeze areas): Chrome plated, all brass construction with adjustable packing nut, teflon impregnated packing and standard "O" size washer, tee handle. Woodford Model 24P-1/2 and vacuum breaker by Chicago Mfg. or T&S Brass Co or approved equal, contingent upon full compliance with all criteria.

B. Exterior hose bibbs (freeze-proof wall box): Non freeze, automatic draining type with vacuum breaker, all brass construction enclosed in flush mounted, chrome plated, brass wall box. Woodford Model B65, Chicago Mfg., T&S Brass Co or approved equal, contingent upon full compliance with all criteria.

C. Provide at project hand-over two keys for every hose bibb furnished for this project. Submit with close-out documents.

2.14 VACUUM BREAKERS:

A. Provide vacuum breakers on connections to all hose bibbs, hose outlets, wall hydrants, below the rim water supplies of all types, plugged or capped outlets and at all other locations shown on the drawings.

B. Vacuum breakers shall have bronze body, chrome-plated in finished areas. Watts Regulator Company Model No. 288A or approved equal.

2.15 PLUMBING FIXTURES:

A. Provide plumbing fixtures complete with trim. All fixtures, trimmings and stops shall be Grade "A" and shall be of one manufacturer. Trim shall be chrome plated brass. Plastic trim will not be acceptable. Refer to the plumbing fixture schedule on the drawings. Equal manufacturers to those listed below may be approved, contingent upon full compliance with all criteria.

B. Plumbing fixtures for use by handicapped persons shall be in accordance with the Americans with Disabilities Act (ADA) and/or local accessibility codes.

C. Plumbing fixtures shall be low water consumption type with a maximum of 1.5 gal/flush for water closets, 1.0 gal/flush for urinals and 0.5 gpm for lavatories unless specified otherwise.

D. Manufacturers:
1. Fixtures: American Standard or Kohler, Fiat or Stern-Williams.
2. Lavatory/sink faucets: Symmons, American Standard or Kohler.
3. Trim: Jameco, Brasscraft or McGuire.
4. Flush valves: Sloan, Delaney or Zurn.
5. Toilet seats: Bemis, Beneke, Church or Centoco.
6. Drinking fountains: Oasis, Halsey Taylor or Acorn Aqua.
7. Stainless steel sinks: Just or Elkay.
8. ADA insulation: Truebro # 103.

E. Models:
1. See Plumbing Fixture Schedule on the drawings for specific manufacturers, models and additional information.

2.16 WATER HEATER:

A. Water heater shall be fully automatic, electric element, storage tank type.

B. The storage tank shall be steel, rated for 150 psig, with threaded tappings in accordance with ASME B1.20.1 and with an interior finish complying with NSF 61 barrier material for potable water tank linings, including lining material into tappings.

C. The water heater shall be complete with the following factory-installed appurtenances:
1. Replaceable magnesium anode rod.
2. Dip tube.
3. Drain valve in accordance with ASSE 1005.
4. Insulation complying with ASHRAE/IESNA 90.1 or ASHRAE 90.2.
5. Steel jacket with enameled finish.

6. Single electric heating element.
8. Adjustable thermostatic temperature control.
9. Inlet type heat trap fitting on cold water inlet and outlet type heat trap fitting on hot water outlet.
10. Combination pressure and temperature relief valve in accordance with ANSI Z21.22/CSA 4.4. Relieving capacity shall be at least as great as the heat input and shall include pressure setting less than water heater working pressure rating. The relief valve sensing element shall extend into the storage tank.

D. The water heater shall be guaranteed by the manufacturer for a period of not less than 3 years after start-up. Furnish to the Owner the manufacturer's guarantee.

E. Water heater manufactured by A.O. Smith as detailed on the drawings and schedule. American Water Heater Co., Bradford White, State Industries, LARRS or equal will be acceptable contingent upon full compliance with all criteria.

2.17 HOT WATER RECIRCULATING PUMP:

A. The hot water system shall be returned to the water heater by an in-line cartridge type circulating pump.

B. The hot water recirulating pump shall be controlled by an aquastat and a time clock. The controls may be integral or independent.

C. See the drawings for additional manufacturer, model and installation requirements.

PART 3 - EXECUTION

3.1 GENERAL:

A. Make connections to all fixtures, traps and similar items. Place into operation all equipment.

B. Refer to the architectural drawings for the exact location of fixtures and drains. Determine rough-in dimensions from the manufacturer of the equipment furnished.

3.2 INSTALLATION:

A. Remove stems and washers from solder end valves and other item subject to damage by heat during installation and reassemble valve after soldering.

B. Provide dielectric union connectors at all connections between non-ferrous and ferrous metal piping materials.

C. Pipe openings shall be closed with caps or plugs during installation. Tightly cover fixtures and equipment and protect against dirt, water, chemicals and mechanical injury. Upon completion of the work, thoroughly clean,

adjust and operate the fixtures, materials and equipment.

D. Cut pipe accurately and work into place without springing or forcing. Run above ground piping parallel with the lines of the building unless otherwise indicated. Do not bury water pipe in or under floors unless specifically indicated on the drawings. Make changes in pipe sizes with reducing fittings. Use of bushings will not be acceptable, make changes in direction with fittings.

E. Securely anchor water piping to urinal and water closet flush valves within the wall structure during the plumbing rough-in phase to prevent movement. Use only non-ferrous materials for anchor straps or pipe clamps.

3.3 DRAINS:

A. Set floor drains with tops flush with the finished floor. Route water line from trap primer connection to floor drain concealed inside walls, partitions and the floor system.

B. Install roof drains with lead flashing extending at least 8" from the clamping ring in all directions.

C. In special roofing systems, flash in accordance with roofing manufacturers recommendations.

3.4 CLEANOUTS:

A. Provide cleanouts where indicated and where required by the applicable plumbing code.

B. Cleanouts shall be 4 inch size in line sizes 4 inches and smaller. Pipe lines larger than 4 inches shall have cleanouts same size as the line size.

C. Cleanouts installed outside buildings shall be the same as in floors, shall be flush with the grade and shall have minimum 6 inch thick, 24 inch diameter concrete pad poured around the cover. Make cover flush with top of concrete.

3.5 PRESSURE REDUCING VALVE:

A. Provide for a pressure test of the water service and forward the results to the Architect. Where the pressure exceeds 70 psig, provide a pressure reducing station. Pressure reducing station shall include a pressure reducing valve, bypass with globe valve, pressure gauges and isolation valves at the entering and leaving sides.

B. Pressure reducing valve shall be manufactured by Watts model 223S or approved equal, contingent upon full compliance with all criteria.

3.6 BACKFLOW PREVENTER:

A. Where required by local code, provide a backflow preventer on the incoming domestic water service inside the building. If it is not required for the backflow preventer to be located inside the building, coordinate with the civil engineer for locating the unit outside the building.

B. Provide a full size copper drain line from the unit to floor drain.

3.7 PLUMBING FIXTURES:

A. Grout between plumbing fixtures and walls and/or floors.

B. For connection of floor outlet water closets, use brass floor flanges. Make the joints between closet trap and flange tight with gaskets.

C. Make the connection of fixture traps from lavatories, drinking fountains, service sinks, etc. to cast iron with D.W.V. type copper.

D. Seal, using sealant meeting the requirements of Federal Specification TT-S-230, for the joint between urinals and wall and between water closets and floor.

3.8 WATER HEATER:

A. Provide a drain pan under the water heater. Pipe relief valve discharge to floor drain. Do not make direct connection to drain.

B. Install water heater and accessories in strict accordance with the manufacturer's recommendations.

3.9 TESTS:

A. Test the plumbing system as required by the applicable plumbing code.

B. Test domestic hot and cold water piping for a continuous period of not less than four hours at a hydrostatic pressure of not less than 125 psig and make free from leaks. Completely remake leaky joints with piping dry. Retest system after leaks are corrected.

C. Plug all necessary openings in the drainage and vent piping systems and fill the entire system with water to the level of the highest vent stack above the roof. Hold this water for 30 minutes without showing a drop in water level greater than 4 inches. Subject to approval of the Architect, the drainage system may be tested in sections.

D. Test natural gas piping at 50 psig minimum using compressed air or inert gas for a minimum of 6 hours without a

discernible loss of pressure when adjusted for temperature changes. Subject all joints to a soap suds test during testing.

3.10 STERILIZATION:

A. Disinfect the potable water system in accordance with the applicable plumbing code. After disinfection, send water samples to the local Health Department for testing for purity and lead content. Obtain approval of the local Health Department before the system is placed into service. Submit written test results with close-out documents.

B. Unless the local Health Department requires otherwise, disinfect potable water piping upon completion of installation by a mixture containing not less than 0.6 pounds of high test calcium hypochlorite, or 2 pounds of chlorinated lime to each 1000 gallons of water to provide not less than 50 ppm of available chlorine. Inject the mixture into the system and retain for not less than 24 hours, at which time the chlorine level shall be at 10 ppm or greater. Then drain the system and flush with potable water until only a normal chlorine residual remains (0.2 ppm).

End of Section

SECTION 23 0000

MECHANICAL GENERAL

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This division and the accompanying drawings cover furnishing of all labor, equipment, appliances and materials and performing all operations in connection with the installation of complete air conditioning, ventilating, heating, plumbing and fire protection systems as specified herein and as shown on the drawings.

B. The general provisions of the Contract including the conditions of the Contract (General, Supplementary and other Conditions) and other divisions as appropriate, apply to all work specified in this division.

1.2 CODES AND REGULATIONS:

A. Comply with the following codes and standards as applicable, including all Georgia amendments, for all heating, ventilating and air conditioning materials and workmanship:
1. The International Energy Conservation Code, 2000 Edition.
2. The International Mechanical Code, 2006 Edition.
3. The National Electrical Code, 2005 Edition.

B. Comply with the following codes and standards as applicable, including all Georgia amendments, for all plumbing materials and workmanship:
1. The International Plumbing Code, 2006 Edition.
2. The National Electrical Code, 2005 Edition.

C. Comply with the following codes and standards as applicable, including all Georgia amendments, for all fire protection material and workmanship:
1. The International Fire Code, 2006 Edition.
2. The National Electrical Code, 2005 Edition.

D. The publications listed below form a part of this specification to the extent referenced and are referred to in the text by the basic designation only.
1. Air-Conditioning and Refrigeration Institute Standards (ARI).
2. American National Standards Institute, Inc. Standards (ANSI).
3. American Society for Testing and Materials Publications (ASTM).

4. American Society of Mechanical Engineers Code (ASME).
5. Factory Mutual Underwriters (FM).
6. National Fire Protection Association Standards (NFPA).
7. Sheet Metal and Air-Conditioning Contractors' National Association, Inc. (SMACNA).
8. Underwriters Laboratories, Inc. (UL).

E. Comply with all state and local codes having jurisdiction. Make all modifications required by these codes without additional charges. Immediately bring to the attention of the Architect any conflict between these documents and the governing codes. Follow the drawings and specifications where code requirements are less stringent than those shown on the drawings or in the specifications.

F. Obtain all permits, inspections and approvals as required by all authorities having jurisdiction and deliver certificates of approval to the Architect. Assume and pay all fees and costs of any nature whatsoever incidental to these permits.

G. Comply with all applicable provisions of the William-Steiger Occupational Safety and Health Act (OSHA).

PART 2 - PRODUCTS

2.1 COORDINATION:

A. The products of particular manufacturers have been used as the basis of design in preparation of these documents. Coordinate with all other trades any modifications to the mechanical systems and their components, the electrical systems, the building structure and architecture or any other portion of the building that result from the use of any other than the basis of design equipment.

B. Such coordination shall occur before delivery of products from the manufacturer and shall be clearly indicated on the shop drawings. Perform all related modifications without any additional cost to the Contract.

2.2 DESCRIPTION:

A. All products shall be new and shall bear the Underwriter's Laboratories, Inc. (UL) label unless specifically indicated otherwise.

PART 3 - EXECUTION

3.1 GENERAL:

A. The mechanical/plumbing/fire protection drawings do not give exact elevations or location of lines, nor do they show all the offsets, control lines or installation details. Carefully lay out the work at the site to conform to the structural conditions, to provide proper grading of lines, to avoid all obstructions, to conform to details of the installation supplied by the manufacturers of the equipment to be installed, and to thereby provide an integrated and coordinated installation operating at optimum performance.

B. If equipment, piping and ductwork requires space conditions other than those shown, or if the equipment is rearranged, assume full responsibility for the rearrangement of the space and have the Architect review the change before proceeding with the work. Perform all related costs incurred without any additional cost to the Contract.

C. Properly locate and size of all slots and openings in the building structure pertaining to the work and correctly locate sleeves, inserts and cores.

D. Coordinate the work of several various trades so that it may be installed in the most direct and workmanlike manner without hindering or handicapping the other trades. Handle piping interferences by giving precedence to pipe lines which require a stated grade for proper operation. For example, sewer lines and condensate piping shall take precedence over water lines in determination of elevations.

E. Install all piping and ductwork in finished areas in chases, furred spaces or above ceilings. Install pipes and ducts as high as possible. Group runs of piping whenever it is feasible to do so.

F. Do not install piping, equipment or ductwork in electrical rooms or electronic data rooms except as serving only those rooms. Do not run piping or ductwork or locate equipment with respect to switchboards, panelboards, power panels, motor control centers or dry type transformers:
1. Within 42" in front (and rear if free standing) of equipment.
2. Within 36" of sides of equipment.
3. Clearances apply vertically from floor to structure.

G. Provide access to equipment and apparatus requiring operation, service or maintenance within the life of the system. Devices include but are not limited to motors,

valves, filters, dampers and shock absorbers. Equipment located above lay-in type ceilings is considered accessible.

3.2 EXCAVATION, TRENCHING AND BACKFILLING:

A. Perform all excavation, trenching and backfilling for work under Divisions 21 and 22. During excavation, pile material for backfilling back from the banks of the trench to avoid overloading and to prevent slides and cave-ins. Remove and dispose of all excavated material not to be used for backfilling. Grade to prevent surface water from flowing into trenches and other excavations and any water accumulating therein shall be removed by pumping. Make all excavations by open cut. Do no tunneling.

B. Lay pipe on firm soil, laid in straight lines and on uniform grades. Provide bell holes so that barrels of pipe rest evenly on bottom of trench along entire length of pipe.

