

SECTION 15000 – MECHANICAL SYSTEMSPART 1 – GENERALSCOPE:

These Specifications are intended to provide all cooling, heating, ventilating and plumbing systems, including roughing-in services for equipment provided for by others, all as specified herein or shown on the accompanying Drawings or reasonably implied in either. All systems shall be first quality, complete and in full and proper operating condition. The term "the Contractor" as used in this Section shall denote the Mechanical Sub-Contractor.

All electrical work will be done under the Electrical Section of these Specifications, except where indicated. Furnish wiring diagrams for all wiring in connection with Mechanical Equipment and Controls. Coordinate with all other crafts and contractors as required.

The Contractor shall verify all utility tie-in points for exact location, elevation and size and shall verify all routings and determine any interference with existing obstructions or obstructions that might result from other work in this project. The Contractor shall verify that all proposed work is in compliance with any laws, ordinances or regulations applicable to this work at this location. This verification shall be done before any work begins.

GENERAL CONDITIONS:

All general sections of the General Specifications shall be part of this Section of the Specifications the same as if attached hereto. The Mechanical Contractor is instructed to read and be thoroughly familiar with all provisions of the General Specifications.

MANUFACTURERS OR TRADE NAMES:

The Contractor shall furnish the items as specified, or a substitute as listed by addendum to the Specifications. Review of substitutions shall be requested in writing as described in the General Specifications. Requests for review shall include exact model numbers proposed or they will not be considered for review.

ORDINANCES, RULES AND REGULATIONS:

All work shall conform to the requirements of all building codes, sanitary codes and laws and ordinances in force in the locality in which the work is to be done. All work shall conform to the requirements of the National Fire Protection Association, Underwriter's Laboratories and National Electrical Manufacturers' Association.

PERMITS, FEES AND INSPECTIONS:

Contractor shall obtain all permits and inspections required in connection with this work and shall pay any fees or other costs involved. Inspections shall include (but not be limited to) water heaters, etc., as required by State and/or Local Regulating Authorities for the system(s) to be installed. Unless indicated otherwise, Contractor shall pay fees required for utility service connections and meters, such as for sewer, storm drain and water.

GUARANTEE:

The Contractor shall guarantee all materials and workmanship under this contract for a period of one year from the date of final acceptance of his work and shall repair and replace any such defective materials and workmanship without cost to the Owner.

The Contractor shall guarantee all equipment to be of the quality and capacity specified and shall also further guarantee specific portions of the installation: such as, heat exchangers, refrigerant systems, etc., as specified hereinafter.

The Owner will be responsible for routine maintenance: such as, oiling, greasing and changing of filters during the warranty period under the Contractor's instructions. The Contractor shall furnish the Owner a list of routine maintenance items and shall inspect the project and report to the Architect in writing if Owner maintenance is not being performed.

WARRANTIES:

Refer to the Division 1 General Conditions and Supplementary Conditions for procedures and submittal requirements for warranties. Refer to individual equipment specifications for warranty requirements. Compile and assemble the warranties specified in the "MECHANICAL WORK" into a separated set of vinyl

covered and suitable three ring type permanent binders, tabulated and indexed for easy reference. Provide complete warranty information for each item to include product or equipment; date of beginning of warranty or bond; duration of warranty or bond; and names, addresses and telephone numbers and procedures for filing a claim and obtaining warranty services.

OPERATING AND MAINTENANCE INSTRUCTIONS:

Provide three copies of typewritten system operating instructions and three copies of operating and maintenance brochures for each piece of equipment including manufacturer's descriptive bulletins with wiring diagrams, parts lists and specific lubricating and maintenance instructions. Brochures shall be bound in suitable permanent type binders and suitably indexed.

PART 2 – PRODUCTS

No products are specified under this Section of the Specifications.

PART 3 – EXECUTION

REVIEW OF EQUIPMENT AND MATERIALS:

The Contractor shall submit six copies of manufacturer's data and descriptive literature and drawings for all equipment and material. This material shall contain all pertinent information necessary for the Architect to properly evaluate the item. No item of equipment or material shall be placed on order until final review comments are received from the Architect. In the event the Contractor submits equipment requiring electrical service other than shown in Drawings and Specifications, the Contractor shall bear all costs for revisions to electrical service.

COORDINATION OF TRADES:

Where work is in close proximity to the work of other contractors, the Contractor shall review plans of other contractors and coordinate his work with theirs. This Contractor shall verify the location of lighting fixtures, beams, conduit, pipes or other obstructions before beginning his work in the area. Notify the Architect where proper clearances do not occur or where the work of others would interfere with the safe and/or proper operation of this work.

START-UP AND INSTRUCTIONS:

The Contractor shall furnish qualified personnel to start the installation and to train the Owner's operator in the operation of the system.

AIR SYSTEM BALANCING:

The balancing, testing and adjusting of the heating, ventilating and air conditioning system shall be performed by an independent balancing company possessing calibrated instruments, qualified engineers and skilled technicians to perform the tests. This agency shall be hired by the mechanical subcontractor. The balancing agency shall be responsible for inspecting, adjusting and balancing and logging the data of performance of fans, drives, drive motors, dampers and all air distribution devices and the flows of air through the system. The mechanical subcontractor and the suppliers of the equipment installed shall cooperate with the balancing agency to provide all necessary data on the design and proper application of the system components and shall furnish all labor, materials, additional dampers, balancing, etc., required to eliminate any deficiencies.

Before final acceptance of the system is made, the balancing agency shall furnish to Architect the following data, performed on all HVAC systems and on all fan systems, in five copies:

1. A tabulation of simultaneous temperatures of all spaces and equipment entering and leaving conditions on each separately controlled zone.
2. A listing of measured air quantities at each outlet.
3. Air quantities, at all return, outside air intakes and exhaust devices.
4. Pressure readings, entering and leaving from each supply, return and exhaust fan, air handling unit, filter, coil, balancing damper and other components of the system.
5. Measurement and tabulation of all electrical data for motors, including starter type, size, heater rating, amperage and voltage rated and running.
6. A reading of voltage and amperage for heat strips, all stages.

The test and balancing agency selected shall make a total of three inspections within ninety days after occupancy of the building to insure satisfactory conditions are being maintained. Also, this agency shall make an inspection of the building during the opposite season from when the balance was performed to insure optimum operating conditions. All space temperatures shall be balanced for both summer and winter to within 1-1/2°F.

All work performed by the balancing agency shall be done in accordance with "National Standards for Field Measurements and Instrumentation, Total System Balance Volume 1, Number 81266," published by the Associated Air Balance Council.

SITE CONDITIONS:

The Contractor shall visit the building site to determine existing conditions and will be held responsible for allowing for these conditions in his bid.

SECTION 15010 – BASIC MATERIALS AND METHODSPART 1 – GENERAL

No special general provisions are required in this Section. Refer to other sections.

PART 2 – PRODUCTSLABELS:

Provide labels for all devices identifying function and position settings. Labels shall be pressure sensitive adhesive mount type, 1/16 inch minimum thickness, engraved type laminated plastic, black with white lettering.

