

SECTION 15000  
MECHANICAL OUTLINE SPECIFICATIONS

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Provide all material and equipment related to the installation of systems as shown on the contract drawings including but not limited thereto.
  - 1. Library meeting room HVAC system included cold climate heat pump and energy recovery unit along with all associated accessories and controls. Including all electrical work.
  - 2. Library drinking fountain including all plumbing, electrical and architectural work.
  - 3. Town Office front porch gutter downspout repair and new heat trace. Includes electrical and architectural work.
  - 4. Work not specifically shown or specified, yet required to ensure proper and complete operation of all systems and to satisfy the design intent inherent in the Work and to comply with all applicable codes and regulations.
  
- B. Drawings
  - 1. Contract drawings are, in part, diagrammatic and are intended to convey the scope of work and indicate, in general, arrangement of the equipment and do not indicate every required offset, fitting, valve, etc. Follow these drawings in laying out the work. Consult all Drawings to become familiar with all conditions affecting the work and to verify spaces in which the work will be installed.
  - 2. Reasonable changes required by job conditions (including offsetting of piping and ductwork, etc.) shall be made at no additional cost to the owner.
  
- C. Definitions:
  - 1. "Provide" shall have the same meaning as "furnish and install". All material so implied either on the drawings or in these specifications shall be furnished and installed unless specifically noted otherwise.

1.2 QUALITY ASSURANCE

- A. All work specified in Division 15 shall be performed by approved workmen qualified by satisfactory experience in the particular work.

- B. Submit seven copies of all submittal data and/or completes shop drawings for review. Submittals for equipment requiring electrical service shall include wiring diagrams. Submittals and/or shop drawings are to be edited to show specific data for the mechanical equipment that the contractor intends to provide. Submittals and/or shop drawings are to be identified with numbers and letters identical to those listed on the drawings and/or specifications.
- C. Substitution for Specified Materials:
1. Where a specific trade name, manufacturer and model number is mentioned, it is intended to establish the quality, style and type of equipment necessary to fulfill design criteria and shall not be construed as restricting or limiting competition among manufacturers.
  2. The specific name and model number scheduled on the drawings and/or the first name in the specification is the basis of the system design.
  3. Contractor may propose substitutes.
    - a. Any material or equipment other than that designated as system design shall be considered a substitute whether referenced as an equal or not.
    - b. All submittals for substitution shall be in the form of a fully coordinated proposal covering all changes in the work associated with making the substitution.
    - c. The change shall include the mechanical and all other disciplines associated with the change.
    - d. Refer to Division 1, General Requirements for procedures to propose substitutes.
  4. Contractors shall be held responsible for all physical changes resulting from such substitutions of equipment and shall bear any and all increased costs as well as costs to other trades in making said substitutions. Approval by the Architect/Engineer of equipment other than the specified does not relieve the Contractor of this responsibility.
  5. In all instances, contractors shall assume full responsibility for proof of quality of the substitute to the equipment hereinafter specified. All data and information necessary for proof of equality, function and space requirements shall be prepared and accompany the submittal of the substitution to the Architect/Engineer.
  6. In the event the substitute material or equipment does not perform, fit or meet quality standards, the Contractor shall provide the specified material or equipment and bear all costs to replace the substituted item with the specified.

- A. Comply with all Federal, State, Municipal, OSHA, NFPA, AGA, NEC, and Utility Companies' laws, ordinances and regulations that apply to the work.