C. Inspect and test pipe prior to backfilling. Use no roots, rocks or foreign materials of any description in backfilling the trenches. Hand fill trenches to a minimum of 12" above the top of the pipe with clean earth and tamp to 95% compaction after first layer using the modified Proctor test method of compaction.

3.3 ELECTRICAL WORK:

A. Comply with the electrical system characteristics indicated on the electrical drawings and specified in Division 26 all electrical equipment provided under this Division.

B. All components shall be in conformance with the requirements of the National Electrical Code and Division 26. Furnish motor starters for all equipment under Section 23 0513, Starters and Disconnect Switches, unless specifically indicated to be furnished under Division 26.

C. Provide all power wiring and final power connections to the systems under Division 26.

D. Provide control wiring (120 volt and less) under Division 23 and extend from the 120 volt power circuits indicated on the electrical drawings. All wiring for voltages higher than 30 volts shall be done by a licensed electrician.

E. Take all electrical characteristics from the electrical drawings and coordinate with the electrical drawings before equipment is ordered or shop drawings submitted.

F. Electrical power wiring to HVAC control panels may not be indicated on the drawings. Determine final control panel locations and quantity prior to bidding and include 115 volt power circuits to each control panel location.

3.4 MOTORS:

A. Unless specifically noted otherwise in other sections of these specifications, all motors and motor controllers shall meet the requirements specified in this Section. All motors shall be built in accordance with the current applicable IEEE and NEMA standards and shall have voltage, phase, frequency and service as scheduled.

B. Motors shall be ball bearing type selected for quiet operation and shall be manufactured for general purpose duty unless otherwise indicated. Each bearing shall be accessible for lubrication and designed for the load imposed by the V-belt drive or the driven apparatus. Direct drive motors shall be designed for the specific application with all necessary thrust bearings and shaft capacities.

C. Each motor to be installed outdoors shall be of the totally enclosed fan-cooled type or housed in a weatherproof housing.

D. Unless otherwise indicated, motors smaller than 1/2 horsepower shall be capacitor start or split phase type designed for 120 volt, single phase, 60 cycle alternating current. Shaded pole motors will not be acceptable except 35 watts and smaller. Motors 1/2 horsepower and larger shall be squirrel cage induction type, 3 phase, 60 cycle alternating current.

E. If motors are furnished varying in horsepower and/or characteristics from those specified, first inform the Architect of the change by clearly identifying it on the shop drawings or submittal, and then coordinate the change with all associated parties. Bear all additional charges in connection with the change.

3.5 PROTECTION OF EQUIPMENT:

A. Store all equipment, including pipe and valves, off the ground and under cover. For storage outdoors, securely fit minimum 4 mil thick plastic to withstand splattering, ground water, precipitation and wind.

B. Protect coils by use of protective sheet metal panels or plywood.

C. Plug ends of pipe when work is stopped and close ends of ducts with 4 mil thick plastic taped in place until work resumes. Duct tape is not an acceptable substitute.

D. Repair or replace damaged equipment at the option of the Architect.

3.6 PAINTING:

A. Repaint factory painted equipment that has been scratched or marred to match original factory color.

B. Clean and paint all un-insulated black ferrous metal items exposed to sight inside the building such as loop water piping, fire sprinkler standpipes and exposed sprinkler piping, equipment hangers and supports with one coat of zinc chromate primer. In addition, paint such items in finished spaces with two coats of finish paint in a color to match adjacent surfaces or as otherwise directed by the Architect.

C. Clean and paint black ferrous metal items exposed outside the building such as gas piping, uninsulated pipe and pipe supports with one coat of rust inhibiting primer and two coats of an asphaltic base aluminum paint. Clean and paint all piping installed outside the building that is to be insulated with one coat of rust inhibiting primer before installing insulation.

D. Do not paint nameplates on equipment and afford suitable protection to the plates to prevent their being rendered illegible during the painting operation.

E. Re-coat galvanizing broken during construction with cold galvanizing compound.

F. Paint all ductwork, piping, insulation, conduit or other appurtenances visible through ceiling grilles flat black.

3.7 PROTECTION OF EXISTING UTILITIES:

A. Use extreme caution during excavation operations not to damage or otherwise interrupt the operations of existing utilities. Be responsible for the continuous operation of these lines and provide bypasses or install such shoring, bracing or underpinning as may be required for proper protection.

B. Schedule work so existing systems will not be interrupted when they are required for normal usage of the existing building. Inform the Owner's representative and Architect and obtain approval from the utility authority involved at

least seven days prior to any utility interruption or connection.

C. Coordinate all activities around existing utility lines with the appropriate utility company.

3.8 CUTTING AND PATCHING:

A. Assume all cost of, and be responsible for, all cutting and patching required to complete the installation of the work. All cutting shall be carefully and neatly done so as not to damage or cut away more than is necessary of any portions of the structure.

B. Reinstate all surfaces to the condition of the adjacent surfaces.

C. Make suitable provisions for adequately water-proofing at the penetrations of exterior walls and roofs.

3.9 SLEEVES AND FRAMES:

A. Install in concrete, carpentry or masonry construction, all necessary sleeves, frames, hangers, expansion bolts, inserts and other fixtures and appurtenances necessary for the support of all pipe, duct, equipment and devices furnished under this Division.

B. Cut openings and install sleeves or frames through walls and surfaces in a neat workmanlike manner. Cut openings only as large as required for the installation. Install sleeves and/or frames flush with finished surfaces and grout in place unless otherwise indicated. Leave surfaces around openings smooth and finish to match surrounding surface.

C. Where pipes pass through walls, sleeves shall be standard weight black steel pipe or 20-gauge galvanized sheet metal with ends flush with both surfaces.

D. Provide each pipe or duct passing through walls or partitions with sleeves having an internal diameter 1 inch larger that the outside dimensions of the insulated pipe or duct.

E. Build all pipe sleeves through new masonry walls in place as the affected new walls are built.

F. Pack all penetrations through rated walls with mineral wool and cap off with a silicon caulk. As a alternate use an approved, fire rated sealant as manufactured by Hilti, 3M or Dow. Assemblies and materials shall meet or exceed UL

1479 or ASTM E814 requirements. Fire dampers, if required, shall be installed in UL listed fire penetration duct assemblies and shall be type 'B' curtain type dampers rated appropriately for the rating of the fire barrier they are penetrating.

G. Sleeves through exterior walls shall be steel pipe, cast iron pipe or Schedule 40 PVC flush with both wall surfaces, and with the space between the pipe and the sleeve caulked watertight in an approved manner.

H. Inserts shall be individual type galvanized steel with accommodations for removable nuts and threaded rods up to 3/4 inch diameter and permitting lateral adjustment.

3.10 ESCUTCHEONS:

A. Install escutcheons on all pipes where they pass through ceilings, walls or partitions in finished areas.

B. Escutcheons shall be split, hinged, stamped brass type designed to fit the pipe and to cover the terminating pipe sleeve. Escutcheons shall be chrome plated finish unless otherwise specified with a securing device to hold them tight to the pipe.

C. Allow sufficient spacing between parallel pipe runs to ensure installation of escutcheons without modification. Do not alter the escutcheons in any manner to allow for installation.

3.11 CLEANING:

A. Flush new water piping systems until water runs clean. Mild chemical cleaning may be required. If so, flush all cleaning chemicals out of the piping system before recharging with water.

B. Remove all stickers, rust, stains, labels and temporary covers before final acceptance.

C. Clean the exterior surfaces of all mechanical equipment, plumbing fixtures, piping and ducts of all grease, oil, paint, dust and other construction debris.

D. Clean the interior of all ducts, plenums and casings of all debris and blow free all particles of rubbish and dust before installing outlet faces.

E. Lubricate bearings that require lubrication in accordance with the manufacturer's recommendations. Provide two copies of certification of lubrication.

F. Provide temporary filters for any fans operated during construction. Change temporary filters regularly to prevent contamination of the equipment and duct systems. Install new and unused permanent filters one week prior to final inspection.

G. Cover ends of open ducts and pipes during construction except when working on such end prohibits covering. Cover with minimum 4 mil thick polyethylene taped, tied or wired in place.

H. Sterilize the domestic water supply and distribution system in accordance with Section 22 0000, Plumbing, and the local codes having jurisdiction. Furnish three copies of a certificate of performance of complete sterilization to the Architect before final inspection of the work. All work shall be certified by a state approved testing laboratory.

3.12 EQUIPMENT, MATERIALS AND BID BASIS:

A. It is the intent of these Specifications to indicate a standard of quality for all materials incorporated into the work. Manufacturer's names are used to designate the item of equipment or material as a means of establishing grade and quality.

B. Substituted manufacturers of similar quality products will be considered unless these specifications state otherwise. Such manufacturer's products may be considered as substitutions but shall not be used as a basis for bidding. In the event substitutions are submitted to the Architect for review prior to bid, furnish descriptive catalog material, test data and samples, as well as any other pertinent data necessary to demonstrate that the proposed substitutions are acceptable equals to the specified product. No substitutions shall be made without the written consent of the Architect.

C. The use of one named manufacturer in the schedules on the drawings is for guide purposes. The provisions of the previous paragraph shall govern in the selection of products to be used.

3.13 WARRANTY:

A. Provide all systems and components with a one year warranty from the date of final acceptance unless otherwise noted in the contract documents. The warranty shall cover all materials and workmanship. During this warranty period correct all defects in materials and workmanship by repair

or replacement without incurring any additional cost to the Contract.

B. Warrant all air conditioning compressors for an additional four years beyond the initial one year warranty. This additional warranty shall include parts only.

3.14 RECORDS AND INSTRUCTIONS FOR OWNER:

A. Accumulate during the job's progress the following data in triplicate prepared in neat brochures or packet folders and turn over to the Architect for check and subsequent delivery to the Owner:
1. All warranties, guarantees and manufacturer's directions on equipment and materials.
2. Approved fixture brochures, wiring diagrams and control diagrams.
3. Copies of approved shop drawings.
4. Operating instructions for the HVAC and other mechanical systems. Include recommended periodic maintenance and seasonal changeover procedures, and suggested procedures in operation of all systems to promote energy conservation. Write these instructions expressly for this project and refer to equipment and devices by mark number from the drawing schedules.
5. Repair parts lists of all major items of equipment including name, address and telephone number of the local supplier or agent.

B. Submit all of the above data to the Architect for approval at such time as the last inspection is requested prior to the final inspection, but in no case less than two weeks before final inspection.

C. Give not less than sixteen hours of operating instruction, during the adjustment and testing period, to the Owner's operating personnel in order to familiarize them with the proper care and operation of the equipment. Break the 16 hours into a series of 4 hour sessions. Use the written operating instructions referred to above as the basis for this instruction.

D. A competent technician employed by the Building Automation System subcontractor shall be required to instruct the Owner in proper operating procedures and shall explain the significance of the controls literature filed in the maintenance manual over a period of two days while the system is in continuous operation.

3.15 RECORD DRAWINGS:

A. Maintain on a daily basis at the project site a complete set of "Record Drawings" reflecting an accurate dimensional record of all buried or concealed work. Mark the "Record Drawings" to show the precise location of concealed work and equipment, including concealed or embedded piping and valves and all changes and deviations in the work from that shown on the Contract Documents. This requirement shall not be construed as authorization to make changes in the layout of the work without definitive instructions from the Architect.

B. The "Record Drawings" shall consist of a set of mylar sepia prints of the Contract drawings for this Division with the Engineer's seal and Engineer's firm name blacked out or removed. Prior to commencing work purchase from the Architect a set of mylar sepia prints to be used for the "Record Drawings"

C. Record dimensions shall clearly and accurately delineate the work as installed. Locations shall be suitably identified by at least two dimensions to a permanent structure.

D. Mark all "Record Drawings" on the front lower right hand corner with a rubber stamp impression that states the following: "RECORD DRAWINGS. To be used for recording field deviations and dimensional data only"

3.16 INSTALLATION:

A. Install all equipment in strict conformance with the manufacturer's recommendations, as specified herein and as shown. If any conflict arises between these instructions notify the Architect immediately for guidance.

3.17 EQUIPMENT LABELS:

A. Permanently label each item of equipment with a nameplate of sufficient size to clearly indicate the identification designation (i.e. mark number) appearing in the Contract documents.

B. Nameplates shall be 1/16" thick bakelite laminate engraved with white letters through black, or aluminum with black enameled surface and engraved letters. Handwritten marker identifications will not be acceptable.

3.18 ACCESS DOORS:

A. Furnish and install access doors at each point required to provide access to concealed valves, cleanouts, fire dampers and other devices requiring operation, adjustment or

maintenance. Access doors shall be 16 gauge steel, prime coat finish with mounting straps, concealed hinges and screwdriver locks, designed for the door to open 180 degrees.

B. Access doors installed in fire rated walls or partitions shall be UL labeled to maintain the fire rating of the wall or partition.

C. Coordinate access panels in ceilings with the architectural reflected ceiling plans. Obtain approval from the Architect before installing any ceiling access panels.

3.19 FLAME SPREAD AND SMOKE DEVELOPED RATINGS OF MATERIALS:

A. Materials and adhesives used throughout the mechanical systems for insulation, jackets or coverings of any kind, or for piping or conduit systems or components, shall have a flame spread rating not over 25 without evidence of continued combustion, and with a smoke developed rating not to exceed 50. If such materials are to be applied with adhesives, test them as applied with such adhesives, or the adhesives used shall have a flame spread rating not over 25 and a smoke developed rating not to exceed 50.

B. Determine flame spread rating and smoke developed rating by the Method of Testing of Surface Burning Characteristics of Building Materials, NFPA 255, ASTM E84, and Underwriters' Laboratories, Inc. standards. Such materials are listed in the Underwriters' Laboratories, Inc., Building Materials List, under the heading Hazard Classification (Fire).

3.20 HAZARDOUS MATERIALS:

A. Use no products that contain any known hazardous or carcinogenic materials. Do not use products with asbestos or radioactive content. Handling of any hazardous material is beyond the scope of these specifications. Any requirements for such shall be handled outside this Contract by persons contracted to do so.

3.21 FREEZE PROTECTION:

A. During construction ensure that no portion of the work is subjected to freeze damage. Take all steps necessary such as temporary heat, draining of systems, heat tape or other means to prevent damage. Do not use anti-freeze solution in potable water systems. Repair any damages as a result of freezing at no additional cost to the Contract.