MOTORS, STARTERS AND ELECTRICAL WORK:

Electric motors with characteristics as shown on the Drawings shall be provided by the Contractor for all pieces of driven equipment. Electric motors shall be submitted for approval and shall conform to the following: Single phase motors shall generally be as recommended by the manufacturer of the driven equipment. Motors shall have characteristics as listed on the Drawings and shall be selected to be non-overloading and capable of normal scheduled operation without requiring operating in the service factor range. Motors shall be designed for a 40°C rise from 40°C ambient and shall have NEMA design B normal starting torque unless otherwise specified. Enclosures shall be open, drip-proof for all applications not exposed to outside weather conditions and totally enclosed, fan-cooled for motors located outside, or exposed to outside conditions. All non-invertor use motors shall be rated at full load conditions and be high efficiency, high power factor type, copper wound, premium grade: Motors from 1 HP to 2 HP to have 82% minimum efficiency with .85 minimum power factor.

Motor starters for factory assembled units shall be provided for by the manufacturer, and be completely factory wired and mounted. All contactors to be NEMA rated and shall generally conform to the specification below. All separate motors and motors not otherwise packaged with a starter unit as part of a factory assembly shall have a starter as specified below.

The motor controller for single phase motors shall be a manual motor starter unless otherwise indicated with melting alloy type thermal overload protection. When a magnetic starter is specifically called for, it shall be an A.C. magnetic

contactor, NEMA rated, with melting alloy thermal overloads, Square D Type 8536 Series, Allen-Bradley Bulletin 509, Cutler Hammer Freedom Series, General Electric CR306, Siemens-Furnas 14 Series, or equal as listed by addendum.

INSULATION:

General: All surfaces shall be clean and dry when covering is applied. Covering shall not be applied before piping and equipment have been tested and proven free of leaks. On piping carrying cold fluids, the covering shall pass full thickness through or over hangers and the Contractor shall provide a galvanized steel bearing plate at each support. Plates shall be 8 inches long, formed to fit the outside of covering and shall extend halfway around the covering. Plates shall be of 18 gauge steel for piping up to 4 inches and 16 gauge steel for piping 4 inches and larger. All plates, sleeves and hanger devices to be sized and applied without damaging or deforming the insulation or puncturing the vapor barrier.

Unless indicated otherwise, all insulation installed within the building enclosure(s) shall have a composite (insulation, jacket and adhesive, as applicable) flame spread rating of 25 or less and a smoke developed rating of 200 or less, unless required otherwise by local Codes. Insulation within air ducts, plenums or other similar compartments used as part of an air distribution system shall be of materials approved for plenum service and shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less, as per NFPA 90A. Plastic materials are not allowed in plenum spaces unless specifically rated for such service.

Insulate evaporator condensate drain piping, horizontal runs of interior waste piping carrying cold fluids or evaporator condensate, and refrigerant suction piping with 1/2 inch thick flexible elastomeric cellular (foam) insulation applied by the slip on method with glued and sealed joints. Where routed within a return air environment, insulation shall have an acceptable composite flame and smoke rating. Provide manufacturer's recommended coating for outdoor applications.

Insulate all domestic hot water piping except exposed runouts at fixtures, with molded glass fiber insulation having factory fire retardant vaporproof jacket (stapled and glued) or pre-slit/pre-glued flexible elastomeric cellular (foam) molded insulation with peel-off adhesive. Except where indicated otherwise, insulation shall be 1 inch thickness for piping 2 inch diameter or less, and 1-1/2 inch thickness for piping 2-1/2 inch diameter and larger. Branch run-out piping

(to individual fixtures) that is 2 inch diameter or less and is less than 12 feet total accumulated length from the piping main may be insulated with 1/2 inch thickness insulation in lieu of 1 inch. Domestic cold water piping at inlet to water heaters shall be insulated same as specified for domestic hot water piping; insulation shall extend from inlet of heater to inlet of piping (in-line) heat trap. Except as indicated above for water heaters, domestic cold water lines in attics, outside walls, and unconditioned equipment spaces shall be insulated same as specified for domestic hot water, except may be 1/2 inch thickness. Insulate all such fittings with molded fitting sections to match or with fire rated plastic fitting cover sections filled with glass fiber. Plastic fitting covers shall not be used in plenum spaces. Provide bearing plates, same as specified above, at hangers for insulated domestic water piping larger than 3/4 inch diameter.

Insulate domestic cold water piping exposed to weather with 1 inch thickness flexible elastomeric cellular (foam) insulation applied by the slip-on method with joints glued and sealed. Provide manufacturer's recommended coating for outdoor applications.

Where required, insulate access doors and frames with 1 inch thick glue-on fire rated flexible elastomeric cellular (foam) sheet insulation. Apply with approved adhesive to a clean dry surface. Insulate all surfaces sufficient to prevent sweating.

Insulate all unlined supply ductwork (including flexible duct connections on fan coil units), unlined return air ductwork, outside air ductwork, and all lined ductwork routed in attics or unconditioned spaces, with 2 inch thickness, 3/4 pound glass fiber blanket with glass fiber reinforced aluminum foil vapor barrier. Staple joints and apply pressure-sensitive tape (matching the insulation facing and designed for use with the insulation) all around joints and at longitudinal seams. Where insulation is applied to oval or rectangular ducts with horizontal dimension greater than 24 inches, provide clips on the underside at 18 inches on centers both ways. Refer to Section 15020 for additional information.

Insulate tops of air diffusers occurring in spaces not conditioned nor part of return air space. Insulation shall be 2 inch thick 3/4 pound glass fiber with reinforced aluminum foil vapor barrier. Overlap diffuser 6 inches all around. Scribe to neck size and attach with aluminum tape.

Insulation materials shall meet the following minimum standards:

Fiberglass piping insulation:	ASTM C 547, CLASS 1.
Flexible elastomeric cellular insulation:	ASTM C 534, TYPE I (for Piping) ASTM C 534, TYPE II (for Sheets)
Flexible fiberglass ductwork insulation:	ASTM C 553, TYPE I, CLASS B-4.

Insulating materials shall be as made by Dow, Knauf, Owens-Corning, Pittsburgh Corning, Johns Manville, Armstrong, Rubatex, or equal as listed by addendum, and shall be installed as per manufacturer's recommendations.

PART 3 - EXECUTION

INSULATION INSTALLATION:

Extend insulation without interruption through walls, floors and similar penetrations, except where otherwise indicated. Apply insulation using staggered joint method for both single and double layer construction, where feasible. Apply each layer of insulation separately. Maintain and seal carefully and completely all vapor barriers.

FOUNDATIONS AND SUPPORTS:

The Contractor shall, unless otherwise specified, provide all foundations, supports, etc., necessary for properly supporting his work and equipment.

OPENINGS, CUTTING AND PATCHING:

Cut all openings as required for the work under this subcontract. Patching will be done by the various crafts whose work is involved. Furnish and install all necessary sleeves, thimbles, hangers, inserts, etc., at such times and in such a manner as not to delay or interfere with the work of other contractors. Caulk, flash or otherwise make weatherproof all penetrations through the roof and exterior walls. Isolate pipe and duct penetrations through walls to prevent the transmission of vibration.