#### 1.4 OPERATION AND MAINTENANCE MANUAL

- A. Upon completion of this portion of the work, and as a condition of its acceptance, deliver to the Architect/Engineer three copies of a manual describing the system. Prepare manuals in durable plastic binders approximately 8½ by 11 inches in size with at least the following:
  - 1. Identification on, or readable through, the front cover stating general nature of the manual.
  - 2. Neatly typewritten index near the front of the manual, furnishing immediate information as to location in the manual of all data regarding the installation.
  - 3. A copy of all reviewed submittals and shop drawings.
  - 4. A simplified description of the operation of all systems including the function of each piece of equipment within each system. These descriptions shall be supported with a schematic flow diagram.
  - 5. An explanation of the control sequence of each system along with the following instructions wherever applicable.
    - a. Emergency procedures for fire or failure of major equipment.
    - b. Normal starting, operation, and shutdown.
    - c. Summer or winter shutdown.
  - 6. An outline of a preventive maintenance program for each system that shall include a schedule of inspection and maintenance. It shall suggest the maintenance and inspection that should be done with outside service.
  - 7. Complete name and address of nearest vendor of replaceable parts.
  - 8. Copy of all guarantees and warranties issued.
  - 9. Where contents of manual include manufacturer's catalog pages, clearly indicate the precise items included in this installation and delete, or otherwise clearly indicate, all manufacturers' data with which this installation is not concerned.
  - 10. Guarantee letter from Contractor.

## PART 2 – PRODUCTS

### 2.1 MATERIALS

#### Mechanical Outline Specifications

- A. Provide and install only new materials and equipment of the latest design of the respective manufacturers.
- B. All materials and equipment of the same classification shall be the product of the same manufacturer unless otherwise specified.
- C. Furnish to the proper trades, all manufacturer's wiring diagrams for installation of mechanical equipment.

## 2.2 PIPING

- A. All pipe and pipe fittings shall meet ruling codes and regulations and shall be used and installed according to the ruling codes and regulations.
- B. Install piping approximately as indicated, straight, plumb and as direct as possible. All piping in occupied spaces to be concealed. Install risers in corner as close to wall as possible, without offsets unless in such a fashion that they can be concealed. Install ceiling mounted piping parallel to walls and as close to junction of ceiling and wall as possible.
- C. All piping shall be installed with appropriate provisions for movement and expansion. Provide adequate expansion joints, guides, and anchors.
- D. Connections to equipment or control valves shall include unions whether shown on drawings or not. Connection to water heater shall be with dielectric unions.
- E. Before starting installation of piping, survey the routes and check for interference. Modify route as required with the permission of the Owner at no additional cost.
- F. Pipe and pipe fittings for each service shall conform to the following schedule:

## 2.3 QUALITY OF PIPING (All standards shall be of the latest editions).

- A. Copper tube, Type "L", hard temper: ANSI H23.1.
- B. Copper tube, Type "K", soft temper: ANSI H23.1.
- C. Cast iron soil pipe, service weight: C.I.S.P.I. HS-67.
- D. Cast iron soil pipe, no hub: C.I.S.P.I., IAMPO.
- E. Galvanized steel pipe, Schedule 40: ANSI B36.20.
- F. Black steel pipe, Schedule 40: ANSI B36.20.
- G. P.V.C. (Polyvinylchloride) - ASTM D3034.
- H. Black steel pipe - Schedule 40: Coated and Wrapped.
- I. Black steel pipe, Schedule 80: ANSI B36.20.

- J. Brass pipe fittings.
- K. Ductile iron pipe - Class 50-56.
- L. FRP Pressure Carrier Pipe - chemically resistant resins reinforced with fiberglass filament. Rated 150 PSIG working pressure at 250 degrees F.
- M. Polypropylene: ASTM D635; rated SE-O in accord with UL94.
- N. Hard drawn copper refrigeration tubing. Cleaned and sealed.
- O. Polyethylene: ASTM D1248, ASTM D2737, AWWA CTS C901
- P. Pex tubing, high-density cross-linked polyethylene with oxygen barrier: ASTM F 876