B. Prior to start up of any air handling equipment supplied with water coils, when ambient temperature is below 40 degrees F, make certain the intake of outside air is not low enough to drive the mixed air temperature below 35 degrees F.

End of Section

SECTION 23 0515

VARIABLE FREQUENCY SPEED CONTROLLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. The requirements of the General Conditions, Special Conditions and Section 23 0000, Mechanical General, apply to all work specified in this section.

1.2 COORDINATION:

A. The speed controllers of one manufacturer have been used as the basis of design. Any modifications that result from the use of any other units shall be coordinated with all trades. Any modifications shall be performed without incurring any additional cost to the contract.

1.3 ACCEPTABLE MANUFACTURERS:

A. Variable frequency speed controllers manufactured by ASEA-Brown-Bovari (ABB), Eaton, Allen Bradley, Graham or Toshiba will be acceptable.

PART 2 - PRODUCTS

2.1 DESCRIPTION:

A. The variable frequency speed controllers shall be provided in a NEMA 1 enclosure for individual partition or fabricated support installation.

B. The speed controllers shall be of the variable voltage input type or pulse width modulation type.

C. If fabricated supports are used to mount speed controllers, they shall be designed to support the full weight of the controller plus any additional force anticipated to be applied during installation, maintenance or incidental contact. If controllers are partition mounted, structural supports shall be incorporated in the partition framing to comply with the same criteria.

D. Fused input shall utilize standard I squared T type fuses.

E. Inverters shall have UL or ETL approval.

F. Each variable frequency power and logic unit shall be solid state. The unit shall transform input power into frequency and voltage controlled 3 phase output power suitable to

provide positive speed and torque control to air handling unit motors. The speed control shall be stepless throughout the speed range under variable torque load on a continuous basis. The adjustable frequency control/motor combination shall have a power factor of 0.95 or better.

G. Each variable frequency speed controller shall superimpose no electrical line noise on the line side of the electrical service to the controller. Electrical isolation fitters on the line side of the controller are to be included to achieve this result, if required by the characteristics of the speed controller.

H. The speed controller and the speed controller/controlled motor combination shall be certified to be compatible in writing by both the controller manufacturer and the motor manufacturer.

I. The controller/controlled motor combination shall cause no airborne or structure-borne noise to be produced which could cause the occupied areas below the equipment room to experience noise levels exceeding NC40.

J. Factory installed disconnecting means shall be provided on the power to the controller.

2.2 SELF PROTECTION AND RELIABILITY FEATURES:

A. Each controller shall limit output current to 110% of the inverter rating.

B. Each controller shall safely limit the output current in under 50 micro-seconds due to phase short circuits or severe overload conditions.

C. To protect the controller due to non-momentary power or phase loss, under-voltage trip shall activate automatically when line voltage drops 15% below rated input voltage.

D. To protect the inverter due to voltage levels in excess of its rating, over-voltage trip shall activate automatically when the DC bus in the controller exceeds 1000 VDC.

E. Over-temperature trip shall be required to protect the inverter from elevated temperatures in excess of its rating.

F. The controller shall automatically restart from a trip condition resulting from over-current, under-voltage, over-voltage or over-temperature upon removal or correction of the causative condition.

G. For indications of conditions described in items A through E and to show power on, zero speed, and enabled shall be provided in the front panel of the unit.

H. Current and voltage signals shall be isolated from the logic circuitry.

I. Drive logic shall be microprocessor based.

J. In the event of a power loss, the control shall shut down without component failure. Upon return of power the system shall be designed to automatically return to normal operation if the unit is enabled.

K. In the event of a phase short circuit, the control shall be designed to shut down safely without component failure.

L. In the event that an input or output power contractor is opened or closed while the control is activated, no damage to the control shall result.

M. The control shall operate without a motor or any other equipment connected to the inverter.

2.3 OTHER FEATURES:

A. Controller shall be capable of tolerating the following ambient temperatures:
1. Operating: 0 to 40 degrees C.
2. Storage: -20 to 60 degrees C.

B. The output frequency shall not vary with load nor with any input frequency variations. Output frequency will not vary with ±10% input voltage changes.

C. A zero to five volt DC signal shall be provided for speed indicator meter. Provide a 0-100% speed meter compatible with the inverter reference signal mounted on the front panel of the controller.

D. The controller shall be started or stopped by a contact closure.

E. Power supply (115 volt ac) shall be available on the customer connection board when power has been applied.

F. The controller shall accelerate or decelerate in response to a 4-20 mA signal from the Building Automation System.

G. Full unit bypass and accelerate-stop-decelerate switch shall be mounted on door of unit. The switch shall accelerate, decelerate or stop the controller independent

of the control panel. Full bypass operation shall disable the controller and allow air unit operation.

H. Speed controllers controlling air handling units whose operation is a part of an engineered smoke control system shall include an automatic bypass to allow full capacity operation of the air-handling unit fan immediately upon a signal from the fire alarm detection system.

I. Provide a 0-100% speed meter compatible with the inverter reference signal to be mounted in the door of the control panel provided under Division 23.

PART 3 - EXECUTION

3.1 INSTALLATION AND START UP:

A. The controller manufacturer shall provide start-up supervision, in conjunction with the control contractor, as required to place the inverter and control system in proper operation and instruct the Owner.

B. Provide a spare parts kit for the inverter as recommended by the manufacturer.

End of Section

SECTION 23 0700

THERMAL INSULATION FOR MECHANICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. The requirements of the General Conditions, Special Conditions and Section 23 0000, Mechanical General, apply to all work specified in this section.

1.2 DESCRIPTION:

A. All insulation products shall meet NFPA requirements for a Flame Spread Rating not to exceed 25, a Smoke Developed Rating not to exceed 50 and a Fuel Contributed Rating not to exceed 50.

B. Do not use staples for securing insulation.

C. Insulation and vapor barrier shall be continuous through wall sleeves, ceilings and roofs except at fire and fire/smoke dampers.

D. Supports for insulated piping shall be outside the insulation. For pipe sizes 2-1/2 inch and larger provide inserts and pipe shields at pipe hangers. For pipe sizes 2 inch and smaller provide pipe shields only at pipe hangers. Inserts shall be foamglass or calcium silicate insulation and shall be 2" longer than the pipe shields. Use pipe shoes welded to the pipe at roll type hangers.

E. Do not store insulation materials in the building until it is enclosed and dry. Do not install wet insulation.

F. Do not apply insulation products with self-sealing type lap jackets at ambient temperatures below 40 degrees F.

G. Do not insulate the following items:
1. Chromium plated brass connections to plumbing fixtures.
2. Domestic cold water piping except where installed above ceilings or in exterior walls.
3. Loop water piping.
4. Discharge piping from pressure relief devices.
5. Factory pre-insulated ducts.

1.3 QUALITY ASSURANCE:

A. Codes and regulations referred to in these specifications are minimum standards, however if the requirements of these

specifications exceed those of the codes and regulations, the specifications shall govern.

B. Any methods of application of insulation products or finishes not specifically detailed herein shall be applied in accordance with the insulation manufacturer's published recommendations. Apply insulation by experienced workers regularly employed in this type of work.

C. Insulation products manufactured by Owens-Corning, Johns-Manville, CertainTeed, Knauf or Armstrong will be acceptable.

D. Adhesives, mastics and coatings manufactured by Benjamin Foster, Childers, Insul-Coustic or Minnesota Mining and Manufacturing Co. (3M) will be acceptable.

PART 2 - PRODUCTS

2.1 PRE-MOLDED GLASS FIBER PIPE INSULATION:

A. Pipe insulation shall be 4 pcf density fibrous glass wool accurately molded to conform to the outside diameter of the pipe. Insulation shall be the one piece snap-on or self-sealing lap type with white all-service jacket and vapor barrier. Insulation shall be suitable for use on hot or cold pipes with a temperature range of 35 to 400 degrees F. Thermal conductivity shall not exceed 0.26 at 75 degrees F mean temperature.

2.2 PRE-MOLDED GLASS FIBER INSULATION THICKNESS IN INCHES:

Service	Up to 1"	1-1/4" to 2"	2-1/2" and Over
Plumbing systems			
Hot water and hot water circulating	1/2"	1"	1"
Cold water	1/2"	1"	1"

2.3 GLASS FIBER WRAP PIPE INSULATION:

A. Pipe insulation shall be 1 pcf density fibrous glass wool wrapping with factory applied all-service jacket. Insulation shall be sealed with vapor barrier tape.

B. Insulate the following with 1-1/2" thick glass fiber wrap pipe insulation:
1. Horizontal portions of rain leaders including each elbow and the roof drain body.
2. Vertical portions of rain leaders installed in areas of the building defined as plenums.

2.4 FOAMED PLASTIC TUBING:

A. Foamed plastic tubing shall have a minimum density of 4.5 pcf. Thermal conductivity shall not exceed 0.28 at 75 degrees F mean temperature.

B. Apply and secure insulation and seal all joints with Armaflex 520 adhesive so as to maintain a continuous vapor barrier. On piping, do not split the insulation longitudinally except at branch fittings where it cannot be avoided.

C. Insulate the following with 1/2" thick foamed plastic tubing insulation:
1. Domestic hot water piping below ground.
2. Condensate drain piping.

D. Insulate the following with 3/4" thick foamed plastic tubing insulation:
1. Refrigerant suction piping. Coat piping outside the building with two coats of white, ultra-violet resistant Armaflex vinyl lacquer.

E. Insulate the following with 1" thick foamed plastic tubing insulation:
1. Refrigerant suction piping serving walk-in coolers and freezers. Coat piping outside the building with two coats of white, ultra-violet resistant Armaflex WB vinyl lacquer finish.

2.5 FIBERGLASS WRAP DUCT INSULATION:

A. Insulation shall be 1 pcf minimum density having a thermal conductivity of 0.27 at 75 degrees F mean temperature. Insulation shall have a factory applied vapor barrier of foil-faced flame resistant kraft paper.

B. Insulate the following with 2" thick fiberglass wrap duct insulation:
1. All supply ductwork whether internally lined or not.
2. All return ductwork except ductwork run in return air plenums and internally lined return ducts need not be insulated.
3. All outdoor air ductwork.

2.6 FIBERGLASS BOARD DUCT INSULATION:

A. Insulation shall be 3 pcf semi-rigid board material having a thermal conductivity not to exceed 0.25 at 75 degrees F mean temperature.

B. Insulate the following with 2" thick fiberglass board duct insulation:
1. All ductwork installed outdoors.

2.7 ACOUSTICAL DUCT LINER:

A. Acoustical duct liner shall be a flexible type having long glass fibers with a smooth, firmly bonded fire-resistant surface specifically designed to prevent erosion of the fibers. Thermal conductivity shall not exceed 0.26 at 75 degrees F mean temperature and the noise reduction coefficient shall be not less than 0.60 when based on the Acoustical Materials Test, Mounting No. 6.

B. Completely coat all duct surfaces with Benjamin Foster 85-15 adhesive. Join sections of liner by coating the edges with Benjamin Foster 30-36. Impale the liner on self-adhering pins, secured with self-locking washers, spacing the pins not more than 4" from the edges and not more than 16" on centers.

C. Duct liner shall meet the National Board of Fire Underwriters' Standards for Internal Duct Application and shall have a minimum density of 3 pcf. Air friction correction factor shall not exceed 1.40 at 2000 fpm and 1.50 at 4000 fpm.

D. Provide 1" thick acoustical duct liner on the following ductwork:
1. Return ductwork where indicated on the drawings.

2.8 ADHESIVES, MASTICS, COATINGS AND VAPOR BARRIERS:

A. The treatment of pipe insulation jackets and duct insulation facings to impart flame spread and smoke developed ratings shall be permanent. The use of water-soluble treatments is prohibited.

B. Vapor barriers shall be installed on all pipe and duct insulation which shall have a perm rating of not more than 0.05 perms. Adhesives, coatings and mastics shall have a perm rating of not less than 0.25 perms.

2.9 TAPE:

A. Whenever tape is used for sealing purposes, it shall be of the type and shall be applied as recommended by the covering manufacturer. If there is no such recommendation, the tape used shall be 3M Adhesive EC-1329.

2.10 INSULATING CEMENT:

A. Insulating cement shall be Owens-Corning 110 mineral wool, Benjamin Foster, or 3M All Purpose Cement. Where insulating cement is applied to pipe fittings in concealed locations it shall be "one-coat" cement.

2.11 GLASS CLOTH JACKET:

A. Glass cloth jacket on pipe, duct and equipment insulation shall be open weave, standard weight.

PART 3 - EXECUTION

3.1 GENERAL:

A. Clean all surfaces to be insulated of all loose scale, dirt, rust, oil and other foreign matter and thoroughly dry before applying insulation.

B. Perform pressure tests required by other sections before insulation is applied.

C. Where existing insulation is damaged due to demolition or construction operations, remove and replace it with new insulation to match the existing work or as specified herein for new insulation.

D. Insulate completely all metal surfaces of piping and ductwork other than hangers.

E. Insulation surface finishes shall present a tight, smooth appearance and the surface finish shall be extended to protect all raw ends and edges of the insulation.

3.2 INSULATION FOR PIPING:

A. Insulate all valves, strainers, flanges and fittings. Use pre-molded material where available.

B. Install insulation materials with smooth and even surfaces, with jackets drawn tight and cemented down smoothly at longitudinal seams and end laps. Do not use scrap pieces of insulation where a full length of insulation will fit.

C. Install insulation, jackets and coatings continuous through wall openings and through pipe sleeves.

D. Insulate valves, strainers, fittings, and flanges with field fabricated, multiple mitered segments of molded pipe insulation of the same thickness and material as the

adjoining pipe insulation. Secure segments with 20 gauge galvanized steel wire and apply a smoothing coat of insulating cement. Use white fabric and mastic on all fittings exposed to view such as in mechanical rooms.

E. Butt all joints together and seal with joint straps furnished with the insulation. Secure all jacket laps with lap adhesive.

3.3 INSULATION FOR DUCTWORK:

A. Cover all standing ribs and seams with insulation. Secure insulation to the duct with Benjamin Foster 85-15 adhesive applied in 4" strips around the duct on 18" centers. Use nylon cord ties at 18" intervals to secure the insulation on round ductwork. On rectangular ductwork 36" wide or more in either dimension, secure the insulation to the bottom of the duct using self-adhering pins and self-locking washers spaced not more than 18" on center. Overlap factory applied insulation, where applicable, a minimum of 2". Seal the vapor barrier at all butt joints, laps and breaks using 4" wide foil-reinforced tape adhered with Benjamin Foster 82-07 adhesive.