No additional compensation will be authorized for cutting and patching work that is necessitated by ill-timed, defective, or non-conforming installations.

All openings shall be protected by a rated protection system listed for the specific application for the type of material penetrating the fire barrier and the type of construction of barrier penetrated. Sealants used in floor penetrations shall be waterproof.

Where piping, ductwork or other items that are provided for under this contract penetrate fire rated walls or floors, the Contractor is to seal around the item to maintain the integrity of the rated system. All openings shall be protected by a rated protection system listed for the type of material penetrating the fire barrier and the type of construction of barrier penetrated. Sealants used for floor penetrations must be waterproof. Systems must be U.L. rated for two hours minimum. Submit for approval system proposed for review.

For openings containing non-metallic material, piping, conduit or wiring, and penetrating a floor-ceiling assembly, the system shall include intumescent material and shall be a listed "through penetration" assembly tested in accordance with ASTM E-814.

EXCAVATING, TRENCHING AND BACKFILLING:

Protect trenches and handle materials in accordance with good safety practice. All pipes shall be installed with 24 inch cover wherever possible and in no case less than 12 inch cover.

The bottom of the trenches shall be accurately graded or filled as required to provide uniform bearing for each section of pipe on undisturbed soil or stable fill at every point along its entire length.

The trenches shall not be backfilled until all tests and inspections have been performed. The trenches shall be carefully backfilled with excavated materials approved for backfilling, deposited in 9 inch layers and thoroughly and carefully tamped. Repeat backfill as required after any subsequent settlement.

Refer to Division 2 "SITE WORK" of this Specification for additional requirements for trenching, backfill, bedding, compaction, etc.

CLEANING AND STERILIZATION:

Clean all fixtures, pipes and exposed work. Thoroughly clean and polish all plated and other finished products.

Provide for sterilization of new potable water lines as required by Louisiana State Board of Health.

Flush out all new piping, vessels and heat exchangers with appropriate fluids before systems are placed in operation. After flushing, all strainers and dirt traps shall be checked and cleaned.

SECTION 15020 – SHEET METAL WORK

PART 1 – GENERAL

SCOPE:

Furnish and erect in a neat, workmanlike manner all ducts and sheet metal work shown on Drawings. Verify all dimensions at the site, making all field measurements and shop drawings necessary for fabrication and erection of sheet metal work. Obtain approval of the Architect on all deviations from the Contract Drawings and Specifications, as may be necessitated by job conditions otherwise. Unless noted otherwise, all SMACNA plate and table references are from SMACNA HVAC Duct Construction Standards, 3rd Edition, 2005. Conform to the requirements for metal thickness, reinforcing (types and intervals), tie rod applications (types and intervals) and joint construction (types and intervals).

PART 2 – PRODUCTS

MATERIALS, GAUGES AND CONSTRUCTION:

Except as otherwise specified herein, or on Drawings, construct all supply, return and exhaust sheet metal ductwork of galvanized steel, lock-forming quality, ASTM A653/A653M, A924/A924M Coating Designation G90, as manufactured by U.S. Steel, Wheeling or Pittsburgh Steel. Unless noted otherwise, shall be in accordance with SMACNA HVAC Duct Construction Standards for 2 inch Water Gauge Pressure Class, see "SCOPE" above.

BRANCH RUN-OUTS:

Branch run-outs may be rectangular ducts or round insulated ducts. Round metal ducts shall be 26 gauge minimum construction and insulation shall be as specified under "INSULATION." Pre-insulated flexible ducts shall be used for final 48 inch length at supply air branch runouts to diffusers. These ducts shall comply with U.L. 181, with U.L. label, and have reinforced aluminum foil vapor barrier jacket with an airtight woven glass fiber or aluminum-plastic laminate inner liner. Insulation shall be 2 inch thickness fiberglass, R value of 6 (minimum). Pressure drop shall not exceed .12 inches water gage per 100 foot duct run for a 12 inch diameter duct moving 500 CFM. Use Thermaflex M-KE, Flexmaster Type 5M or 8M or Omniair 1200. All parts of duct systems shall be fire-rated.

ACOUSTIC LINING:

Except where indicated otherwise on Drawings, acoustic lining in rectangular ductwork shall be glass fiber coated liner of 1 inch thickness unless otherwise noted on Drawings. Material shall meet NFPA 90A requirements and have K factor of 0.27 measured at 75°F mean temperature and have noise reduction coefficient (NRC) not less than 0.60 (per ASTM C423, Type A mounting). Duct sizes on Drawings are metal sizes, allowances having been made for lining. Lining shall be Johns-Manville Permacote Linacoustic, CertainTeed ToughGard R, or Knauf Duct Liner E-M. Submit for approval.

The duct liner shall conform to the requirements of ASTM specification C 1071 and shall not support the growth of fungus or bacteria, as per ASTM G21 and G22. Duct liner shall be installed in accordance with the latest edition of North American Insulation Manufacturer Association's *Fibrous Glass Duct Liner Standard* (NAIMA FGDL) or Sheet Metal and Air Conditioning Contractors National Association *HVAC Duct Construction Standard, Metal & Flexible* (SMACNA HVAC DCS). Liner shall be installed with the surface treatment exposed to the air stream. Adhesive shall be applied to the sheet metal with minimum coverage of 90%. All transverse edges not receiving sheet metal nosing shall be coated. Exposed joints shall be coated with an adhesive or secured with mechanical fasteners in accordance with NAIMA Standards. All joints shall be firmly butted without gaps. All rips and tears on the air stream surface shall be repaired by coating damaged areas with approved adhesive or coating, or shall be replaced. Longitudinal corner joints may be folded and/or overlapped and compressed. Mechanical fasteners shall be used to secure the duct liner to the sheet metal, and shall be spaced in accordance with NAIMA FGDL or SMACNA HVAC DCS (but not less than one for each two square feet of lining). These may be either impact-driven or weld-secured and shall include 1-1/2 inch diameter sheet metal washers or speed nuts. Metal nosings (either channel or zee profile) shall be securely installed over transverse line edges facing the air stream at fan discharge and any interval of lined duct preceded by unlined duct.

Unless indicated otherwise on Drawings, all rectangular return air ductwork shall be lined in accordance with the above requirements. Unless indicated otherwise on drawings, all rectangular supply air ductwork shall be lined in accordance with the above requirements; other supply ductwork not to be lined shall have externally applied insulation, see Section 15010, "INSULATION." Refer to Drawings for additional applications requiring acoustic lining.

DAMPERS:

Submittals for dampers shall include a damper schedule indicating the following for each damper:

- System/area served to identify each individual damper
- Damper model
- Damper nominal (duct) size
- Damper sleeve length, as applicable
- Required wall/floor opening size, as applicable
- Size of duct access door(s), as applicable
- Indicate damper sleeve gauge and duct connection type (if other than rigid type connection), as applicable.

Construct multi-blade opposed action volume dampers where called for on Drawings according to SMACNA Standards.

