15121 VALVES AND STRAINERS

a. All valves and other piping specialties, either as shown or required in the connection of the mechanical system of systems, except as may be otherwise specified elsewhere in the specifications, shall be Crane, Nordstrom, Nibco, or equal.

b. Gate valves shall be used for blocking purposes and branch isolation only. Lubricated plug cocks and globe valves are to be used for balancing. Do not use globe valves except where specifically indicated.

1. Gate Valves. 2" and smaller shall be Crane No. 428 or 438. Valves 3" and smaller may be Crane No. 1334 or 1324. Valves 2 1/2" orlarger shall be Crane 465 1/2 or 461.

2. Check Valves. 2" and smaller shall be Crane No. 37. Valves 3" and smaller may be Crane No. 1342. Valves 2 1/2" and larger shall be Crane No. 373.

3. Balancing Cocks. 2" and smaller shall be equal to Nordstrom No. 114. Cocks 2 1/2" and larger shall be equal to Nordstrom No. 115.

15122 MECHANICAL SYSTEMS INSULATION

a. Domestic Hot and Cold Water Piping. After satisfactory tests upon the piping systems have been made as herein specified and after the systems have been thoroughly cleaned, the following insulation shall be installed:

1. a. All water piping above ceiling, in crawl space and in exterior walls, shall be insulated with 1/2" thick PPG Fiberglass pipe insulation with factory applied flame retardant vapor barrier jacket as manufactured by PPG Industries. The insulation shall have a maximum K Factor of .24 at 75 degrees F mean temperature with a nominal density of 4#/cubic foot. Insulation shall be pre-molded, three feet long section, and be split ready for application.

b. All hot water piping shall be insulated with 3/4" fiberglass pipe insulation or 3/4" armaflex II installed as per manufacturer's directions.

c. Coverings shall be continuous through floors and walls, etc.

d. Provide semi-circular protection saddles of #16 gauge galvanized steel 10" long for insulated piping where hangers occur. On pipe sized 3" and larger provide 12" length of high density insulation at hangers.

e. All refrigerant suction line piping shall be insulated with Armstrong Armaflex II pipe insulation of 1/2" thickness. all joints shall be sealed with "501" adhesive.

2. The insulation shall be applied over clean dry pipe with all joints butted firmly together. Longitudinal laps shall be sealed with white vapor barrier cement such as Benjamin Foster 82-07. Butt joints shall be wrapped with a 3" wide strip of the vapor barrier jacket cemented with white vapor barrier cement such as Benjamin Foster 82-07.

3. Valves, fittings and flanges shall be insulated by wrapping with compressed Fiberglass blanket or mitered pipe covering to a thickness and density equal to adjoining pipe insulation securely wired in place and finished with a smoothing coat of asbestos cement using white vapor barrier cement such as Benjamin Foster 82-07.

a. Hot Water Piping if Run Under Floor shall be insulated with 3/4" thick Armaflex 22. Joints shall be sealed with #520 adhesive.

b. Rectangular Supply and Return Duct from the Units shall be insulated internally with one inch (1") thick Gustin-Bacon Ultra-Liner, flame spread classification less than 25. Do not increase duct sizes for insulation. Ducts shall be further insulated when indicated on the plans and to extent indicated.

c. Application of Duct Liner Insulation (Choose 1, or 2 and 3)

Method 1. All ducts requiring insulation liner shall be lined bycutting pieces to fit snugly against the interior duct surfaces. The liner shall be fastened to the duct with a heavy coat of quick-tacking rubber-based adhesive spread over the entire surface. The top and bottom pieces are to lap the side pieces and all exposed edges of the insulation at the duct ends shall be coated with adhesive. The heavy density surface shall face the air stream. The strength of Ultra-Liner fiber assures positive attachment to adhesive and will not shear.

Method 2. All ducts requiring insulation liner shall be lined by carefully adhering the liner in a continuous piece to clean flatmetal sheets with a quick-tacking rubber-based adhesive and forming the liner with the metal through the brake. The smooth heavy density surface shall face the air stream.

Method 3. All ducts over 24" in width or breadth shall be lined in accordance with Method 1 or Method 2 in addition, the linershall be secured with sheet metal screws and washers, or stud welded pins and clips.

b. DUCTWORK NOT INTERNALLY LINED (ROUND SUPPLY):

1. Ducts shall be insulated with 0.6 lb. density, 2" thick of General Purpose PPG Textra Fine Fiberglass duct insulation with a factory-applied foil scrim Kraft facing, Type IV, as manufactured by PPG Industries.

2. All joints shall be sealed by cementing 2" wide vapor seal tabs on the insulation or by taping with 3" wide strips of vapor barrier tape.

c. Refrigerant suction piping: Piping shall be insulated with Armaflex Pipe Insulation of 1/2" thick. insulation shall be installed in strict accordance with the manufactures directions. All joints shall be sealed. Piping located outside building shall be provided with flexible paint as furnished by the insulation manufacturer. Provide a minimum of two full cover coats. Color shall be selected by the Architect. See refrigerant pipe support detail for additional information.

d. All condensate piping at units to connection to drain shall be insulated same as noted for refrigerant piping.