B. Provide insulation, jackets and coatings continuous through wall openings except do not insulate fire and fire/smoke dampers.

C. Insulate all ductwork exposed outdoors with 2" thick, 3 pcf density glass fiber semi-rigid board insulation, secured with self-adhering pins and self-locking washers spaced not more than 18" on center. Seal butt joints and edges with mastic. Finish with standard weight glass cloth set in 1/16" thick weatherproof mastic similar to "Seal-Kote". After drying, apply a 1/16" thick finish coat of waterproof mastic.

3.4 CLEANING:

A. Prior to final acceptance, clean the finished surfaces of all exposed insulation of all stains and blemishes. If necessary to obtain a new appearance, coat any discolored insulation with off-white latex based semi-gloss paint or lagging adhesive.

End of Section

SECTION 23 0923

BUILDING AUTOMATION SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. The requirements of the General Conditions, Special Conditions and Section 23 0000, Mechanical General, apply to all work specified in this section.

1.2 QUALITY ASSURANCE:

A. This document contains the specification for the modifications and addition to an existing Direct Digital Control (DDC) Building Automation System (BAS).

B. The system architecture shall utilize intelligent distributed control modules, which communicate to an existing Central Site.

C. The system shall provide the Direct Digital Control, Energy Management and Building Automation for the air conditioning, heating and ventilating systems as shown on the drawings and as specified.

D. An Automated Logic WebCTRL System is existing and all new controls shall be integrated into the existing Automated Logic System. The modifications and additions to the BAS shall be manufactured and installed by ALC Controls, Inc.

1.3 SCOPE OF WORK:

A. Furnish and install all necessary hardware, wiring, computing equipment and software as defined in this specification.

B. System requirements:
1. All material and equipment used shall be standard components, regularly manufactured and available and not custom designed especially for this project. All systems and components shall have previously been thoroughly tested and proven in actual use prior to installation on this project.
2. The system architecture shall be fully modular permitting expansion of application software, system peripherals, and field hardware.
3. The system, upon completion of the installation and prior to acceptance of the project, shall perform all operating functions as detailed in this specification.

C. Equipment:
1. Provide the following system hardware:
a. All sensing devices and necessary transducers to perform the functions listed herein.

b. All relays, switches, indicating devices and transducers required to perform the functions listed herein.
c. All monitoring and control wiring.
d. All accessories.

D. Provide and install all system software identified in this Section. The database required for implementation of this specification shall be provided including point descriptor, alarm limits, calibration variables, graphics, reports and point summaries.

1.4 COORDINATION AND WARRANTY:

A. Promptly correct all work found to be defective or failing to conform to the Contract Documents. Bear all cost of correcting such work.

B. If, within the warranty period required by the Contract Documents, any of the work is found to be defective or not in accordance with the contract documents, correct it promptly after receipt of written notice to do so. Prompt notice shall be given after discovery of the condition.

C. Warranty: Warrant that all systems, subsystems, component parts, and software are fully free from defective design, materials, and workmanship for a period of one year from the date of final acceptance.

PART 2 - PRODUCTS

2.1 OVERVIEW:

A. The existing central site shall interrogate any module in addition to downloading program changes to individual modules.

B. Each control module shall initiate all alarm reporting and selective data uploading to the central site. All Control modules shall communicate with each other.

C. Control modules shall be microprocessor based and operate in a stand-alone mode. All control modules shall contain all necessary software programs to provide DDC and energy management functions to the equipment being controlled.

2.2 FIELD HARDWARE:

A. Field hardware shall be of a modular design to ensure reliability and system performance.

B. General Purpose/Multiple Application Controllers:
1. Each General Purpose/Multiple Application Controller shall be capable of standalone direct digital operation utilizing its own 32 bit processor, non-volatile flash memory, input/output, 12 bit A to D

conversion, hardware clock/calendar and voltage transient and lightning protection devices. All non-volatile flash memory shall have a battery backup of at least five years. Firmware revisions to the module shall be able to be made from the local workstation, portable operator terminals or from remote locations over modems or LANs.

2. The General Purpose/Multiple Application Controllers shall be expandable to the specified I/O point requirements. Each controller shall accommodate multiple I/O Expander Modules via a designated expansion I/O bus port. These expander modules shall expand the total point capacity of each controller up to 192 points where specified. The controller, in conjunction with the expansion modules, shall act as one standalone controller.
3. All point data, algorithms and application software within a controller shall be custom programmable from the operator workstation.
4. Each General Purpose/Multiple Application Controller shall execute application programs, calculations and commands via a 32 bit microcomputer resident in the controller. All operating parameters for application programs residing in each controller shall be stored in read/writable nonvolatile flash memory within the controller and will be able to upload/download to/from the operator workstation.
5. Each General Purpose/Multiple Application Controller shall reside on a BACnet communications bus and shall utilize native BACnet communications between all other controllers and devices on the network. Each controller shall include self-test diagnostics which allow the controller to automatically relay to the network controller any malfunctions or alarm conditions that exceed desired parameters as determined by programming input.
6. Each General Purpose/Multiple Application Controller shall contain both software and firmware to perform full DDC PID control loops.
7. Each General Purpose/Multiple Application Controller shall contain a serial port for the interface of maintenance personnel's portable computer. All network interrogation shall be possible through this port.
8. Input-output processing:
   a. Digital outputs shall be relays, 24VAC or VDC maximum, 3 amp maximum current. Each configured as normally open or normally closed using jumpers and either dry contact or bussed. Triac outputs are unacceptable. Each output shall have a manual Hand-Off-Auto switch to allow for override and an LED to indicate the operating mode of the output.
   b. Universal inputs shall be Thermistor (BAPI Curve II) 10K Ohm at 77F (25C), 0-5VDC, 10K Ohm maximum source impedance, 0-20mA - 24 VDC loop power 250 Ohm input impedance, dry contact -

0.5mA maximum current.

c. Analog output shall be electronic, voltage mode 0-10VDC or current mode 4-20mA.

C. General Purpose/Single Application Controllers:

1. The General Purpose/Single Application controllers shall be capable of stand-alone DDC operation utilizing their own 32 bit processor, nonvolatile flash memory, input/ output, 10 bit A to D conversion, hardware clock/ calendar and voltage transient and lightning protection devices. All nonvolatile Flash memory shall have a battery backup of at least five years. Firmware revisions to the module should be able to be made from the local workstation, portable operator terminals or from remote locations over modems or LANs.
2. All point data, algorithms and application software within the controllers shall be custom programmable from the Operator Workstation.
3. Each General Purpose/Single Application Controller shall execute application programs, calculations and commands via a 32 bit microcomputer resident in the controller. All operating parameters for the application program residing in each controller shall be stored in read/writable nonvolatile flash memory within the controller and shall be able to upload/download to/from the Operator Workstation.
4. Each General Purpose/Single Application Controller shall reside on a BACnet communications bus and utilize native BACnet communications to/from other controllers and devices on the network. Each Controller shall include self-test diagnostics which allow the controller to automatically relay to the network controller any malfunctions or alarm conditions that exceed desired parameters as determined by programming input.
5. Each General Purpose/Single Application Controller shall contain both software and firmware to perform full DDC PID control loops.
6. A serial port shall be provided for the interface of maintenance personnel's portable computer. All network interrogation shall be possible through this port.
7. The General Purpose/Single Application Controllers shall be capable of being mounted directly in or on rooftop equipment.
8. The General Purpose/Single Application Controllers shall be capable of proper operation in an ambient temperature environment of -20F to +150F.
9. Input-Output Processing:
   a. Digital outputs shall be relays, 24VAC or VDC maximum, 3 amp maximum current. Triac outputs will not be acceptable. Each output shall have a manual Hand-Off-Auto switch to allow for override and an LED to indicate the operating mode of the output.
   b. Universal inputs shall be Thermistor (BAPI Curve

II) 10K Ohm at 77F (25C), 0-5VDC - 10K Ohm maximum source impedance, 0-20mA - 24 VDC loop power 250 Ohm input impedance, dry Contact, 0.5mA maximum current.

c. Analog electronic outputs shall be voltage mode 0-10VDC or current mode 4-20mA.

d. Enhanced Zone Sensor Input shall provide one thermistor input, one local setpoint adjustment, one timed local override switch and an occupancy LED indicator.

D. Unitary controllers:

1. Unitary controller interface:

a. Each Unitary Controller shall communicate with the controller network through a Unitary Controller Interface (UCI). The UCI shall provide one EIA-485 port for a controller network connection and one EIA-485 port for the Unitary Controller connection. In addition a direct connect EIA-485 port shall also be provided for connection of a portable operators computer.

b. The UCI shall utilize the BACnet protocol for communication to the Unitary Controllers. The communication speed between Unitary Controllers shall be between 9600 baud to 38.4 kbps.

c. A serial port shall be provided on the UCI for the interface of the operators portable computer. All network interrogation shall be possible through this port.

d. Each Unitary Controller Interface shall execute application programs, calculations and commands via a 32 bit microcomputer resident in the Unitary Controller Interface. All operating parameters for application programs residing in each Unitary Controller Interface shall be stored in read/writable nonvolatile flash memory within the controller and shall be transferred between Operator Workstation to the controller. All nonvolatile memory shall have a battery backup of at least five years. Firmware revisions to the controller should be able to be made from the local workstation, portable operator terminals or from remote locations over modems or LANs.

e. The UCI shall contain both software and hardware to perform full DDC PID control loops.

f. UCI circuits shall be optically isolated.

2. Unitary controllers:

a. Each Unitary Controller shall be able to support various type of zone temperature sensors such as temperature sensor only, temperature sensor with built-in local override switch or temperature sensor with setpoint adjustment switch.

b. Each Unitary Controller and Unitary Controller Interface shall have LED indication for visual

status of communication, power and all outputs.

c. In the event of a loss of communication with the Unitary Controller Interface each Unitary Controller shall control from a standalone algorithm which maintains the assigned space temperature until communication with the Unitary Control Module Interface is restored.

d. Input/Output Processing:

(1) Digital outputs shall be relays, 24VAC or VDC maximum, having a 3 Amp maximum current. Each relay shall be configured as normally open or normally closed, and either dry contact or bussed. Triac outputs will not be acceptable.

(2) Universal inputs shall be Thermistor Precon Type II, dry contacts or 0-5VDC with 0-10K Ohm input impedance.

(3) Enhanced Zone Sensor Input. The input shall provide one thermistor input, one local setpoint adjustment, one timed local override switch and an occupancy LED indicator.

(4) Analog output electronic, voltage mode 0-10VDC or current mode 4-20mA.

E. Instrumentation and control:

1. Input devices:

a. Temperature sensors shall be of the type and have accuracy ratings as indicated and/or required for the application and shall permit accuracy rating of within 1% of the temperature range of their intended use.

(1) Sensors used for mixed air application shall be the averaging type and have an accuracy of +1°F.

(2) OA temperature sensors shall have a minimum range of -52°F to 152°F and an accuracy of within +1°F in this temperature range.

(3) Room temperature sensors shall have an accuracy, of +0.36°F in the range of 45°F to 96°F.

(4) Loop water sensors shall have an accuracy of +0.36°F in their range of application.

2. Pressure instruments:

a. Differential pressure and pressure sensors shall have a 4-20 MA output proportional signal with provisions for field checking. Sensors shall withstand up to 150% of rated pressure without damaging the device. Accuracy shall be within +2% of full scale. Sensors shall be manufactured by Leeds & Northrup, Setra, Robertshaw, Dwyer Instruments, Rosemont, or be approved equal.

b. Pressure switches shall have a repetitive accuracy of +2% of range and withstand up to 150% of rated pressure. Sensors shall be

diaphragm or bourdon tube design. Switch operation shall be adjustable over the operating pressure range. The switch shall have an application rated Form C, snap-acting, self-wiping contact of platinum alloy, silver alloy or gold plating.

c. Flow switches shall have a repetitive accuracy of +1% of their operating range. Switch actuation shall be adjustable over the operating flow range. Switches shall have snap-acting Form C contacts rated for the specific electrical application.

d. Humidity sensors shall have an accuracy of +25% over a range of 20% to 95% RH.

e. Current sensing relays shall monitor status of motor loads. Switch shall have self-wiping, snap-acting Form C contacts rated for the application. The setpoint of the contact operation shall be field adjustable.

3. Output devices:

a. Control relay contacts shall be rated for 150% of the loading application, with self-wiping, snap-acting Form C contacts enclosed in dustproof enclosure. Relays shall have silver cadmium contacts with a minimum life span rating of one million operations. Relays shall be equipped with coil transient suppression devices.

b. Solid state relays (SSR) input/output isolation shall be greater than 10 billion ohms with a breakdown voltage of 15 V root mean square, or greater, at 60 Hz. The contact operating life shall be 10 million operations or greater. The ambient temperature range of SSRs shall be 20°F-140°F. Input impedance shall be greater than 500 ohms. Relays shall be rated for the application. Operating and release time shall be 10 milliseconds or less. Transient suppression shall be provided as an integral part of the relays.

PART 3 - EXECUTION

3.1 HARDWARE INSTALLATION:

A. Wiring:

1. Install wires for the room temperature sensors to the appropriate control module.
2. Install all sensing devices and the wiring to modules.
3. Low voltage wire shall be not less than 18 AWG. All line voltage wire shall be THHN/TFFN, 600 volt rated.
4. All line voltage wire shall be run in conduit (EMT). All exposed wiring shall be run in conduit. Wire run in hollow walls and in accessible concealed areas may be run without conduit. Accessible concealed wire run in return air plenums shall meet NEC 725 (b) code.

B. Mount all room temperature sensors on the wall at the same height above the floor as the light switches. Refer to the electrical drawings and specifications.