Provide automatic backdraft dampers where shown on the Drawings. Backdraft dampers shall be adjustable counterbalanced, heavy duty, pressure relief shutter type with 2 inch x 1/2 inch x 1/8 inch galvanized steel channel frames and 7 inch wide 0.063 inch thick 3003-H14 aluminum blades with 1/2 inch steel axles, self lubricating bearing and tie bar with 1/4 inch brass pivot. Damper adjustable counterweights shall be factory set to begin opening at 0.01 inch W.G. pressure differential and fully open at 0.03 inch to 0.06 inch W.G. Install dampers such that duct acoustical lining does not interfere with damper blades.

Provide fire dampers where shown on Drawings. Fire dampers shall have 1-1/2 hour or 3 hour label rating, as applicable, to meet the requirements for the fire rating of the wall/floor, and shall have 212°F fusible links, all in accordance with NFPA 90A and U.L. 555 (current edition). Dampers shall be per SMACNA Standards and, unless indicated otherwise, shall be galvanized steel construction. Except where indicated otherwise, fire dampers shall be dynamic type single section curtain (interlocking blade) style. Where overall damper size exceeds the listed maximum size for a single section curtain style dynamic damper, the fire damper shall be multi-blade style dynamic type. Multiple section (multi-blade) dynamic dampers shall be factory assembled/fabricated to operate as a single unit. Except where indicated otherwise, curtain style dampers shall have blades recessed "out of the air stream." For non-ducted return air transfer openings and ducted (grille to grille) return air transfer openings, dampers may be static type, single or multiple section, and may have frame style "A" with clear opening (height) of size

as indicated on the drawings.

Fire dampers **shall have integral factory sleeves. Except where allowed otherwise by the Construction Documents, sleeves shall be 16 gauge minimum, except use 14 gauge where damper width exceeds 36 inches or height exceeds 24 inches,** in accordance with U.L. listing and SMACNA *"Fire, Smoke and Radiation Damper Installation Guide for HVAC Systems"* for rigid duct connections. Sleeve shall be length to match wall thickness, plus width of retaining angles, duct connections and damper actuator brackets/linkage (as applicable), refer to Drawings for additional information. Damper frame shall be sealed to the sleeve. For dampers installed in primary supply air ductwork, all joints/seams of the damper sleeve shall be sealed (at the factory).

FLEXIBLE CONNECTIONS:

Wherever ducts are to be fastened to the intake or discharge of a fan, provide a flexible connection between duct and fan. Flexible connections shall be waterproof and fireproof fabric, at least 4 inches long and securely fastened with galvanized band iron hoops and mastic.

STATIONARY LOUVERS:

Louvers shall be Arrow EA-405-P, Greenheck Model EDK-402, Ruskin ELF375X, American Warming LE-27, Air Balance A440 or equal as listed by addendum factory fabricated extruded aluminum, 0.081 in. (minimum) nominal wall thickness. Louvers shall be stationary type with K style blades in a 4 in. louver frame. The frame head member shall incorporate an integral gutter with each jamb having an integral downspout so water drains to the ends of the head, then down the downspouts and out at the louver sill. Blades shall be positioned at 37° to 45° angle from vertical, approximately on 4 inch centers. Each louver shall be equipped with a framed, removable, rear-mounted aluminum bird screen, 0.5 to 0.75 inch mesh.

Each factory-assembled louver section shall be designed to withstand wind loadings of 25 PSF (100.0 MPH wind equivalent). Louver performance data (include airflow pressure loss and water penetration) shall be licensed under the AMCA Certified Ratings Program and shall bear the AMCA Certified Ratings Seal.

Louvers shall be supplied with a baked enamel finish applied after a thorough cleaning and preparation of the metal surface. A total dry film thickness of

approximately 1.2 mils shall be provided. Color shall be as directed by the Architect to match the color of the building exterior.

Frame construction of louver is to be compatible with wall construction. Unless indicated otherwise, louvers shall be flange type when installed in existing masonry walls, stucco walls or other similar walls with rough cut wall opening. Where louver is not installed flush with the exterior wall surface, provide extended sill. Verify frame type required for each louver prior to ordering louvers. Seal around perimeter of louver frame to building wall to make weathertight. Refer to Division 7.

SAFE PANS:

Provide safe pans under evaporator units and water heaters located above first floor level. Safe pans shall be constructed of 16 gauge galvanized steel with all joints lapped, riveted and soldered. Pans shall be a minimum of 4 inches deep and shall extend a minimum of 6 inches beyond all sides of the unit. Coordinate safe pan location with base supports.

ACCESS DOORS:

Provide access doors in ceilings and walls as required for service access to duct mounted cooling/heating coils, dampers, terminal boxes, valves, fans, filters and other locations where necessary for periodic service or inspection of mechanical equipment. Provide access doors in ductwork and inaccessible ceilings for access to duct mounted fire and/or smoke dampers, and automatic (motorized) control dampers. Access doors for duct mounted cooling/heating coils shall be installed on air entering side of coils. Access doors shall be adequate size for easy access to the equipment/damper/coil.

Access doors shall be steel constructed according to SMACNA Standards for 2" (minimum) W.G. Access doors shall be removable type with paired cam locks, two cams for doors up to 14" x 14" size and four cam locks for doors 16" x 16" to 24" x 24" size. Doors shall have foam gasketing at both the door to frame and the frame to duct matting surfaces. Access doors may be sandwich type, Ductmate Sandwich Access Door or equal. Access doors in supply and return air ductwork shall be double wall type with fiberglass insulation sandwiched between the walls of the access panel.

Access panels in fire rated ceiling/walls shall be U.L. labeled to meet the requirements of the rated assembly and shall have a closer device to automatically close and latch the door upon release from any open position. Fire rated access

panels shall have key operated locks with spare set of keys (turn over to Owner).

Where lay-in ceilings exist, no ceiling access panels are required.

FLASHING:

Wherever sheet metal work under this contract passes through exposed walls or roof, furnish and install flashings and counter-flashings necessary for weatherproofing.

Make flashings and counter-flashings of sheet copper, securely soldered and fitted, except that cap flashings for ducts, hoods, etc., shall be same material as duct and isolated from dissimilar metal base flashing with roofing felt. Turn flashings out at least 10 inches.

CAULKING:

All duct work shall be sealed or caulked as required to be airtight. Use hard setting wet applied mastic and fabric on all joints both supply and return.

CEILING DIFFUSERS:

Ceiling diffusers shall be aluminum constructed (except where required otherwise for fire rated ceiling applications, see "DAMPERS"), fixed, louvered type with integral deflectors and with patterns as required. Blade configuration shall include horizontal lip or similar device for ceiling hugging pattern at varying velocities. Diffusers shall have a white, baked enamel finish and shall have opposed blade volume controls, except as described under "AIR EXTRACTORS." Frame style generally shall be "V" type, raised from ceiling face. For lay-in ceilings, use matching frames, panel size 24 inch x 24 inch unless otherwise required. For spline or other special ceiling systems, use appropriate matching frame types. Diffusers shall be Metalaire 5500 Series with Style 25 or Style 65 frames, Nailor 6200 Series with Type B or L frame, Krueger 5SH Series with F21 or F23 frame, Titus TDC-AA with Type 3 or Type 6 border, Price AMD with Type 1 or Type 3 frame, or equal as listed by addendum.