#### 2.4 QUALITY OF FITTINGS (All standards shall be of latest editions).

- A. Copper water tube solder joint fittings: Cast brass ANSI B16.18.
- B. Copper water tube flared joint fittings. Listed for underground service.
- C. Cast iron soil fittings, service weight: C.I.S.P.I., IAMPO.
- D. Cast iron, no hub fittings, C.I.S.P.I., IAMPO.
- E. Galvanized malleable iron fittings, 150 psig: ANSI B16.3.
- F. Black malleable iron fittings, 150 psig: ANSI B16.3.
- G. Steel butt welding fittings, A-106 seamless carbon steel, Schedule 40: ANSI B16.5; 150 psig welding neck forged steel flanges.
- H. P.V.C. (polyvinylchloride) - ASTM D3034.
- I. Cast Brass Compression: 85-5-5-5.
- J. Single rubber sealing type or mechanical joints AWWA specification C110.
- K. Bell X Bell - same material as that of the carrier pipe.
- L. Same material as pipe.
- M. Copper refrigeration tube solder joint fittings.
- N. Same material as pipe: ASTM F 1807

#### 2.5 JOINTS

- A. Brazed Joints

Silver Brazing Alloy: "Stay-Silv "45" or approved equal.  
 Flux: Silver brazing flux as approved.  
 Remove excess flux.  
 Remake leaky joints with new pipe and fittings.

B. Threaded Joints

Ream and/or file before installation to remove all burrs.  
 Remove all metal chips and filings.  
 Pipe joint compound shall be suitable for service.

C. Gasketed Joints

Materials and methods shall be as recommended by the pipe and fittings Manufacturer and shall comply with C.I.S.P.I. HSN-68T.

D. No Hub Joints

Materials and methods shall be as recommended by the pipe and fittings Manufacturer and shall comply with C.I.S.P.I. and IAMPO.

E. Welded Joints

F. Solvent Weld Joints

G. Soldered Joints

95-5 Tin-Antimony solder  
 Flux: Paste form as approved  
 Remove excess solder and flux

H. Mechanical Joints

M.I. Bolt or Stud for tapped bells.

I. Fuseal Joints; As manufactured by R&G Sloane.

J. Compression; crimp or cinch

2.6 SCHEDULE

A. Letters in the schedule refer to paragraphs of Articles 2.3, 2.4 and 2.5 of this Section. The reference in parenthesis is an option; select one. Use the following materials unless otherwise noted:

Service -	Size	Location	2.2 Pipe	2.3 Fittings	2.4 Joints
Domestic Water Piping	<3"	Above Slab	A	A	G

Sanitary Waste Piping	-	Above Slab	G	H	F
Sanitary Vent Piping	-	All	G	H	F
A/C Condensate Drain Piping	-	All	G	H	F
Refrigeration Piping	-	All	N	M	A

2.7 THERMOMETERS

- A. Use Required - Where shown on the Drawings or specified and on the entering and leaving side of heat generating equipment.
- B. Thermometers shall have die cast case with baked enamel finish; red reading mercury-filled tube with suitable 9" scale; adjustable multi-angle housing, and a brass separable socket.

2.8 PRESSURE GAUGES

- A. Use Required – Where shown on the Drawings or specified and on the entering and leaving side of a water pump.
- B. Provide with die cast case with baked enamel finish and the appropriate scale based on pressure of system.

2.9 INSULATION

- A. Insulating material and methods of installation shall conform to the following:
- B. Type A: One piece of half sectional fiberglass insulation jacketed with Owens-Corning Fiberglass, or equal, Fiberglass 25ASJ/SSL-II all service vapor barrier jacket.
  - 1. K: 0.24 BtuH in./°F sq. ft. at 75°F mean temperature.
  - 2. Operating temperatures: -60°F to 450°F.
  - 3. Jacket water vapor permeance: not more than 0.02 perm./inch.
  - 4. Jacket and butt strips: factory applied, self-sealing pressure sensitive adhesive or a conventional lap-seal adhesive.
  - 5. Surface burning characteristic ratings as tested by ASTM E-84, UL 723, or NFPA 255 not exceeding:
    - a. Flame Spread 25
    - b. Smoke Developed 50
- C. Type B: Rigid phenolic foam insulation, Armstrong Accotherm or equal, jacketed with an all service vapor barrier jacket.
  - 1. K: 0.23 BtuH in./°F sq. ft. at 75°F mean temperature.
  - 2. Operating temperatures: -40°F to 275°F.
  - 3. Jacket water vapor permeance: not more than 0.02 perm./inch.
  - 4. Seal vapor barrier jacket laps and butt joints with Accotherm lap-seal tape, Armstrong 520 adhesive, or a conventional lap-seal adhesive.
  - 5. Fitting covers: fabricated and installed in accordance with manufacturer's recommendations with all joints sealed with Armstrong 520.