3.2 SEQUENCES OF OPERATION:

A. Water source heat pumps:
1. Each new water source heat pump shall operate the same as follows.
2. Provide a control module for each water source heat pump unit and provide a wall mounted temperature sensor located in the space to provide an input signal to the control module.
3. Each heat pump unit shall be programmed to start and stop according to the occupied/unoccupied schedule provided by the Owner. When the unit starts the solenoid valve in the loop water supply piping shall open and when the unit stops the solenoid valve shall close.
4. Each water source heat pump shall operate on its integral operating and safety controls to maintain room set-point temperature.
5. During the unoccupied periods, if the space temperature drops below 55 degrees F (adjustable) or above 95 degrees F (adjustable) the loop water system shall be activated and the unit shall operate until the space temperature reaches the unoccupied set-point.
6. A duct mounted temperature sensor located in the supply air duct shall provide an analog input signal to the control module to provide temperature indication only.
7. A current switch mounted in the unit fan control section shall provide a digital input signal to the control module to provide indication that the fan motor is running.
8. The following I/O points shall be provided:
   a. Fan - start/stop (DO)
   b. Compressor - start/stop (DO)
   c. Reversing valve - open/close (DO)
   d. Fan status - current relay (DI)
   e. Discharge air temperature - (AI)
   f. Safety status - (DI)
   g. Water valve - open/close (DO)
   h. Space temperature - (AI)
   i. Space temperature override - (DI)
   j. Condensate overflow alarm - (AI)

B. Energy recovery ventilators: The stand alone DDC controller shall perform the following control sequences.
1. Unit start command:
   a. Outside air damper actuator shall be powered.
   b. DDC controller shall check damper end switch status.

c. Exhaust fan shall start after dampers are open (minimum of 120 second delay, adjustable).
d. Supply fan shall start 15 seconds (adjustable) after the exhaust fan.
e. Heating, cooling and face/bypass dampers shall operate as below.

2. Unit stop command (or de-energized):
   a. Outside air damper actuator shall be de-energized, both dampers shall spring return closed.
   b. Supply and exhaust fans shall be de-energized.
3. Heat wheel VFD sequence:
   a. Economizer: The economizer shall be locked out when the outside air is less than 40 deg. F (- 2 deg. F hysteresis) adjustable. The economizer shall be active only if the outside air temp is less than the supply temperature set-point. The heat wheel VFD shall modulate wheel speed in order to maintain the supply temperature set-point.
   b. Defrost: The heat wheel VFD shall modulate wheel speed in order to maintain the exhaust air temperature above the defrost set-point of 20 deg F.
   c. Energy recovery: When defrost and economizer functions are inactive, the heat wheel VFD shall modulate the wheel to 100% speed.
4. Cooling sequence:
   a. Lockout: The cooling shall be locked out when the outside air is less than 55 deg. F (- 2 deg. F hysteresis) adjustable.
   b. Temperature control: The cooling shall be controlled to maintain the supply temperature set point.
   c. Dehumidification control: The cooling shall be controlled to maintain the supply dew point temperature set-point.
   d. The cooling output shall respond to the highest demand between the supply temperature and supply dew point control loops.
5. Heating sequence:
   a. Lockout: The heating shall be locked out when the outside air is less than 70 deg. F (+ 2 deg. F hysteresis) adjustable.
   b. Heat: The heating shall be controlled to maintain the supply temperature set-point.
   c. Reheat: The heating shall be controlled to maintain the supply temperature set-point, only when the cooling is in dehumidification mode.
6. Supply temperature set-point: The DDC controller shall control the above items to maintain a constant supply discharge temperature.
   a. Supply discharge set-point: 72 deg. F, adjustable.

7. Supply dew point set-point (dehumidification control): The DDC controller shall control the cooling above to maintain a constant supply dew point.
   a. Supply dew point set-point: The DDC controller shall automatically calculate the supply dew point set-point based on the temperature and humidity set-points entered, 72 deg. Fdb/55% = 54.8 deg. Fwb, adjustable.
   b. Supply dew point minimum set-point: 50 deg. F, adjustable.
8. Remote on/off: Unit DDC shall have an input allowing the unit to be started/stopped by others.
9. Occupied mode:
   a. Supply fan on.
   b. Exhaust fan on.
   c. Heating per above.
   d. Cooling per above.
   e. Economizer per above.
10. Unoccupied mode:
   a. Supply fan on.
   b. Exhaust fan off.
   c. Heating per above.
   d. Cooling per above.
   e. Energy recover wheel off.
11. During fan operation the BAS shall continually monitor the following:
   a. Supply fan status.
   b. Exhaust fan status.
   c. Discharge air dry bulb temperature.
   d. Discharge air dew point temperature.
   e. Refrigeration system status.
   f. Gas heat exchanger status.
   g. Filter differential pressure.

C. Ductless split system:
1. The BAS shall enable and disable the ductless split system. During system operation a room temperature sensor shall activate the system on cooling or heating cycle as required to maintain set-point temperature.
2. The BAS shall alarm the central site computer should room temperature exceed a predetermined temperature as established by the Owner.
3. The BAS shall continually monitor the indoor unit discharge air temperature.

D. Exhaust fans:
1. A firestat, set at 125 deg. F and located at the inlet to exhaust fans EF-1 through EF-4, shall shut down fan operation if excess heat is detected.
2. Toilet exhaust fans EF-1 through EF-4 shall run continuously during the occupied periods and shall remain off during the unoccupied periods.
3. Data room exhaust fan EF-5 shall operate from a wall mounted temperature sensor to activate the fan when space temperature rises above 85 deg. F and deactivate the fan when space temperature drops below 70 deg. F

(all adjustable).

E. Electric wall heater:
1. The BAS shall enable and disable electric wall heater EWH-1 on a schedule approved by the Owner.
2. The BAS shall continually monitor the space temperature in the Sprinkler Riser room.

F. Rooftop air conditioning units: The BAS shall control the new rooftop unit RTU-9 and replacement rooftop units RTU-3, RTU-4 and RTU-6 to perform the following control sequences.
1. Unit start command:
   a. Outside air damper actuator shall be powered open.
   b. DDC controller shall check damper end switch status.
   c. Supply fan shall start 15 seconds (adjustable) after the exhaust fan.
2. Unit stop command (or de-energized):
   a. Outside air damper actuator shall be de-energized, damper shall spring return closed.
   b. Supply fan shall be de-energized.
3. Cooling sequence:
   a. Temperature control: The cooling shall be controlled to maintain the room temperature set point.
   b. Dehumidification control: The cooling shall be controlled to maintain the room relative humidity set-point (RTU-3 and RTU-4 only).
4. Heating sequence:
   a. Heat: The heating shall be controlled to maintain the room temperature set-point.
   b. Reheat: The hot gas reheat shall be controlled to maintain the supply temperature set-point, only when the cooling is in dehumidification mode (RTU-3 and RTU-4 only).
5. Remote on/off: Unit DDC shall have an input allowing the unit to be started/stopped by others.
6. Occupied mode:
   a. Supply fan on.
   b. Heating per above.
   c. Cooling per above.
   d. Economizer per above.
7. Unoccupied mode:
   a. Supply fan on.
   b. Heating per above.
   c. Cooling per above.
   d. Energy recover wheel off.
8. During fan operation the BAS shall continually monitor the following:
   a. Supply fan status.
   b. Discharge air dry bulb temperature.
   c. Discharge air dew point temperature.
   d. Refrigeration system status.
   e. Gas heat exchanger status.
   f. Filter differential pressure.

G. Existing pump variable speed controllers:
1. The new variable frequency speed controllers for each existing pump shall be controlled by the BAS. Provide a new pressure differential sensor in the loop water piping system in a representative location that shall be determined in the field, but that shall be approximately 2/3 the way down the longest piping run in the system.
2. The signal output from the pressure differential sensor shall control each variable frequency speed controller such that a constant water system head pressure is maintained. As the system head pressure increases the controller shall slow down and as the head pressure decreases the controller shall speed up.
3. The electronic bypass in each variable frequency speed controller shall be remotely operable through the BAS.

H. Existing cooling tower fan variable speed controller:
1. The new variable frequency speed controller for the existing cooling tower shall be controlled by the BAS. Provide a new temperature sensor in the condenser water supply piping leaving the cooling tower.
2. The signal output from the water temperature sensor shall control the variable frequency speed controller such that a constant water temperature is maintained. As the water temperature drops the controller shall slow down and as the water temperature rises the controller shall speed up.
3. The electronic bypass in the variable frequency speed controller shall be remotely operable through the BAS.

I. Plumbing trap primers:
1. The BAS shall operate each trap primer in the plumbing system. A 115V AC electric solenoid valve in the cold water piping to the trap primer shall be opened for a period of 5 seconds (adjustable) each day at 12:00 midnight.

J. Domestic water heaters:
1. Each new domestic water heater shall be enabled and disabled by the BAS on a schedule to be approved by the Owner.
2. The BAS shall continuously monitor supply hot water temperature from each new domestic water heater.

K. Building fire alarm system:
1. The BAS shall monitor the building Fire Alarm system and shall send an alarm to the central site computer if a signal is received for either trouble or activation.

L. Inside lighting:
1. The inside lighting for both the additions and the renovation shall be controlled by the BAS to turn the lighting on and off at predetermined times and the BAS

shall control the lighting panels HA, HB and HC.

2. The BAS shall initiate a signal to each lighting panel to turn on the lights and to turn off the lights twice each day.

M. Outside lighting:

1. The building addition outside lighting shall be controlled by the BAS outside lighting controls so that the new lighting is turned on and off at the same times as the existing. Provide a DDC connection to the exterior lighting contactor in the addition electrical room.

N. Generator controls:

1. The BAS shall monitor the existing generator set controls and shall send an alarm to the central site computer if a signal is received for either generator run or generator trouble.

End of Section

SECTION 23 3100

DUCTWORK AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. The requirements of the General Conditions, Special Conditions and Section 23 0000, Mechanical General, apply to all work specified in this section.

1.2 PRESSURE CLASSIFICATION:

A. SMACNA standards referred to herein shall mean standards published by the Sheet Metal and Air Conditioning Contractor's National Association, Inc. Ductwork shall be constructed in complete conformance with the latest edition of the SMACNA manual.

B. Pressure classification shall be low pressure, 2" wg static pressure, Class A seals.

PART 2 - PRODUCTS

2.1 LOW PRESSURE DUCT CONSTRUCTION:

A. Construct low pressure rectangular ductwork from lock forming quality galvanized steel sheets having a galvanized coating of 1-1/4 ounces total for both sides per one square foot of sheet. Metal stamp shall be visible after installation. Inside of unlined ducts visible through sidewall grilles and registers shall be paint flat black.

B. Construction methods, metal gauges and stiffening shall be in accordance with the latest edition of SMACNA HVAC Duct Construction Standards, Metal and Flexible. All duct dimensions indicated are clear inside dimensions.

C. Low pressure round ductwork up to and including 12" in diameter shall be longitudinal lock seam construction. Round ducts larger than 12" shall be spiral lock seam construction.
   1. Girth joints in ducts up to and including 12" shall be beaded-crimp type and each joint shall be fastened with sheet metal screws, equally spaced, not more than 8" on centers and with a minimum of three screws in each joint. The beaded-crimp joint shall provide at least a 1" lap to accommodate the sheet metal screws.
   2. Girth joints in ducts larger than 12" shall be the beaded sleeve type. The beaded sleeve joints shall be

fabricated of the same gauge galvanized sheet steel as the duct and shall be a minimum of 4" in length. Each section of duct shall be fastened to the sleeve with sheet metal screws, equally spaced, not more than 8" on centers and with a minimum of three screws in each joint.

D. Install turning vanes in all 90 degree square or rectangular elbows and at other locations shown. The turning vanes shall be large size, double thickness airfoil style with vanes secured to the runners and runners secured to the duct. Elbows in round ductwork and other radiused elbows shall have an inside radius equal to the depth of the duct.

2.2 EXPOSED ROUND DUCT CONSTRUCTION:

A. All round ductwork exposed to view shall conform to the following specifications. Refer to the detail on the drawings for additional fabrication and installation notes.

B. Ductwork shall be double wall spiral formed round insulated sheet metal duct, fabricated from galvanized, mill finish "Paint-Grip" steel. The internal insulation shall be nominal one inch thick having a minimum thermal conductivity value (K) of 0.27 BTU/hr/sq. ft./degree F. Metal gauges for ductwork and fittings shall conform to SMACNA SM-95 (medium pressure) standards to reduce the possibility of damage during shipment and installation.

C. The entire ductwork installation shall be painted after installation, covered under another section of these specifications. Finishes of all ductwork and fittings furnished herein shall be suitable for painting, without peeling, flaking or "bleed-through".

D. Fabricate hangers from center-hung one inch wide minimum 16 gauge straps maximum 10 feet on center. Fabricate hanger rods from 1/4" diameter metal rod. Neatly install take-off boots with pop rivets, and seal the joint with a bead of elastomeric seal. All take-offs shall be centered on the duct center-line unless noted otherwise. Where the internally insulated round duct connects to conventional sheet metal ductwork cover the exposed end of the internal insulation with a sheet metal ring flashing.

E. The entire finished exposed ductwork installation shall present a neat, uniform appearance with no visible blemishes, nicks or dents. Neatly install all connections, couplings, branch take-offs and grille collars without visible gaps. Workmanship shall be of the highest standard and shall be subject to the scrutiny of the **Architect**.

Remove and replace with new materials any exposed ductwork installation that, in the opinion of the Architect, does not conform to this high standard.

F. Exposed sheet metal ductwork and fittings manufactured by United Sheet Metal, Dixie Sheet Metal or Semco will be acceptable.

2.3 EXPOSED RECTANGULAR DUCT CONSTRUCTION:

A. On all rectangular ductwork exposed to view, give special attention to its appearance including the duct construction, reinforcing and hanging. Insulate exposed ductwork on the inside only and fabricate from "Paint-Grip" steel sheets or similarly etched galvanized sheet metal ready to receive painting under another section of these specifications. Finishes of all ductwork and fittings furnished herein shall be suitable for painting without peeling, flaking or "bleed-through".

B. Ductwork shall not be stiffened by cross-breaking, but stiffening shall be accomplished by transverse and/or lateral ribbing. Hangers shall be neatly installed. Pop rivets are prohibited, cadmium-plated sheet metal screws shall be used.

C. The entire finished exposed ductwork installation shall present a neat, uniform appearance with no visible blemishes, nicks or dents. Neatly install all duct joints and grille collars without visible gaps. Workmanship shall be of the highest standard and shall be subject to the scrutiny of the Architect. Remove and replace with new materials any exposed ductwork installation that, in the opinion of the Architect, does not conform to this high standard.