Diffusers for round duct neck sizes may be Metalaire Series 5800, Nailor Series ARNS, Titus TMS-AA Series, Krueger 1400 Series or Price ASCD Series, aluminum construction, with 24 inch x 24 inch nominal panel face for "lay-in" tee-bar grid ceilings. For gypsum board or plaster ceilings, provide diffuser manufacturer's

matching "T-bar plaster frame" to receive the lay-in style diffuser in the ceiling mounted frame.

RETURN AND EXHAUST GRILLES:

Ceiling grilles shall be 1/2 inch x 1/2 inch x 1/2 inch aluminum (except where required otherwise for fire rated ceiling applications, see "DAMPERS"), grid type, Titus 50F Series, Metalaire CC5 Series, Nailor 51EC Series, Krueger ECG-5 Series, Price 80 Series, or equal as listed by addendum. Frames shall be appropriate to type of ceilings in the projects. Finish on ceiling grilles shall be white baked enamel. Finish on wall grilles shall be prime coat suitable for painting.

Refer to drawings for additional requirements.

AIR EXTRACTORS:

Furnish and install in each rectangular duct take-off to ceiling diffusers and sidewall grilles, except the final outlet of each run, an adjustable, factory fabricated air volume extractor and controller consisting of moving vanes on brackets, with capability for full closure. Controllers shall have operators accessible from outside duct in attic or from grille or diffuser opening where feasible. Provide opposed blade dampers in lieu of extractors where the grille or diffuser is at the end of a branch.

At round branch take-offs, in lieu of extractors, provide butterfly dampers of 16 gauge galvanized metal with 4 inch long handle and locking wing nut.

Submit all air extractors for approval.

ROOFTOP AIR INTAKES:

Cook VI, Greenheck FHI, Acme IV, or equal as listed by addendum, aluminum low silhouette gravity ventilator with aluminum birdscreen, anti-condensate coating at underside of top cover, and aluminum 12 inch (minimum) height factory roof curb.

PART 3 – EXECUTION

ELBOWS AND OFFSETS:

Provide turning vanes in all rectangular duct systems for elbows 30 degrees or

greater. Construction of vanes shall be in accordance with SMACNA Standard for single vanes. Provide vanes in all rectangular ductwork moving air for any function both supply and return. Transition panels shall not have offset angle exceeding 20 degrees unless specifically shown.

OBSTRUCTIONS:

Make allowances for beams, pipes, or other obstructions in the construction of the building and for work of other contractors whether or not these are shown on Drawings. The Contractor shall not fabricate ductwork before routing at obstructions is resolved.

Coordinate duct layout with ceiling construction, light fixtures and other ceiling mounted devices for placement of equipment for ease of servicing.

HANGERS AND SUPPORTING SYSTEMS:

Provide hangers and supports in accordance with SMACNA Standards as applicable except that straight up nails or expansion shields will not be allowed. Use auxiliary angles, toggle bolts, clamps, or other positive methods. See Drawings for additional hanging details.

SECTION 15030 – PIPING SYSTEMSPART 1 – GENERALSCOPE:

Piping within air ducts, plenums or other similar compartments used as part of an air distribution system shall be non-combustible or have a flame spread of not over 25, and shall have a smoke developed rating no higher than 50; no plastic piping is allowed in such spaces unless specifically rated for such service.

Furnish and install in a neat, workmanlike manner all piping shown on Drawings or that is specified or required to provide a complete, properly operating installation.

PART 2 – PRODUCTSDOMESTIC WATER AND REFRIGERANT LINES:

Hard temper copper water tubing, Type "L" with wrought copper sweat type fittings. Piping under slabs may be Type "L" soft drawn copper without joints. Water piping underground and not under building slab or other paved surfaces, may be Type 1, Schedule 40, pressure rated, PVC plastic pipe and solvent welded fittings.

EQUIPMENT DRAINS:

Schedule 40 PVC plastic pipe and fittings where drains are not in air plenums. Otherwise use Type "L" hard copper with wrought copper sweat fittings. Use 1-1/2 inch minimum size.

SOIL, WASTE AND VENT:

Coated service weight cast iron bell and spigot pipe with factory applied Neoprene gaskets under building or drives. Waste and vent lines occurring above ground in building or underground but not under building or drives may be Schedule 40 PVC plastic drainage pipe and fittings. Plastic pipe is not allowed in spaces used for air return.

FITTINGS:

Screwed fittings shall be fine grain full weight malleable iron as specified, with smooth cut tapered threads. Welding fittings shall be seamless steel full standard weight. Mitered ells or notched tees will not be allowed. Where pipe 2 inches and smaller tees into pipe 2-1/2 inches and larger, "Thread-O-Lets" may be used. "Weld-O-Lets" may be used for tees where the branch size is not more than one half the main size.

PVC pipe threaded connections larger than 1 inch shall be male threaded fittings, not female thread. When connecting PVC piping to metallic piping or fittings, Contractor shall use plastic male thread into a metallic female thread.

VALVES, GENERALLY:

Valves 2 inches and smaller shall be 125 psig SWP, 200 psig WOG, bronze body, threaded or sweat pattern. Valves to conform to MSS SP-80 and to be as indicated below:

Gate Valves (NRS): Nibco T/S-113, Milwaukee 105/115, Stockham B-103/104

Check Valves: Nibco T/S-413, Milwaukee 509/1509, Stockham B-319/309

UNIONS:

Install union connections at all pieces of equipment such as coils, pumps, tanks, etc., and all control valves. Where there is a valve at a piece of equipment, locate the union connection on the equipment side of the valve. No union shall be concealed in construction.

Unions installed in sweated copper pipe shall be Crane No. 633. Unions 2-1/2 inches and larger shall be Crane, standard malleable iron flange union with gasket.

VALVE BOXES:

All valves underground shall be installed in cast iron, two piece, roadway boxes. Provide extension wrench tool for operation of valve above grade.

PART 3 – EXECUTION

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Sigma Engineers and Constructors

PIPE INSTALLATION:

Install piping so as to eliminate air pockets and permit complete drainage and allow for free expansion and contraction.

Install drains at low points in mains and risers consisting of tee fitting, 3/4 inch ball valve and short 3/4 inch threaded nipple and cap.

Slope horizontal soil and waste pipes 1/4 inch per foot for pipes 2 and 3 inches in size and with a minimum fall of 1/8 inch per foot for pipes 4 inches and larger.

Sanitary piping and fitting arrangements shall be in accordance with applicable codes.

SERVICE CONNECTIONS:

All connections to services shall be verified by the Contractor. Where costs for service connections are incurred, the Contractor shall include these costs in his bid.

PIPE JOINTS:

Threaded joints shall be American Standard taper pipe threads made up metal-to-metal with a thread lubricant. Cut threads so that maximum of three threads remain exposed after the fitting is made-up. Ream all pipe ends after cutting and clean before erection.