- D. Type C: Flexible, elastomeric thermal insulation, Armstrong Armaflex II or equal.
1. K: 0.27 BtuH in./°F sq. ft. at 75°F mean temperature.
  2. Operating temperatures: -20°F to 220°F.
  3. Water vapor permeance: not more than 0.20 perm./inch.
  4. Seal seams and butt joints with Armstrong 520.
  5. Fitting covers: fabricate and install in accordance with manufacturer's recommendations.
  6. Type C insulation shall not be used in air plenums or where prohibited by code.
- E. Type D: Plain, semi-rigid fiberglass board insulation, Owens-Corning Fiberglass 703 board or equal.
1. K: 0.23 BtuH in./°F sq. ft. at 75°F mean temperature.
  2. Operating temperatures: 0°F to 450°F.
  3. Density: 3 lb./cu. ft.
  4. Secure insulation in place with minimum 16 gauge steel wire on 12" centers. Butt all joints firmly together.
  5. Finish: embed reinforced fiberglass cloth into a coat of white Foster 30-70 Lagtone cement; apply second coat of cement to provide neat finished appearance.
  6. Cleanouts, nameplates, and manholes shall not be insulated; neatly bevel insulation on surrounding surfaces at such openings.
- F. Type E: Foil-reinforced kraft faced vapor barrier jacketed, rigid fiberglass board insulation, Owens-Corning Fiberglass 705 FSK board or equal.
1. K: 0.23 BtuH in./°F sq. ft. at 75°F mean temperature.
  2. Operating temperatures: 0°F to 450°F.
  3. Jacket water vapor permeance: not more than 0.02 perm./inch.
  4. Density: 6 lb./cu. ft.
  5. Box around item to be insulated with insulating board filling all spaces and voids of box with fiberglass blanket insulation.
  6. Seal all joints with FRK vapor seal tape.
  7. Finish: embed reinforced fiberglass cloth into a coat of white Foster 30-35; apply second coat of 30-35 providing a complete vapor seal with a neat finished appearance.
  8. Construct insulation for items with sections that must be removed for maintenance, such as split casing pumps, in sections so that same may be removed to service item.
- G. Type F: All service vapor barrier jacketed, rigid fiberglass board insulation, Owens-Corning Fiberglass 705 ASJ board or equal.
1. K: 0.23 BtuH in./°F sq. ft. at 75°F mean temperature.
  2. Operating temperatures: 0°F to 450°F.
  3. Jacket water vapor permeance: not more than 0.02 perm./inch.
  4. Density: 6 lb./cu. ft.