2.4 DUCT HANGERS AND SUPPORTS:

A. Duct hangers and supports shall be in accordance with the Hangers and Supports section of the referenced SMACNA standards, except:
1. Do not space hangers over 8'-0" on centers.
2. For rectangular ductwork with the longest dimensions up through 60", hangers shall be the galvanized steel strap type. For rectangular ductwork with the longest dimension 61" and larger, hangers shall be trapeze type constructed of galvanized steel angles with round hanger rods. Sizes for strap hangers and trapeze angles and rods shall be based on duct size as scheduled in the SMACNA standard for strap hangers and for trapeze hangers.
3. For round ductwork, hangers shall be galvanized steel

strap hangers. Sizes and number of strap hangers shall be based on the duct size as scheduled in the SMACNA standard.

B. Support ductwork in concrete construction with adjustable type inserts, Grinnell Fig. 285 or equal. Where the load exceeds the recommended load of the insert, use two inserts with a trapeze-type connecting member below the concrete.

C. Support ductwork in steel construction with side beam brackets bolted or welded to the side of the beam, Grinnell Fig. 202, or equal.

D. Lower attachment fasteners which penetrate the duct shall be sheet metal screws, blind rivets or self tapping metal screws. Cover all ductwork penetrations with mastic to provide air tight closures.

2.5 SPLITTER DAMPERS AND DAMPER HARDWARE:

A. Construct splitter dampers of not less than 20 gauge galvanized steel sheet. The length of the damper blade shall be the same as the width of the widest duct section at the split, but in no case shall blade length be less than 12".

B. Hardware for splitter dampers:
1. When neither dimension of the splitter damper exceeds 18" the damper shall be provided with a ball joint bracket attached to the outside of the duct. The bracket shall have a set screw for securing the damper rod in position. The damper operating rod shall be not less than 1/4" diameter steel rod and shall be secured to the damper blade with a clip. When either dimension of the damper exceeds 18" the damper shall be provided with two ball joint brackets and rods. The rods shall be located at quarter points on the damper.
2. Duct mounted regulators with operating handle and locking quadrant shall be provided on all manual volume control dampers.
3. Damper hardware manufactured by Ventfabrics, Young Regulator or Duro-Dyne will be acceptable.

2.6 FLEXIBLE ROUND DUCTWORK:

A. Flexible round ductwork shall be Class 1, UL 181 air duct with an aluminized mylar or polyester inner liner laminated to a corrosion resistant steel wire helix. Aluminum helix is not acceptable.

B. A 1" thick, one pound density fiberglass insulation and

vinyl outer jacket shall cover the wire helix.

C. Flexible ductwork shall be designed for pressures up to 4" wg. The maximum allowable length of flexible ductwork shall be 5'-0" and shall be limited to short run-outs connected to round neck ceiling supply diffusers. Provide a spin-in fitting with integral volume damper at all flexible run-out connections.

D. Flexible ductwork manufactured by Genflex Type SLR.25 or Flexmaster Type 3 will be acceptable.

2.7 FLEXIBLE DUCT CONNECTORS:

A. Flexible duct connectors shall be non-combustible, installed at the intake and discharge connections of all belt-driven equipment and where shown. Material shall be glass fabric double coated with neoprene (30oz. per square yard minimum). Provide duct supports on each side of flexible connectors.

B. Flexible duct connectors manufactured by Vent Fabrics, Duro-Dyne or Young Regulator will be acceptable.

2.8 FIRE DAMPERS:

A. Provide fire dampers at all penetrations through fire rated walls, floors and partitions. Fire dampers shall comply with the requirements of UL 555, 6th Edition, and damper type shall be as follows:
1. Type 'A' with blades and blade channels in the air stream for use behind sidewall registers and grilles.
2. Type 'B' with blades out of the air stream for rectangular ductwork passing completely through walls, floors and partitions.
3. Type 'C' with blades and blade channels out of the air stream for round and flat oval ductwork passing completely through walls, floors and partitions.

B. Fire dampers shall be rated as either static (for use in HVAC systems that are automatically shut down in the event of a fire), or dynamic (for use in HVAC systems that are operational in the event of a fire), as appropriate for the application.

C. Fire dampers manufactured by Prefco, Nailor, Ruskin or Air Balance will be acceptable.

2.9 SMOKE DAMPERS AND FIRE/SMOKE DAMPERS:

A. Smoke dampers and fire/smoke dampers shall comply with the requirements of UL 555S, 4th Edition. Dampers shall close

when a signal from the smoke detection system is received and fire/smoke dampers shall also close when excessive heat is detected.

B. Dampers shall be rated as either smoke dampers (for use in HVAC systems where ducts pass through smoke barriers), or fire/smoke dampers (for use in HVAC systems where a fire damper and smoke damper are required at a single location), as appropriate for the application.

C. Dampers shall meet UL 555S Class 2A for low leakage rating. Smoke dampers and fire/smoke dampers shall be of non-heat degradable design with friction free metal-to-metal seals incorporating integral resettable and reusable UL listed electric-ambient temperature link and UL listed releasing device and mechanical lock assembly.

D. Damper frames shall be 16 gauge galvanized steel formed channel with pre-punched slotted mounting holes a minimum of 7" on center. Blades shall be 16 gauge galvanized steel, maximum width of 8". Blades 36" and longer and driven blades shall be furnished with reinforcing cones.

E. The link shall be activated by either an electric signal from the fire alarm circuit or by the associated air system's smoke detector to permit the damper to close and lock independently of the motor actuator position. Upon cessation of the alarm condition or normalization of the air system's smoke detector, the link shall return to its reset position enabling the damper to be fully recycled automatically by the actuator.

F. Electric motor actuators shall be 24 volt, UL listed and furnished with all necessary mounting hardware from the factory for installation on the outside of the ductwork. The actuators shall be power open/spring closed operation. Dampers shall be furnished with connecting shafts and linkages utilizing not more than one actuator for single and multiple sections assembly sized up to 23 sq. ft. Power for motors shall come from the nearest 24 volt fire alarm circuit.

G. Smoke dampers and fire/smoke dampers manufactured by Prefco, Nailor, Ruskin or Air Balance will be acceptable.

2.10 DUCT ACCESS DOORS:

A. Provide a duct access door at each fire damper, smoke damper and fire/smoke damper. Access doors shall be a minimum 18" x 18", duct size allowing, and shall have a continuous hinge on one side with latch on the other side. Access door shall be designed for five times the pressure

of the duct in which it is mounted. Access doors shall be of sufficient size to provide access to the dampers for resetting or replacing thermal links.

B. Do not locate duct access doors above inaccessible ceilings unless approved by the Architect prior to installation.

2.11 ROOF EQUIPMENT SUPPORT RAILS:

A. Factory fabricated roof equipment support rails shall be constructed of 18 gauge galvanized steel and shall be 12" high. Support rails shall be canted and shall be field-flashed to make watertight. Field-flashing shall extend up the sides of the support rails with washers and sheet metal screws placed not more than 12" on centers. Wood nailer strips shall be provided. Coordinate the installation of the roof equipment support rails with the roof installer and with the manufacturer of the equipment to be supported.

B. Provide equipment support rails under each roof mounted condensing unit, minimum two rails per unit.

C. Roof equipment support rails manufactured by Pate, Thy Curb or Roof Products and Systems will be acceptable.

2.12 PIPE CURB ASSEMBLIES:

A. Factory fabricated pipe curb assemblies shall be 18 gauge galvanized steel, unitized construction with integral base plate and all seams welded. Provide 1-1/2" thick, 3 lb density rigid fiberglass insulation on the interior surfaces and a wood nailer strip around the top perimeter. Counter flashing cap shall be acrylic clad ABS thermoplastic with graduated step PVC boots and adjustable stainless steel clamps. Boot size option shall be selected to suit the refrigerant pipe sizes applicable to the project. Pipe curbs shall have integral cants.

B. Provide pipe curb assemblies at each refrigerant piping penetration of the roof.

C. Pipe curb assemblies manufactured by Pate, Thy Curb or Roof Products and Systems will be acceptable.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Install all ductwork and accessories as shown and in accordance with applicable SMACNA standards.

B. Seal all joints in ductwork with a fire retardant sealant. Tape is not acceptable.

End of Section

SECTION 23 3400

EXHAUST FANS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. The requirements of the General Conditions, Special Conditions and Section 23 0000, Mechanical General, apply to all work specified in this section.

1.2 QUALITY ASSURANCE:

A. Fans shall be tested and rated in accordance with the Air Moving and Conditioning Association, Inc. Standard NO. 210, Test Code for Air Moving Devices and shall bear the AMCA Seal.

B. Exhaust fans manufactured by Greenheck, Carnes, Cook or Penn will be acceptable.

PART 2 - PRODUCTS

2.1 GENERAL:

A. Fan motor enclosure shall be the drip-proof type unless specifically indicated otherwise. Motors 2 horsepower and greater shall be the high efficiency type, Century-Plus or approved equal.

B. Roof mounted fans shall be waterproof design so that water cannot enter the building though the fan housing whether or not the fan is operating.

C. Centrifugal fan wheels shall be statically and dynamically balanced. All fans shall be supplied with a factory installed safety disconnect switch.

2.2 CENTRIFUGAL ROOF EXHAUST FANS:

A. Centrifugal roof exhaust fans shall have a spun aluminum housing enclosing the motor drive, a spun aluminum shroud enclosing the fan wheel, an aluminum centrifugal fan wheel, a backdraft damper and birdscreen.

B. Motor shall be single speed, single winding and the motor and drive shall be located in a ventilated compartment out of the exhaust air stream. A safety disconnect switch shall be factory installed in the motor compartment and shall be factory wired to the fan motor.

2.3 CEILING CABINET FANS:

A. Ceiling cabinet fans shall be direct driven. Each fan housing shall be constructed of phosphatized steel with an oven baked enamel finish. The housing interior shall be acoustically lined with 1/2" thick insulation. The discharge outlet shall be adaptable to horizontal or vertical positions.

B. The terminal box shall be internally mounted for motor hook-up. The motor shall be mounted on resilient elastic grommets. The fan shall have a forward curved centrifugal wheel.

2.4 FACTORY FABRICATED ROOF CURBS:

A. Factory fabricated roof curbs shall be constructed of aluminum. Curbs shall be the canted, insulated type and shall be field-flashed to make watertight. Field flashing shall extend up the sides of the curb and shall be fastened to the top flange of the curb with washers and sheet metal screws spaced not more than 6" on centers but in no case using less than two screws per side.

B. Curbs shall have 2" thick walls which shall be insulated with two inch thick rigid insulation. Insulation shall have a smoke developed rating not to exceed 50 and a flame spread rating not to exceed 25 when tested in accordance with ASTM E84. Wood nailer strips shall be provided.

C. When installed on sloping roofs of a slope of 1/4" per foot or greater the roof curbs shall be fabricated with the base angled to match the roof slope so that the top of the curb is level.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Fans shall be installed in complete conformance with the manufacturer's recommendations.

3.2 ADJUSTMENT:

A. The fans shall be tested and adjusted in accordance with Section 23 0593, Test and Balance, to provide the scheduled capacities.

End of Section

SECTION 23 3700

GRILLES, REGISTERS AND DIFFUSERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. The requirements of the General Conditions, Special Conditions and Section 23 0000, Mechanical General, apply to all work specified in this section.

1.2 COORDINATION:

A. The grilles, registers and diffusers of one manufacturer have been used as the basis of design. Any modifications to the ductwork or building structure that result from the use of any other manufacturer's units shall be coordinated with all trades, especially architecture. Any modifications shall be performed without incurring any additional cost to the Contract.

B. The color of all grilles, registers and diffusers shall match the surface in which they are installed or shall be as selected by the Architect. Ceiling mounted devices shall be selected to be compatible with the ceiling types in which they are installed.

1.3 ACCEPTABLE MANUFACTURERS:

A. Grilles, registers and diffusers manufactured by Krueger, Carnes, Titus, Metal*Aire or E.H. Price will be acceptable.

PART 2 - PRODUCTS

2.1 SUPPLY DIFFUSERS:

A. Ceiling supply diffusers shall be square or round neck as indicated, extruded aluminum square louver face type with mitered corners. Where indicated, square neck diffusers shall be provided with a square-to-round adapter. Louver cores shall be removable and held in place with spring loaded pins. Stamped aluminum diffusers will not be acceptable. Provide a steel opposed blade damper for balancing. Radial 'bow-tie' dampers will not be acceptable. Provide a factory applied enamel finish of a color as selected by the Architect.

B. Where indicated, supply diffusers shall be round steel type with round neck consisting of inner concentric flared cones and an outer ceiling plate collar. The inner cone assembly shall be removable and attached with a positive locking

mechanism. The inner cones shall be adjustable to provide horizontal, vertical or intermediate air patterns. Provide steel radial volume control damper, adjustable from the diffuser face. Provide a factory applied enamel finish of a color as selected by the Architect.

2.2 RETURN REGISTERS AND GRILLES:

A. Ceiling return registers and grilles shall be square neck, steel perforated plate sized to fit the ceiling grid with steel opposed blade volume damper for balancing, or shall be panel only as indicated. Provide a factory applied enamel finish of a color as selected by the Architect. The interior of perforated registers and grilles shall be factory painted flat black.

B. Sidewall return air grilles shall be all aluminum with 45 degrees fixed deflection blades on 3/4" centers. The blades shall be horizontal. The finish shall be factory applied primer for field painting.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Grilles, registers and diffusers shall be installed as indicated and in conformance with the manufacturer's recommendations. Coordinate the actual units to be provided with all trades. Ceiling mounted units shall match the ceiling type provided to ensure proper installation.

B. Grille, register and diffuser locations shall be coordinated with the architectural reflected ceiling plans.

3.2 ADJUSTMENT:

A. The grilles, registers and diffusers shall be balanced and adjusted to provide the scheduled capacities in accordance with Section 23 0593, Test and Balance.

End of Section

SECTION 23 7219

ENERGY RECOVERY VENTILATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. The requirements of the General Conditions, Supplemental Conditions and Section 23 0000, Mechanical General, apply to all work specified in this section.

1.2 QUALITY ASSURANCE:

A. Energy recovery ventilators (outdoor air pretreatment units) manufactured by Greenheck, Aaon or approved equal will be acceptable.