Make welded joints by the electric arc method, using direct current in accordance with standards of the American Welding Society.

Make up copper piping with soldered joints using sweat type fittings. Cut pipe square and remove all burrs before assembly. Carefully clean and solder pipe and fittings with solder containing 95% tin and 5% antimony using non-corrosive flux. Piping for potable water systems shall be lead free.

Make up plastic PVC piping using 2-step solvent welded process consisting of a color tinted primer-cleaner coating followed by a clear solvent using a mechanical joining method recommended by the manufacturer.

SLEEVES AND PLATES:

Wherever pipes pass through concrete or masonry walls or structural slabs, furnish and install sleeves, properly located for the work. Where pipes pass through monolithic concrete floors, omit sleeves and use double wrap of 15 pound tarred felt.

Sleeves shall be of sufficient size to allow the specified pipe covering to pass through the sleeves. Finish flush with floors where exposed to view in finished areas of the building, 2 inches above floors where in equipment rooms and furred spaces and 6 inches above roofs.

ESCUTCHEONS:

Where piping passing through walls, floors and ceilings is exposed to view in finished areas of the building, provide nickel plated pressed steel split floor and ceiling plates which shall cover the opening and fit snugly to the pipe or covering.

PIPE FLASHINGS:

Where pipes extend through roof or outside walls, use flashings as required for weatherproofing. Roof flashings shall be lead with minimum 10 inch turnout and rolled into top of pipe. Wall flashings may consist of suitable caulking.

For metal panel roofing systems, flashings shall be T.W. Buildex Dek Tite, The Pate Co. Pipe Flashing Device, or equal, conical shaped, long life E.P.D.M. rubber stepped boot assembly with flexible aluminum base ring for conforming to contour of metal roofing panel. Provide required sealant caulking, self-sealing fasteners and accessories necessary for installation in accordance with manufacturer's requirement to insure a weather-tight/ rain-tight installation.

PIPE SUPPORTS:

In general, suspend horizontal runs of pipe from the overhead construction using steel clevis type hangers in equipment spaces and split ring malleable iron hangers in other locations. Anchor hanger rods to building construction same as specified under duct supports.

Unless otherwise specified herein or on Drawings, space hangers supporting steel pipe at not more than 5 feet for pipe 1 inch and smaller, and at not more than 10

feet for pipe 1-1/4 inch and larger. Support copper tubing at intervals not exceeding 8 feet. Support soil pipe at each joint. Support plastic pipe at intervals one third closer than for steel pipe.

Support cast iron, steel or copper piping at each floor penetration.

TESTING, CLEANING AND BALANCING:

Test all piping and prove tight to the satisfaction of the Architect before covering is applied, trenches backfilled or fixtures connected.

Test all water piping, at 125 psig water pressure, including hydrostatic head for a period of 8 hours.

After all soil, waste and vent lines have been set, all the outlets shall be temporarily plugged up. The pipes shall be filled with water, full to the top, and all allowed to remain so for twenty-four hours. A minimum head of ten feet shall be used for these tests.

Notice shall be given to the Architect and to the plumbing inspector before the tests are made, and the test is not to be drawn off the pipes, and the pipes are not to be covered or insulated until the filled pipes have been examined and the testing approved by the Architect.

SECTION 15040 – EQUIPMENT AND SPECIALTIESPART 1 – GENERAL

Furnish and install equipment as indicated on the Drawing.

Heating and air conditioning equipment shall meet or exceed applicable minimum efficiency requirements of the National Energy Code as adopted by the State of Louisiana.

PART 2 – PRODUCTSCONDENSING UNITS:

Condensing units shall be Lennox, Trane, Carrier, or approved equal as listed by addendum, air-cooled, self contained condensing units suitable for outdoor installation. Special notice shall be taken that dimensions are suitable for the spaces allotted.

The units shall be complete with compressor, high pressure controllers, air cooled condenser, condenser fan motor controller, temperature controller, pressure relief valves, charging valves, and starters and control devices. The unit shall include a factory wired control panel with a motor rated contactor with the same number of poles as electrical phases on the input to the compressor. Provide a separate timed function that will lockout the compressor upon compressor shut off or power failure to delay the starting of the compressor for a preset time. See schedule on Drawings for required number of compressors and independent refrigeration circuits. Units to have minimum EER as scheduled on the drawings.

Compressors shall be full hermetic type. Compressors shall have forced feed lubrication utilizing a positive feed reversible oil pump. Provide crankcase heater and temperature controller, heat cut-out and overload protection for all three legs. Compressor shall carry a 5 year replacement warranty for all labor and materials.

Provide all special control devices with panel for control interlock where required. Furnish wiring diagrams for incorporating into total interlock system.

Condenser shall be air-cooled type with fans especially selected for quiet operation and shall have corrosion resistant steel fan and condenser coil guard. Motors shall be type as required for this application with built-in overload

protection. Include head pressure control devices for head pressure control to the temperature scheduled on Drawings. Coils shall be aluminum fin, copper tube and leak tested, dehydrated and sealed with refrigerant charge before shipment.

INDOOR AIR UNITS:

Air units shall be same manufacturer as condensing units. Configurations shall be as indicated on the Drawings. Arrangements and sizes shall be as required to be properly accommodated in the spaces shown on Drawings. **For units five tons and less**, provide single point electrical connection for indoor air unit and electric air coil as required. For units greater than five tons, provide for a separate electrical connection for the heater and a separate electrical connection for the motor. Electric heating coils shall be as specified below. Space requirements are as indicated on the Drawings. Any other requirements must be submitted for prior approval before bid. Units shall be complete with cooling coils, electric heating coil with contactors or sequencers, multi-blade centrifugal fans and fan motors with adjustable or multi-speed drive. Coils and filter shall be as specified hereinafter. Heating coils shall have contactors or sequencers that are all phase disconnecting type, or Contractor's option to provide a field installed 1/2" x 1/2" steel mesh at the discharge or inlet to the unit (wherever the heater is located).

Unit casings shall be heavy gauge steel provided with adequate access panels for servicing, lined with not less than 1 inch waterproof noncombustible insulation and with drain pans adequately insulated to prevent sweating. Units shall be complete with 2 inch thick throw-away filters and filter rack. Provide isolators as required.

Refrigerant coils shall have aluminum fins mechanically bonded to copper tubes arranged in staggered rows.

ELECTRIC AIR COILS:

This specification shall apply to all electric heating systems, separate duct heaters, unit heaters and factory supplied heaters as part of packaged systems. For packaged systems, only where the heater is part of the factory construction, heating coils shall have contactors or sequencers that are all phase disconnecting type, or Contractor's option to provide a field installed 1/2" x 1/2" steel mesh at the discharge or inlet to the unit (wherever the heater is located).