5. Apply insulation with mechanical fasteners spaced not more than 12" on center.
  6. Seal all edges, punctures, and joints with ASJ pressure sensitive tape.
- H. Type G: Foil-reinforced kraft faced vapor barrier jacketed, inorganic glass fiber blanket insulation, Owens-Corning Fiberglass T-100 FSK Faced Duct Work Insulation, Commercial Grade, or equal.
1. K: 0.30 BtuH in./°F sq. ft. at 75°F mean temperature
  2. Operating temperatures: 40°F to 250°F.
  3. Jacket water vapor permeance: not more than 0.02 perm./inch.
  4. Wrap insulation tightly on ductwork with all circumferential joints butted and longitudinal joints overlapped a minimum of 2"; ductwork over 24" wide use mechanical fasteners spaced not more than 18" on center.
  5. Adhere insulation to sheet metal with Foster 85-17 bonding adhesive.
- I. Type H: Bonded mat of glass fiber insulation coated with a black pigmented fire-resistant coating and EPA - Registered anti-microbial agent on the airstream side, Certain Teed Tough Guard or equal.
1. K: 0.26 BtuH in./°F sq. ft. at 75°F mean temperature.
  2. Operating temperature: to 250°F.
  3. Airstream side coating shall prevent insulation erosion at velocities up to 6,000 fpm.
  4. Attach liner to duct with both mechanical fasteners and Foster 85-62 adhesive in conformance with SMACNA "Duct Liner Application Standard", latest edition.
- J. Type I: Lightweight, semi-rigid glass fibers, bonded with a high temperature binder, board like insulation, Owens-Corning Fiberglass Insul-Quick Insulation or equal.
1. K: 0.30 BtuH in./°F sq. ft. at 200°F mean temperature.
  2. Operating temperatures: to 950°F after product stabilization.
  3. Secure insulation and metal mesh with welded pins or studs maximum spacing of 16" on center.
  4. Finish: trowel coat of insulating cement to a smooth, hard finish; apply coat of fire retardant lagging adhesive, Foster Lagton 30-70 embedding a layer of open weave glass cloth or canvas, overlapping seams 2"; finish with second coat of 30-70.
- K. Type J: Rigid hydrous calcium silicate insulation, Owens-Corning Fiberglass Kaylo Asbestos Free insulation or equal.
1. K: 0.42 BtuH in./°F sq. ft. at 200°F mean temperature.
  2. Operating temperatures: to 1200°F.
  3. Insulation: fit the contour of surface using preformed pipe sections for pipe and beveled lag sections for circumferences.
  4. Butt insulation at joints and hold in place using 16 gauge steel wire bands spaced not more than 12" on centers.

2.10 INSULATION SCHEDULE

A. Contractor shall provide insulation as per the following Schedule:

Service	Location	Type	Size	Thickness
<b>PIPING</b>				
Domestic Cold Water Piping	all	A	runouts	1/2"
Domestic Hot Water Piping	all	A	runouts	1/2"
Refrigeration Piping	all	C	all	1"
<b>DUCTWORK</b>				
Supply Air Ductwork	Mechanical room	G	all	1-1/2"
Exhaust Air Ductwork from space	all	none	-	-
Exhaust Air Ductwork to outside (heat recovery unit)	all	G	all	1-1/2"
Outside Air Ductwork to outside (heat recovery unit)	all	G	all	2"

1. The Type A insulation noted for heating hot water piping, domestic hot water piping and domestic cold water piping applies to copper piping. If the piping is to be pex, Type C insulation shall be provided at the thickness noted above.

2.11 ESCUTCHEONS

A. Provide chromium plated, satin finish, cast brass escutcheons for exposed piping passing through or protruding from walls, ceilings, and floors.

2.12 DUCTWORK AND FITTINGS

- A. Construct all ductwork of galvanized sheet metal unless noted otherwise.
- B. Galvanized steel shall be of lock forming quality with zinc coating of 1.25 ounces per square foot on each side. Metal gauge, joints, connections, fan casings, casements, bracing, supports and other details not listed in these specifications or indicated on the drawings shall comply with the SMACNA Duct Construction Standards and shall become part of this specification as though printed herein.
- C. Fabricate ductwork in a neat and workmanlike manner, free from dents, all joints driven home, smooth inside, neat outside, airtight and without the use of tape. Inside radius of elbows not less than 1.5 times width. Provide all square elbows with turning vanes.
- D. Fabricate branch take-offs with 45° tee connection or straight tee connection with air extractors.
- E. All low-pressure supply ducts shall be sealed to limit leakage to 5% or less of system air capacity.