B. Provide each unit with an operating charge of R410a refrigerant.

1.3 WARRANTY:

A. The energy recovery ventilators shall be warranted to be free from defects in material and workmanship for a period of one year from the purchase date. Each energy recovery wheel shall be warranted to be free from defects in material and workmanship for a period of five years from the purchase date. Motors shall be warranted by the motor manufacturer for a period of one year from the purchase date.

PART 2 - PRODUCTS

2.1 GENERAL:

A. Units shall be listed as per ANSI/UL 1995, Heating and Cooling Equipment. Energy transfer ratings of the energy recovery wheel shall be ARI Certified. Performance shall be as scheduled on drawings. Exhaust discharge and outside air intake shall not be located on the same side of roof top units.

2.2 UNIT CASING AND FRAMES:

A. Each unit shall be of internal frame type construction of galvanized steel. Frame and panels shall be G90 galvanized steel. All panels exposed to the weather shall be a minimum of 18 gauge galvanized steel. Units shall be internally lined with galvanized sheet metal creating a double wall. Where top panels are joined there shall be an overlapping, standing seam to insure positive weather protection. All

metal-to-metal seams shall be factory sealed, requiring no caulking at job site. Provide baked enamel finish.

B. Unit base to be designed for curb mounting. Unit base shall overhang the curb for a positive seal against water run-off.

C. Weatherhoods shall be the same finish as the unit. Outdoor air weatherhood shall incorporate a louvered design and moisture eliminator. Weatherhoods shall be tested in accordance with AMCA Standard 500-L to prevent water penetration up to 3 inches per hour at 29 mph.

D. Unit casing to be insulated with 1 inch fiberglass. Insulation shall meet requirements of NFPA 90A and tested to meet UL 181 erosion requirements. Insulation shall be enclosed in double wall construction.

2.3 ENERGY RECOVERY WHEEL:

A. Wheels shall be of the enthalpy type for both sensible and latent heat recovery and shall be designed to ensure laminar flow. Energy transfer ratings shall be ARI Certified to Standard 1060 and bear the ARI certification symbol for ARI Air-to-Air Energy Recovery Ventilation Equipment Certification Program based on ARI 1060. Ratings "in accordance with 1060" without certification will not be acceptable. Desiccant shall be silica gel for maximum latent energy transfer. Wheel shall be constructed of lightweight polymer media to minimize shaft and bearing loads. Polymer media shall be mounted in a stainless steel rotor for corrosion resistance.

B. Wheel design shall consist of removable segments for ease of service and/or cleaning. Silica gel desiccant shall be permanently bonded to wheel media to retain latent heat capability after cleaning. Wheels with sprayed-on desiccant coatings will not be acceptable. Wheels with desiccant applied after wheel formation will not be acceptable. Energy recovery device shall transfer moisture entirely in the vapor phase.

C. Energy recovery drive belt material shall be high strength urethane and shall be factory installed in a pre-stretched state, eliminating the need for field belt tension adjustment. Link style belts will not be acceptable.

2.4 ACCESS DOORS:

A. All components shall be easily accessible through hinged removable doors for exhaust, supply, filter and damper compartments. Energy recovery wheels shall be mounted in a

slide-out track for ease of inspection, removal, and cleaning.

B. Access doors shall be operable without the use of tools and shall have integral locking capability or provision to use a padlock to secure each door.

2.5 FAN SECTIONS:

A. Centrifugal fans shall be double width, double inlet, forward curved type. All blower wheels shall be statically and dynamically balanced. Ground and polished steel fan shafts shall be mounted in permanently lubricated, sealed ball bearing pillow blocks. Bearings shall be selected for a minimum (L10) life in excess of 100,000 hours at maximum cataloged operating speeds. Separate motors for exhaust and supply blowers shall be provided. Adjustable sheaves on belt-driven fans with motors shall allow independent balancing of exhaust and supply airflows. Fan and motor assemblies shall be mounted to the unit base with neoprene isolators as standard. Fans shall be located in draw-through position in reference to the energy recovery wheel.

B. Motors shall be energy efficient, complying with EPACT standards, for single speed ODP and TE enclosures. Motors shall be permanently lubricated, heavy-duty type, matched to the fan load and furnished at the specified voltage, phase and enclosure. Drives shall be sized for a minimum of 150% of driven horsepower. Pulleys shall be of the fully machined cast type, keyed and securely attached to the fan wheel and motor shafts and shall be supplied with an adjustable drive pulley. Energy wheel motors shall have integral overload protection.

2.6 FILTERS:

A. Supply and exhaust air filters shall be 2-inch thick pleated fiberglass, 30% efficient and tested to meet UL Class 2. Filter racks shall be die-formed galvanized steel.

2.7 ELECTRICAL:

A. All electrical components shall be UL Listed, Approved, or Classified where applicable and wired in compliance with the National Electrical Code. Provide single point electrical connection.

B. A weatherproof, integral door interlocking disconnect switch, motor starters, control circuit fusing, control transformer for 24 VAC circuit, and terminal strip shall be supplied as standard components in the control center. Motor starters shall consist of a contactor and Class 20

electronic adjustable overload protection and shall be provided for all motors in the unit.

C. Provide each unit with a 115 volt ground fault interruptable convenience outlet and weatherproof cover.

2.8 COOLING COIL:

A. Direct expansion (DX) coils shall be factory tested and rated in accordance with ARI 410. Coils shall have copper tubes with permanently expanded aluminum fins, 12 fpi or less.

2.9 GAS HEATING SECTION:

A. Units shall be suitable for use with natural gas. Gas fired heat exchanger shall be constructed of heavy gauge aluminized steel or stainless steel, factory tested for leaks and shall have anon-prorated ten year warranty.

B. Burners shall be constructed of aluminized steel or stainless steel.

C. Heating controls shall consist of a redundant gas valve, intermittent spark pilot ignition system with electronic flame supervision and a two-stage gas valve, limit switches and combustion air proving switch with minimum 30 second delay.

D. Design shall be specifically for outdoor application and certified by the AGA.

E. Provide a threaded gas connection on unit.

2.10 CONDENSING SECTION:

A. Each unit shall be equipped with a pre-piped and wired air-cooled condensing unit. There shall be no field piping required. Compressors shall be hermetic scroll type, mounted on neoprene vibration isolation to minimize vibration transmission and noise. Compressors shall be mounted in an isolated compartment to be serviceable without affecting airflow. Compressors shall be equipped with a crankcase heater.

B. Each system shall come equipped with a thermal expansion valve to control refrigerant flow. Systems shall also be equipped with a liquid-line filter drier, high-pressure manual reset cutout, low-pressure auto-reset cutout, time delay relays for compressor protection, service/charging valves and moisture indicating sight valve. Condenser fans shall be direct drive, statically and dynamically balanced

and AMCA Licensed for Air Performance. Multiple condensing fans shall be supplied to allow fan cycling for head pressure control. Units 10 tons and larger shall have 2 stages of capacity control. Provide modulating hot gas reheat coil for 70 degree discharge air.

2.11 ROOF CURBS:

A. Provide each unit with a matching, full perimeter roof curb fabricated of not less than 14 gage galvanized steel. The roof curb assembly shall be minimum 12 inches in height and shipped knocked-down for in-field assembly by the installer, in advance of the unit shipment. Curb assembly shall not require field welding.

B. Curb assembly package shall include appropriate cell foam gasketing for the full top flange perimeter of the curb, shipped loose for in-field application.

C. Each curb shall be anchored to the roof structure and installed in such a manner so that curb top is level to within 1/8" per foot, with any slope to be in the direction of the condensate drain connection.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Manufacturer's published installation instructions shall be followed.

B. After curbs are set, they shall be filled with two layers of 4 inch thick mineral wool batt insulation over the entire area inside the curb, except at the supply and return duct connections. Below each layer of mineral wool, install two layers of 5/8 inch thick gypsum board with staggered joints sealed with drywall mud. All voids between the supply and return duct connections and the roof openings shall be caulked with mineral wool fiber and caulked top and bottom with mastic.

3.2 START-UP, TEST AND ADJUST:

A. Provide services of the unit manufacturer as required to inspect and approve final installation of the units and to supervise start-up and placing into proper operation of each unit.

B. The units shall not be operated unless the filters are installed.

C. Do not operate the units until authorized manufacturer's

representative has inspected installation for compliance with equipment manufacturer's published installation instructions.

3.3 INSPECTION:

A. Before request for final inspection submit three copies of inspection report to the Architect, signed by the authorized representative of the unit manufacturer, certifying that the installation and operation of each unit is in compliance with the requirements of the manufacturer's recommended practices.

End of Section

SECTION 23 7415

PACKAGED ROOFTOP AIR CONDITIONING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. The requirements of the General Conditions, Special Conditions and Section 23 0000, Mechanical General, apply to all work specified in this section.

1.2 SCOPE:

A. Furnish and install curb mounted packaged rooftop air conditioning units where shown on the drawings.

B. Units shall be complete with all components, controls and internal wiring necessary for their proper functioning.

C. Units shall be designed for outdoor installation.

1.3 ACCEPTABLE MANUFACTURERS:

A. Roof mounted air conditioning units of one manufacturer have been used as the basis of design. Any modification to piping, controls, electric connections and structural supports that result from the use of equipment by other manufacturers shall be coordinated with all other trades; this coordination shall occur before delivery of the equipment from the manufacturer. Any modifications shall be performed without incurring any additional cost to the Contract.

B. Packaged rooftop air conditioning units manufactured by Carrier, Trane or York will be acceptable.

1.4 WARRANTY:

A. Provide a four year non-prorated extended warranty on each compressor in addition to the standard one year warranty.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS:

A. All electrical components shall comply with the National Electrical Code.

B. All materials, including adhesives and sealants, shall comply with provisions of NFPA 90A. Flame spread rating

shall not exceed 25, smoke developed rating shall not exceed 50.

C. Cooling capacity shall be rated in accordance with ARI Standard 360.

D. All units shall be factory assembled, internally wired and fully charged with refrigerant R 410a. Units shall be designed and capable of operating at outdoor temperatures up to 120 degrees. Units shall be UL listed and labeled for central cooling air conditioners.

2.2 CASINGS:

A. Units shall be constructed of a minimum 16 gauge welded frame and 20 gauge access panels. All exposed surfaces of the unit casing shall be galvanized steel, phosphatized and finished with a coating of paint.

B. All portions of casing panels exposed to the air stream shall be insulated with a minimum of 1" thick mat-faced fiberglass insulation. Casings shall be weather proof and air tight with gasketed joints. Units shall have a continuous airtight floor constructed of the same gauge material as the casing panels.

C. Units shall be designed for curb mounting and mate with either a full perimeter weathertight roof curb or a full perimeter adapter roof curb designed to exactly fit on the existing roof curb, as indicated on the drawings. Unit sides shall overhang the roof curb or adapter curb a minimum of 1" to form a protective drip lip.

D. Units shall have access panels to gain access to the control panel, filter section, supply fan and return/exhaust air section. Panels shall be bolted lift off or hinged type.

E. Units shall have factory installed lifting lugs capable of accepting standard lifting slings and spreader bars to facilitate hoisting.

2.3 ROOF CURBS AND ADAPTER ROOF CURBS:

A. Curbs for mounting on roof and adapter roof curbs shall be constructed of not less than 16 gauge galvanized steel, a minimum of 14" high with a wood nailer and continuous gasket at the top, designed such that the unit shall sit level on the curb.

B. Curb design shall be approved by the National Roofing Contractor's Association.

C. Roof curbs shall be anchored to the roof structure and installed in such a manner so that curb top is level to within 1/8" per foot, with any slope to be in the direction of the condensate drain connection.

2.4 REFRIGERATION SYSTEM:

A. Compressors:
1. Each hermetic compressor shall be reciprocating type, 1750 RPM with a minimum of 2 steps of unloading, or scroll type 3600 RPM. Compressors shall be isolated from the unit casing by rubber-in-shear or spring vibration isolators.
2. Each compressor shall have a centrifugal oil pump, oil charging valve, oil level sight glass, crankcase heater, suction inlet screen and suction and discharge valves.
3. Safety controls shall include high and low refrigerant cut-out, oil pressure cut-out with not over 60 second time delay, time delay relay to prevent short cycling and reset relay.
4. Each compressor shall have an individual refrigerant circuit including accumulator and sub-cooling circuit.
5. Multiple compressors on a single refrigerant circuit will not be acceptable. Single compressor units with only two steps of unloading shall also have hot gas bypass capability.
6. For each refrigeration system provide controls to permit starting and operation down to 0 degrees F outdoor temperatures.
7. Provide a 4 year extended warranty on all compressors in addition to the standard one year warranty.

B. Evaporator coils:
1. Tubes shall be copper and fins shall be aluminum mechanically bonded to tubes.
2. Coils shall be factory tested to 300 psig and shall include factory installed thermal expansion valve, liquid line filter and solenoid valve.
3. When multiple compressors are used, coil circuits shall be entwined. Horizontal or vertical split row coils will not be acceptable.

C. Condenser coils:

1. Tubes shall be copper and fins shall be aluminum mechanically bonded to tubes.
2. Coils shall be factory tested to 425 psig.
3. Protective gaurds shall be provided over all exposed portions of the condenser coils.

D. Condenser fans and motors:
   1. Fans shall be vertical discharge, direct drive propeller type with statically and dynamically balanced zinc plated steel blades and hubs.
   2. Motors shall be single or three phase with permanently lubricated ball bearings and with built-in current and thermal overload protection and weathertight slingers over bearings.

2.5 DRAIN PAN:

A. Provide a drain pan below the cooling coil and extend it a sufficient distance downstream to collect any water carryover.

B. Drain pan shall be of zinc coated steel sandwich construction with insulation enclosed within the sheet metal.

C. Drain pan shall have threaded drain line connections on both sides of the unit.

D. Provide a float switch or equivalent device to shut down unit in the event that the condensate line or drain is blocked.

E. Where multiple coil sections are furnished, provide an intermediate drain pan under each upper coil section, with drain tube down to main pan.

2.6 AIR FILTERS:

A. Provide 2" thick pleated media throw-away filters with a minimum efficiency of 30%.

B. Pressure drop across clean filter media shall not exceed 0.20" wg. at a media velocity of 500 FPM.

C. One set of filter media shall be installed before fans are operated. A second set of filter media shall be installed at completion of construction.