Heating coils shall be U.L. listed and be as manufactured by unit supplier or shall

be Indeco Type QUA, Redd-i Heat Model R, or equal as listed by addendum. Coils shall be integral to cabinet with insulation to prevent condensation. Coil shall be complete with automatic primary reset, thermal cut-out and magnetic contactor for each stage, pre-wired and mounted on the coil. **Contactors for non-packaged HVAC systems/heater combinations must be all phase disconnecting type.** In addition, the control panel shall contain a supplementary manual reset. The unit shall comply with all NEMA and NEC regulations. Disconnect switches for each coil shall be included in the control panel and be of the cabinet interlocking fused disconnect type. Fuses shall be for all phases and rated at full current delta or wye connected. Provide control voltage transformer as required for coordination with the control voltage required by the Temperature Controls Supplier. Provide pressure differential airflow switch factory mounted, wired and piped. Coordinate with the Temperature Controls Supplier for calibration and sequence of operation required. Coils to be derated for maximum density of 35 watts per square inch and be of the 80% nickel, 20% chromium composition type. All terminals shall be stainless steel tubular crimped type not screw post type, and all factory wiring shall be Grade "A".

Position coils so that clearance of 36 inches is maintained in front of panel for at least a 30 inch width and hinged door is free to open to 90 degrees.

FANS:

Fans shall be constructed in accordance with AMCA standards with ratings certified in accordance with the "Standard Test Code for Centrifugal and Propeller Fans" as adopted by the AMCA and ASHRAE.

Propeller Wall Fans:

1. Propeller wall fans shall be wall mounted, belt driven, propeller exhaust fans. Fans to be complete with all accessories specified on Drawings.
2. Fan shall be bolted and welded construction utilizing corrosion resistant fasteners. The motor shall be mounted on a 12 gauge steel wire guard. The wire guard shall be bolted to a minimum 14 gauge wall panel with continuously welded corners and an integral venturi. Unit shall bear an engraved aluminum nameplate and shall be shipped in ISTA certified transit test packaging.

3. All steel fan components shall be protected with an electrostatically applied, baked polyester powder coating. Paint must exceed 1,000 hour salt spray under ASTM B117 test method.
4. Propeller shall have aluminum blades riveted to a painted steel hub. The hub shall be securely fastened to the motor shaft utilizing two setscrews. Propeller shall be balanced in accordance with AMCA Standard 204-96, balance quality and vibration levels for fans.
5. Motor shall be open drip proof type with permanently lubricated sealed bearings. See "MOTORS AND MOTOR STARTERS".

TEMPERATURE CONTROLS:

Furnish and install as hereinafter specified, a complete system of temperature controls. The control devices shall be as manufactured by the equipment supplier, Siebe, or Johnson Controls Inc. Systems shall be installed and adjusted by qualified mechanics in this field. Control wiring shall be by the Mechanical Contractor. The Mechanical Contractor shall furnish all control devices, provide system control diagrams, and be responsible for overall coordination and performance of the controls system.

All wiring shall be in conduit. This conduit to be separate from all other conduit. All wiring methods and materials shall comply with Electrical Section of these Specifications.

CONTROL SEQUENCE – SPLIT SYSTEM DX UNITS:

A room heat/cool thermostat shall control the unit to maintain space conditions. Provide a heat-cool-off switch and a fan on-auto switch. In the "cool" position, the thermostat shall cycle the refrigeration as required. In the "heat" position, the thermostat shall cycle the heat strip in stages to maintain space conditions. In the "off" position, the system shall be off.

Thermostats shall be fully programmable electronic type with auto changeover feature, keypad lockout feature to prevent unauthorized tampering, seven-day programming with two or four events per day (selectable), temporary temperature override feature, and backup feature to maintain programming during power outage. Thermostats for A/C systems with electric heat shall be PerfectTemp

SHC-7, Trane BAYSTAT 036A, Siebe TC-98-S or approved equal.

Thermostats may be Honeywell T7300 Series with subbase to match the system.

Provide an opposed blade damper on the outside air connection. Provide a motorized damper on the outside air duct. Interlock this motorized damper with the compressor such that the damper opens when the cooling is enabled. In the heat mode, the motorized damper remains open.

SMOKE DETECTOR SYSTEMS:

For air units and fans moving above 2000 CFM furnish a smoke detector in the supply duct and return air duct. The detector shall actuate the smoke mode system or stop the fan upon detection. Refer to other sections of this Specification. Detectors shall be photoelectric type with indicator light on the unit. Provide an auxiliary audio-visual alarm in a normally occupied area that will activate when the smoke detector is activated as per NFPA 90A. Upon a trouble signal from the smoke detector, the visual only section of the auxiliary alarm shall be activated as per NFPA 90A. The exact location of the auxiliary alarm shall be determined in the field. Provide all controls and power and interlocking. Detectors shall be furnished and installed and connected under the Temperature Controls Sub-Contract.

SAFE PAN FLOAT SWITCH:

Provide a safe pan float switch for each horizontal type indoor unit, as indicated on Drawings. Upon detection of water in the unit safe pan, the float switch shall de-energize the unit control system, including outdoor unit.

PART 3 – EXECUTION

Furnish and install per manufacturer's recommendations.

SECTION 15050 – PLUMBING FIXTURES AND ACCESSORIES

PART 1 – GENERAL

SCOPE:

Plumbing fixtures shall be as specified below, or equal as listed by addendum. Unless noted otherwise, American Standard numbers are used here to establish quality and style desired.

Rough-in locations shall be carefully spotted to result in a symmetrical pattern with sufficient spacing to accommodate full escutcheons.

All fixtures shall have supplies with stops. Stops shall be chrome plated brass. Trim shall be polished, chrome plated brass, same manufacturer as fixture unless otherwise indicated. All pipe, fittings, etc., in connection with supply or drain trim shall be chrome plated. In cases where fixtures may have hot and cold water trim without hot water service, connect cold water to both trim inlets.

Trap separately each fixture and piece of equipment requiring connection to drainage, unless otherwise shown on Drawings. Place traps as near to the fixture as possible. No fixture shall be double trapped. Unless indicated otherwise, drain "P" traps shall be polished, chrome plated cast brass with cleanout plug and 17 gauge tubular outlet to wall. For floor drains, hub drains or other similar devices with underfloor traps, drain "P" traps shall be same material as the branch piping system.

PART 2 – PRODUCTS

WATER CLOSET – WC:

American Standard 2998.012 or Kohler K-3427, vitreous china, siphon jet, elongated bowl, 1.6 gallons per flush, 17-1/2 inch rim height, **floor mounted** with bolt caps, tank with water saving trim, 3/8 inch angle supply with stop, and Church 9500SSC, Beneke 527SS or Bemis 1655SSC, contoured solid polystyrene, white, open front seat with self-sustaining check hinge.

Water closet shall be designed and installed to meet The Americans With Disabilities Act (ADA) Standard for physically impaired people and ANSI 117.1 Standard. Flush valve handle shall be constructed to meet ADA. Top of toilet seat

shall not be higher than 19 inches above finished floor.

LAVATORY - L:

American Standard 0476.028 or Kohler K-2196, vitreous china, nominal 20 inch x 17 inch self-rimming **counter-top** lavatory, Delta 523-WFHGMHDF, American Standard 2385.003 or Kohler K-15597 centerset faucet with vandal-resistant single lever handle, 0.5 GPM flow restrictor spray spout and chrome plated brass grid strainer drain.