- F. Fabricate and install all ductwork in accordance with recommendations and procedures of the latest edition of the ASHRAE Handbooks, all pertinent local, state, and federal codes, and the "Duct Manual of Sheet Metal Construction for Ventilating and Air-Conditioning Systems" published by the Sheet Metal and air-conditioning Contractor's National Association, Inc.
- G. Install flexible connections between all ducts and heat recovery unit, fans, etc., to prevent the transfer of equipment vibration to the ductwork.
- H. Adjoining duct inlet shall be same size and shape of equipment outlet and shall be aligned with outlet and independently supported with a minimum of 2" separation from equipment.
- I. Provide materials that meet the requirements of NFPA Pamphlet #90A, and are UL approved for use intended, as manufactured by Duro-Dyne Ventfabrics, Inc., Elgin or approved equal.
- J. Round Ductwork and Fittings above grade.
  - 1. Factory manufactured or machine fabricated of galvanized steel or aluminum with lock formed joints and seams.
  - 2. Low pressure round ductwork of rigid snap lock or ACME seam pipe, seal joints and seams.
  - 3. Include damper with locking quadrant in collar where a manual damper is shown on plans.
  - 4. Connect to rectangular ductwork with spin collars or clinch collars; seal airtight with suitable duct sealer.
- K. Flexible Ductwork
  - 1. For connections between air devices and where otherwise shown on Drawings. Manufactured flexible duct from spring steel helix with an impervious, reinforced, vapor proof, reinforced polyester outer jacket and inner core. Inner Core shall be airtight and prevent fiberglass erosion into air stream. Wire helix shall be encapsulated and prevent unraveling when cut to length. Provide 1 inch thick by 3/4 lb./cu. ft. fiberglass insulation and polyethylene jacket. Duct shall comply with UL 181 Class I Air Duct.
  - 2. Fire Resistant, self-extinguishing, UL Standard 181, Class 1, flame spread of 25 or less and smoke development index not to exceed 50.
  - 3. Length: three (3) feet maximum, fully extended. Where more length is required, remainder shall be rigid round ductwork.
  - 4. Install duct in full extended position with no kinks or sags; use only minimum length required to make connection; support ducts, as required,

to prevent sagging with 3/4" wide metal banding material; secure joints with a draw band.

L. Duct Sealant

1. All duct systems shall be effectively sealed. Total allowable leakage from low-pressure ducts shall not exceed five (5) per cent of the total system design airflow rate. These requirements are in compliance with ASHRAE Standard 90.1, and SMACNA High, Medium and Low Pressure Duct Construction Standards (Seal Class A, B, C, D).

M. Manual Damper (Volume Damper)

1. Dampers shall be two gauges heavier than the duct in which installed.
2. Operators shall be operated by locking type quadrant operators.
3. Locate dampers at access panel locations. Coordinate final locations with architectural drawings.

N. Grilles, Registers, Diffusers

1. Furnish and install air diffusers, grilles and registers of capacities and material indicated on the Drawings.

2.13 CONTROLS

A. See drawings for Control Sequences.

B. OTHER MATERIALS

1. Provide all other materials such as wire, transformers, relays, etc. that may be required for a complete control system as described herein and on the Drawings. Items shall be as selected by the Contractor subject to the acceptance of the Engineer.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install all work with a neat and orderly appearance, as specified and as shown on the Drawings.
- B. Make all installations structurally sound throughout.
- C. Perform all work incidental to the installation of the apparatus and materials including, but not limited to, cutting, patching, trenching, excavating, backfilling, and trench covering. All work shall be performed by qualified workmen regularly employed in the applicable trades.