2.7 SUPPLY AND RETURN AIR OR RETURN/EXHAUST FANS:

A. Fans shall be double inlet, double width, forward-curved design, Class I or II as determined by system operating conditions.

B. Exhaust fans may be propeller type, belt driven or direct drive.

C. Supply fans shall be belt driven with variable pitch sheave on the motor and fixed pitch sheave on the fan shaft. When multiple belt arrangements are required belts shall be matched sets.

D. Fan wheels and blades constructed of ferrous metal shall have corrosion-resistant coating.

E. Shafts shall be supported in ball type bearings with extended lubrication lines. Bearing mountings shall be pillow block type.

F. Fan wheel and shaft shall be statically and dynamically balanced as an assembly.

G. Fan and motor shall be mounted on a common rail-type isolation base. Motors shall be mounted on slide rails. Isolation shall be either rubber-in shear or spring.

H. Provide a guard for each belt.

I. For each fan motor, rated motor horsepower shall not be less than brake horsepower required at scheduled capacity plus ten percent.

2.8 ADAPTIVE DEHUMIDIFICATION SYSTEM

A. Where noted on the drawings, units shall be provided with a dehumidification system. In sub-cooling mode the system shall further sub-cool the hot liquid refrigerant leaving the condenser coil when both space temperature and space humidity are above set-point. In hot gas reheat mode a portion of the refrigerant hot gas shall be mixed with the hot liquid refrigerant leaving the condenser coil to create a two-phase heat transfer in the system, resulting in a neutral leaving air temperature when only space humidity is above the set-point.

B. The system shall consist of a sub-cooling/reheat dehumidification coil located downstream of the standard evaporator coil. The system shall include a crankcase heater for the compressor and a low outdoor air temperature switch to lock out both sub-cooling and hot gas reheat when the outdoor temperature is below 40 degrees F.

C. The system shall include a low ambient control to ensure the operation of normal design cooling mode of down to 0 degrees F. A low pressure switch shall be provided on the suction line to ensure low pressure start-up of hot gas reheat mode at lower outdoor temperature conditions.

D. The system shall include a thermal expansion valve to ensure a positive superheat condition and a balance of pressure drop.

2.9 OUTSIDE AIR ECONOMIZER CONTROL:

A. Provide complete operating outside air economizer system with all facilities necessary for its functioning, including dampers and control devices, except for any control devices specified to be remote from the unit.

B. Dampers:
1. Dampers shall be opposed blade design. Dampers shall have extruded aluminum blades which seat against continuous resilient seals. At pressure difference of 2" w.g. leakage through damper shall not exceed 6 CFM per square foot, as measured inside damper frame.
2. Provide adjustable minimum position control for outside air damper. Refer to schedule on the drawings for minimum outside air quantities.
3. All damper operators shall have spring return to normal position. Outside air and relief air dampers shall be normally closed, return air damper shall be normally open. Modulation of relief and return dampers shall be synchronized with that of the outside air damper.
4. Provide weather hoods or louvers to prevent rain from entering openings from outdoors.

C. Economizer control shall function as follows:
1. All dampers shall assume normal position when supply fan is off.
2. Dry bulb sensor/controller shall open outdoor air damper 100% when outdoor temperature is lower than indoor.
3. A low limit mixed air temperature controller, located at the fan section to ensure sensing of mixed air, shall modulate the outside air damper to prevent supply air temperature from dropping below 50 degrees F. In addition provide a 2-position low limit temperature controller to restore all dampers to normal position if mixed air falls to 45 degrees F.
4. For units with return air fan, return air fan shall be interlocked to run when the supply fan runs. If return/exhaust fan is furnished, this fan shall start when outside air damper opens to approximately 20%. Return/exhaust fan relief dampers shall modulate in response to both the outside air damper and supply fan inlet or discharge damper.

5. Mechanical cooling shall be locked out at an adjustable point, approximately 55 degrees F outdoor dry bulb.

2.10 HEATING SYSTEM:

A. Units shall be suitable for use with natural gas. Gas fired heat exchanger shall be constructed of heavy gauge aluminized steel or stainless steel, factory tested for leaks and shall have anon-prorated ten year warranty.

B. Burners shall be constructed of aluminized steel or stainless steel.

C. Heating controls shall consist of a redundant gas valve, intermittent spark pilot ignition system with electronic flame supervision and a two-stage gas valve for units over six tons, limit switches and combustion air proving switch with minimum 30 second delay.

D. Design shall be specifically for outdoor application and certified by the AGA.

E. Provide a threaded gas connection on unit.

2.11 ELECTRICAL POWER SUPPLY:

A. Provide single point for power supply, all internal power wiring and motor control for all motors. All electrical work shall comply with the National Electrical Code.

B. Units shall be suitable for use with voltages and phases as scheduled on the electrical drawings. Power wiring to control transformers shall be factory wired.

2.12 TEMPERATURE AND OPERATIONAL CONTROLS:

A. Provide all internal control devices, control power transformers and wiring necessary for the proper functioning of each unit.

B. Control devices shall be mounted in the control panel with access door or panel as described above.

C. Control voltage shall not exceed 120 volts. Provide necessary control transformers.

D. Start-stop and operating control shall be initiated and operate as described under Section 23 0923, Building Automation System.

2.13 FIRE AND SMOKE CONTROL:

A. Provide contacts or relays in unit control panel for interface with the building fire alarm system as specified in Section 23 0923, Building Automation System.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Manufacturer's published installation instructions shall be followed.

B. After new roof curbs are set, they shall be filled with two layers of 4 inch thick mineral wool batt insulation over the entire area inside the curb, except at the supply and return duct connections. Below each layer of mineral wool, install two layers of 5/8 inch thick gypsum board with staggered joints sealed with drywall mud. All voids between the supply and return duct connections and the roof openings shall be caulked with mineral wool fiber and caulked top and bottom with mastic.

3.2 START-UP, TEST AND ADJUST:

A. Provide services of the unit manufacturer as required to inspect and approve final installation of the units and to supervise start-up and placing into proper operation of each unit.

B. Rooftop air conditioning units shall not be operated unless the filters are installed.

C. Do not operate unit until authorized manufacturer's representative has inspected installation for compliance with equipment manufacturer's published installation instructions.

3.3 INSPECTION:

A. Before request for final inspection submit three copies of inspection report to the Architect, signed by the authorized representative of the unit manufacturer, certifying that the installation and operation of each unit is in compliance with the requirements of the manufacturer's recommended practices.

End of Section

SECTION 23 8133

DUCTLESS SPLIT SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. The requirements of the General Conditions, Special Conditions and Section 23 0000, Mechanical General, apply to all work specified in this section.

1.2 DESCRIPTION OF WORK:

A. Materials and equipment furnished under this specification shall be standard cataloged products of manufacturers regularly engaged in production of such materials or equipment and shall be the manufacturer's latest design that complies with these specifications.

B. Each component shall be factory tested, dehydrated and charged. All equipment capacities shall be certified in accordance with ARI 240 and sound levels shall comply with the requirements of ARI 270 and ARI 350. All components shall be UL listed. The outdoor condensing unit and indoor fan coil unit shall be factory rated for use together to provide the cooling capacities and operating efficiencies within 5% of that indicated on the drawings.

1.3 QUALITY ASSURANCE:

A. Ductless split system manufactured by Carrier, Mitsubishi, Samsung, Sanyo or EMI will be acceptable.

PART 2 - PRODUCTS

2.1 OUTDOOR CONDENSING UNIT:

A. The outdoor air cooled condensing unit shall be a completely packaged, factory assembled, electrically operated unit consisting of hermetic reciprocating or rotary compressor with crankcase heater, high and low pressure safeties, operating controls, air-cooled condenser coil with direct drive propeller fan, suction and liquid line service valves, service gauge connection port, liquid line accumulator, filter drier and wiring.

B. The entire condensing unit shall be completely factory charged with the amount of refrigerant and lubricating oil as recommended by manufacturer.

C. Condensing unit shall have isolation mountings under the

compressor and shall be enclosed in a weatherproof cabinet constructed of galvanized steel, bonderized and coated with a baked-on enamel finish. Condenser coil shall be constructed of aluminum fins mechanically bonded to seamless copper tubes which have been cleaned, dehydrated and sealed.

D. Motor shall be NEMA rated class F suitable for operation in a refrigerant atmosphere. Provide each motor with thermal overload protection. Provide overload protective devices either integral to motor or controller or mounted in separate enclosure.

E. Operating and safety controls shall include time delay restart, automatic restart on power failure, high pressure and liquid line low pressure switches, start capacitor and relay, compressor motor current and temperature overload protection and outdoor fan failure protection.

2.2 HIGH WALL INDOOR FAN COIL UNIT:

A. The indoor fan coil unit shall be the high wall mounted type complete with blower, cooling coil, piping connectors, microprocessor control system and hard wired remote controller.

B. Direct drive fan shall have capacity for distributing and conditioning air over evaporator coil to provide cooling allowance not exceeding 10% above or below specified capacities. A user adjustable horizontal and vertical air sweep shall be provided.

C. Unit shall consist of a reinforced sheet metal enclosure with baked-on enamel finish and with high impact polystyrene discharge and inlet grilles. Furnish unit with wall mounting bracket and mounting hardware.

D. Ship coil after dehydration with a holding charge of refrigerant provided by the manufacturer. Evaporator coil shall be constructed of seamless copper or galvanized steel tubes with aluminum plate fins mechanically bonded to tubes.

E. Provide evaporator coil with a drip pan of nonferrous material or with steel pan completely waterproofed with a non-hardening type mastic on water side and with thermal insulation to prevent casing condensation.

2.3 FILTER:

A. Provide cleanable type air filter 1" thick. Filters shall be Class 2, conforming to the requirements of UL.

B. Filter shall be easily removable for cleaning without use of special tools.

2.4 CONTROLS:

A. Furnish microprocessor-based controls for the ductless split system.

B. System controls shall have the following characteristics:
1. Automatic restart after power failure at the same conditions as at failure.
2. Return air temperature sensor and indoor high discharge temperature shutdown.
3. Hard wired remote controller to enter set points and operating conditions.
4. Dehumidification mode to provide increased latent removal capability by modulating fan speed and temperature set point.
5. Diagnostics to provide continuous checks of all unit operations with error messages displayed at the unit and remote controller.
6. Fan speed controls for high, medium and low modes.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Ductless split system shall be installed in accordance with the manufacturer's recommendations.

End of Section

SECTION 23 8146

WATER SOURCE HEAT PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. The requirements of the General Conditions, Special Conditions and Section 23 0000, Mechanical General, apply to all work specified in this section.

1.2 QUALITY ASSURANCE:

A. Codes and regulations referred to are minimum standards. Where the requirements of these specifications or drawings exceed those of the codes and regulations, the drawings and specifications shall govern.

B. All water source heat pumps shall be factory run tested and shall conform to the requirements of ARI 320-81, shall be UL listed and shall be new.

C. Material and equipment furnished under this specification shall be standard catalogued products of manufacturers who have produced that equipment for at least three years. All water source heat pumps shall be of the same manufacturer.

D. Water source heat pumps shall utilize R 410a refrigerant.

E. Water source heat pumps manufactured by Carrier, Trane, American Air Filter, Climatemaster or Florida Heat Pump will be acceptable.

1.3 WARRANTY:

A. In addition to the one year parts and labor warranty provided under the general conditions provide an additional 4 year parts only warranty for the compressors.

1.4 REQUIREMENTS:

A. The characteristic requirements for water source heat pumps shall be:
   1. The units shall be capable of operating with an entering water temperature of 40 deg. F and an entering air temperature 40 deg. F at ARI water and air flow rates.
   2. Units shall be extended range type rated for 45 deg. F to 120 deg. F entering water temperature.
   3. A low pressure cut-out device with a manually reset lockout shall be provided to prevent freezing during

the heating operation.

4. Installation and piping for water-to-refrigerant heat exchangers shall include provision for isolation and access valving for chemical cleaning or physical access for mechanical cleaning of the water side of heat exchange surfaces.

PART 2 - PRODUCTS

2.1 WATER SOURCE HEAT PUMPS:

A. Water source heat pumps shall consist of packaged units of the horizontal type as shown on the drawings. Package units shall consist of factory assembled refrigerant circuit, rotary or scroll type hermetic compressor, air-to-refrigerant finned tube coil, metering device, pilot operated reversing valve, water-to-refrigerant heat exchanger, fan and motor, housing, piping, wiring, controls, removable service panels, and safeties. Each unit shall be provided with a factor operating charge of refrigerant. A thermal expansion valve shall be provided to control refrigerant flow.

B. Compressors shall be of the welded hermetic rotary or scroll type rated for heat pump service and shall be resiliently mounted to avoid vibration and noise. Compressors shall be provided with compressor motor, starter, overload protection, time delay on recycling, thermal cutouts, hot gas cutout and high and low pressure safeties.

C. Water-to-refrigerant heat exchangers shall be of the circular tube-in-tube type with a steel outer tube and copper finned inner tube. Design operating pressure shall be not less than 300 psig.

D. Fans shall be double-width, double inlet, forward curved centrifugal type, mounted on a dynamically and statically balanced motor shaft. Outlet velocity shall not exceed 2000 feet per minute. Direct drive motors shall be resiliently mounted to the fan, belt drive blower and motor shall be internally mounted on vibration rails. Belt driven units shall have adjustable sheaves to provide not less than 20 percent fan speed adjustment.

E. Outer casings shall be constructed of insulated heavy gauge metal panels reinforced with angles or formed metal frame and provided with easily removable access panels for access to all parts of the equipment. Supply and return connections shall be copper. Drain pans shall be coated with thermal insulation to prevent condensation.

F. Filters shall be located to filter return air inside of each heat pump casing unless indicated otherwise. Filters shall be 2 inches thick, replaceable throwaway type. Filter access panels shall not require the use of tools in order to remove and replace the filter.

PART 3 - EXECUTION

3.1 GENERAL:

A. Units shall not be operated until filters are in place. Provide an extra set of clean filters at the time of final inspection.

B. Make electrical connections taking care that these do not block access to any part of the equipment.

3.2 BALANCING AND TEST:

A. Operate each water source heat pump on heating and cooling and check for proper supply air quantity, temperature, noise, and correct operation.

B. Report the airflow, static pressure, voltage and current draw of each unit, GPM, water pressure drop, refrigerant pressure readings, etc., as required by Section 23 0593, Test and Balance.

End of Section