Lavatory shall be designed and installed to meet The Americans With Disabilities Act (ADA) Standard for physically impaired people and ANSI 117.1 Standard. Unless indicated otherwise on Contract Drawings, lavatory is to be installed with rim height 34 inches (maximum) above finished floor. Lavatory shall have a minimum clearance of 29 inches measured from floor to the bottom of the lavatory apron. Exposed drain and water piping under lavatory shall not interfere with required knee clearance, 8.5 inches measured horizontally from front edge toward rear of lavatory. Provide two-piece, snap-on, PVC insulated covers over traps and both hot/cold water supplies. For lavatories with drain type trap primers, include matching cover for trap primer line. Covers shall meet 25/50 Flame/Smoke Rating per ASTM-E84, Truebro "Handi Lav-Guard", Plumberex PRO-2000 Series, or equal.

SINK - SK-1:

Elkay LR-3322 or Just DL-2233-A-GR, counter-top, 33 inch x 22 inch stainless steel sink, 18 gauge ledge back, self-rimming, double bowl with Elkay J or Just J-35 duo strainers and Elkay LK-4101, Just J-901 or Delta 400 single metal lever swing spout faucet with hose spray and 2.0 to 2.5 GPM flow restrictor.

SERVICE SINK - SK-2:

Commercial Enameling 866 or Kohler K-6716, acid resisting, enameled 24 inch x 20 inch cast iron service sink with rim guard, American Standard 7798.176 or Kohler K-6673 trap standard with strainer and 3 inch outlet, wall hangers, American Standard 8341.075 or Kohler K-8906 supply trim with integral stops, vacuum breaker, pail hook and threaded spout. Contractor shall provide suitable wall reinforcement for all wall supports.

ICE MAKER SERVICE BOX:

Guy Gray Model BIM 875, 20 gauge steel, white finish, flush mounted water service box with brass angle valve.

HOSE BIBBS:

Hose bibbs shall be Woodford 24P or Prier C-135SP-VB, chrome plated, cast brass, angle pattern faucet with 3/4 inch hose end, lockshield with loose key and chromed back-flow preventer.

DRAINS - GENERAL:

Body castings shall be of high grade, even grain cast iron, free from defects which might affect their serviceability and with 1/4 inch minimum wall thickness. All floor drains shall be installed with a deep seal P-trap. All grates, strainers and trims to be nickel bronze.

FLOOR DRAINS - FD:

J.R. Smith 2010-A, Josam 30000A or Wade W-1100-A with adjustable, 6 inch diameter, heavy duty, nickel bronze strainer, bottom caulk outlet and non-puncturing membrane clamping device. Where noted on Drawings, provide 1/2 inch trap primer connection at inlet to drain "P" trap.

TRAP PRIMER - TP:

Dearborn 831-1, J.R. Smith 2698 "Prime-Eze", Josam 88260, or equal as listed by addendum, water saver trap primer with chrome plated cast brass P-trap with cleanout, 17 gauge tubing outlet, slip joint nuts, 1/2 inch chrome plated primer tube and escutcheons. Include required slip joint nuts to match plumbing fixture drain outlet. In Toilet Rooms requiring floor drains, provide water saver trap primer (in lieu of the drain trap as previously specified in this section) for the lavatory drain. Where there are multiple floor drains and lavatories per toilet room, install sufficient quantity of trap primers to match quantity of floor drains. Extend 1/2 inch copper trap primer tubing (same as specified for water piping) from primer tube wall fitting connection to floor drain; trap primer line shall be installed concealed from view and sloped to prevent trapping water within the trap

primer line.

CLEANOUTS:

Provide cleanouts where shown on Drawings and wherever required for easy service of the installation. Cleanouts shall be same size as pipe, except cleanout plugs larger than 4 inches will not be required.

Body casting shall be of high grade, even cast iron, free from defects which might affect serviceability and with 1/4 inch minimum wall thickness.

Floor cleanouts shall be J.R. Smith 4000, Josam 56000 or Wade 6000 Series with tops suitable for surface in which they are installed. Where a floor material covers the cleanout, the top shall be of a type which is readily incorporated into the covering system without ridges or recesses. Tops must be flush with finished floor, except where carpet is used, a top incorporating a small round marker shall be furnished. Use square tops in floors such as, tile, brick, slate, etc. Cleanouts in unfinished concrete floors shall have heavy, nickel bronze tops. Wall cleanouts shall have heavy, stainless steel or chrome plated covers, no larger than 6 inches diameter, which shall completely cover hole. Outdoor cleanouts shall be as detailed on Drawings.

WATER HAMMER ARRESTORS:

Furnish and install in connection with fixtures or fixture groups throughout the building, a bellows type shock absorber, J.R. Smith 5000 Series, Wade "Shokstop", or equal as listed by addendum, and sized as recommended by manufacturer. Water hammer arrestors may be Precision Plumbing Products (PPP) Fluid (Water) Hammer Arrestors with copper barrel, brass piston and guaranteed for "life of the piping system." Water hammer arrestors shall meet ASSE Standard No. 1010. Long isolated runs to single fixtures such as EWC's, lavatories, etc., without quick-acting valves, may use field fabricated air chambers.

WATER HEATERS – GENERAL:

Where applicable, provide for certificate inspection of water heater(s) as required by State Authorities; this inspection is to be occur prior to Substantial Completion of the Work.

DOMESTIC ELECTRIC WATER HEATER:

Heater shall be U.L. listed and have a glass-lined welded steel tank rated for 150 psi working pressure. Tank shall have a one year limited warranty and be insulated with blanket type fiberglass or foam insulation and enclosed in baked enamel finish steel jacket. Heater shall be complete with immersion type heating element, automatic thermostat, high limit cutoff, cold water baffle and magnesium anode and brass/bronze drain valve. Heater shall be complete with AGA rated temperature and pressure relief (T & P) valve listed and installed in accordance with ANSI Z21.22. Unless indicated otherwise on Drawings, discharge of T & P valve shall be piped full size to outside of building. Unit size, capacity, and voltage shall be as indicated on Drawings. Heater shall meet ASHRAE 90.1 Standard. Heaters shall be Rheem 81V/81SV/81VP Series, Rudd PE/PES/PEP Series, A.O. Smith EEST/ELJF/ELSF Series, or equal as listed by addendum.

Point of use (utility) type heaters may have field installed drain valve at low side inlet in lieu of factory tank mounted valve. Also, when point of use type heaters are to be installed above the plumbing fixture served, Contractor shall provide Watts No. 36A, or equal, water heater vacuum relief valve at the water inlet to the heater.

PART 3 – EXECUTION

Immediately after installation of plumbing fixtures, cover each fixture with a fixture protector. Take every possible precaution for the protection of fixtures and connections and replace any fixture or other work damaged with no additional cost to the Owner.

Provide suitable (silicone base) caulking material between fixture and wall/floor/countertop (as applicable) for each fixture type such as water closets, urinals, lavatories, sinks, showers, etc.; caulking material shall form a neat bead around the perimeter of fixture to form a watertight joint.