3.2 DUCTWORK INSTALLATION

- A. Take all necessary measurements at the building and fabricate the ductwork on the site if required to ensure an approvable installation.
- B. Provide cross overs, transitions, offsets and changes in duct shapes as required in order to avoid interfering with pipe lines and to maintain full areas of ducts. No pipes shall pass through ducts.
- C. The right is reserved to vary runs, shapes and make offsets during construction to meet structural interference. Consult with other trades to establish clearances before installing ductwork, grilles, registers and diffusers.
- D. Install suitable access doors wherever necessary to permit operation, adjustment and servicing of equipment.
- E. Connect the ducts, casings, and other sheet metal work to all outside air intakes and exhausts through building walls. Blank off unused portions of louvers with proper type and gauge sheet metal faced on room side with one-inch thick rigid insulation with vapor barrier.
- F. At connections to all equipment, support ductwork independently with no weight upon the equipment.
- G. Furnish and install hangers, brackets and supports for all sheet metal work. Secure ducts passing through walls and floors to angle frames by rivets or sheet metal screws. Secure angle iron frames in place by inserts, expansion bolts or wood screws.
- H. Support rigid round ducts at joints and on maximum 5'-0" centers. Support rectangular ducts to 24" wide at joints and on maximum of 6'0" centers; over 24" wide support at joints and on maximum of 4'-0" centers. Supports are to prevent sag and vibration when equipment is operating at maximum speed and capacity.
- I. Protect openings in ductwork during construction. Seal supply and exhaust boots to prevent dirt and materials from entering the system during construction. Clean system thoroughly when complete.
- J. Install ductwork and accessories to provide a system free from buckling, warping, and vibration.
- K. Insulate ductwork in accordance with the requirements of this Specification Section, Paragraph 2.10.

### 3.3 CLEANUP AND PROTECTION OF EQUIPMENT

- A. The contractor is responsible to protect all equipment from the dust and dirt generated by the contractor during the construction of the project.
- B. No construction debris may remain in the building.

- C. Clean up must occur twice daily or as required to keep the area clean and free from debris.

### 3.4 IDENTIFICATION

- A. All piping shall be identified as to the service of the pipe and the normal direction of flow. The letters shall be at least 1" high and the flow arrows shall be at least 6" long.
- B. All equipment shall be identified by stenciling the title of the equipment in a position that is clearly visible.
- C. All isolation valves shall be labeled with brass tags hanging from a chain on valve.
- D. Piping shall be identified at all tees, at equipment locations and in each separate room.
- E. All color codes of piping shall comply with ANSI A 13.1.

### 3.5 GUARANTEE

- A. The Contractor shall guarantee all materials, workmanship, and the successful operation of all equipment and apparatus installed for a period of one year from the date of final acceptance.

### 3.6 TESTING, ADJUSTING, AND BALANCING

- A. The Contractor shall provide for the adjusting and balancing of all systems to conform to these plans and specifications.
- B. The following codes and standards shall be followed:
  - 1. NEBB: "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems".
  - 2. AABC: "National Standards for Total System Balancing".
  - 3. ASHRAE: ASHRAE Handbook, 2003 HVAC Applications, Chapter 37, "Testing,
  - 4. Verify cleanliness of strainers.
  - 5. Verify expansion tanks are not air bound.
  - 6. Verify the system is full of water/propylene glycol mixture (20%).
  - 7. Check bearing and motor lubrication.
  - 8. Verify air vents (manual or automatic) are installed and working properly.

- C. Air systems shall be balanced to within  $\pm 10\%$  of values shown on plans.
  - 1. Contractor shall submit an Adjusting, and Balancing”.
- D. Air System Testing Procedures
  - 1. Review the system installation from distribution units to terminal units to verify the system has been installed per plans.
  - 2. Check bearing and motor lubrication.
  - 3. Check fan belt tensions.
  - 4. Check for proper fan rotation.
  - 5. Check air filters.
- E. Balance water system to within  $\pm 10\%$  of values shown on plans.

END OF SECTION