15123 COLD WATER PIPING

a. This system shall consist of cold water piping as shown on the drawings, including distribution and connection to every fixture furnished, installed or connected under this contract.

b. Isolation valves shall be provided for each group of fixtures and each separate riser. Valves shall be located in accessible locations and grouped together for easy maintenance and service. Provide Milcor access panels where valves are concealed.

c. At the end of runout to each plumbing fixture group, provide a full sized air chamber on cold water lines. Provide drains in low points of systems. Special compression chambers shall be used as specified.

d. Provide make-up water and supply to all equipment furnished by others where shown on the plans and/or as required with stop valves located as required for the equipment supplied.

e. All pipes penetrating poured concrete floor shall be wrapped with 1/2" Armaflex II from two inches (2") below concrete to two inches (2") above finished floor. See paragraphs on General Piping and Sleeves for other conditions. Pipe joints shall be made with lead free solder as per Arkansas State Plumbing Code.

f. Piping shall be Type "K" copper below grade and Type "L" copper above grade.

g. All copper piping shall be hard drawn except that under slab piping one-half inch (1/2"), three-quarter inch (3/4") and one inch (1") sizes shall be type "L" soft drawn. Wherever possible, all connections of pipe should be made above grade.

15124 STERILIZATION

a. The entire domestic hot and cold water piping systems shall be thoroughly sterilized with solution containing not less than 50 parts per million available chlorine. The chlorinating material shall be either liquid chlorine conforming to the requirements of Federal Specification C-C-114, Type II, Grade B. The sterilizing solution shall be allowed to remain in the system for a period of eight hours, during which time all valves and faucets shall be opened and closed several times. After sterilization, the solution shall be flushed from the system with clean water until the residual chlorine content is not greater than 0.2 part per million, unless otherwise directed. Satisfy all requirements of The Arkansas State Board of Health, Plumbing Division.

15126 SYSTEM OF SANITARY WASTE AND VENT PIPING

a. This system shall consist of all sanitary, waste and vent piping from each and every fixture furnished, installed, or connected under this contract, and connecting to existing sewer lines as indicated on drawings. All fixtures and floor drains shall be separately trapped as close to the fixtures and in such manner that the discharge from any one fixture does not pass through more than one (1) trap before reaching the drains.

15127 INTERIOR

a. Underground soil, waste, and drain pipe and fittings inside building and extending 5'0" outside, shall be service weight hub-and-spigot plain end cast iron soil pipe and fittings designed for gasket systems. Above slab soil, waste and drain piping shall be service weight hub-and-spigot plain end cast iron soil pipe and fittings designed for gasket systems, or DWV copper. Waste and vent piping above grade shall be same as above except that no-hub pipe and fittings with neoprene gasket and steel corrugated clamp may be used. Fittings for piping above ground shall be sweated copper drainage pattern for all copper drain and waste piping and cast iron soil fittings for cast iron pipe. Underground piping shall be 2" minimum

15128 INSTALLATION OF DRAINAGE AND VENT PIPING

a. Horizontal soil and waste pipes shall be given an even grade of 1/4" per foot where possible, but in no case less than 1/8" per foot. All main vertical soil and waste tacks shall be installed with provisions for expansion and shall be extended full size to and above roof line as vents, except where otherwise specifically indicated. Horizontal offsets in all sanitary and waste pipe shall be accomplished with 1/16, 1/8 or 1/6 bends, with preference given in the order named. Horizontal intersections shall be accomplished with 45 degree or 60 degree "Y" branches, or combination "Y" and eighth bends with preference given to the order named. Sanitary tees or crosses may be used on vertical lines for fixture connections. Intersections between vertical and horizontal lines shall be the same as for horizontal lines, except that long sweep bends will be permitted.

15129 PIPE ASSEMBLY

a. Cast iron plain end soil pipe and fittings shall be assembled using Ty-seal gaskets. Gaskets shall be installed strictly according to manufacturer's recommendations using approved Ty-tools and compression gasket lubricants.

b. Cast iron no-hub soil pipe and fittings shall be assembled using the Tyler no-hub system complete with gaskets or neoprene, shield of type 301 stainless steel with worm drive clamps to make up tight joints. Install strictly according to manufacturer's recommendations.

c. Copper pipe shall be assembled with sweat type fittings and using lead-free solder and Silfos and a suitable flux. Pipe ends shall be cut square, reamed to remove all burrs and cleaned bright with fine sand- paper and steel wool. Solder shall take up by capillary action, and joint shall be made tight without a built-up head. Joints between copper and cast iron pipe shall be made with appropriate caulking ferrules and sweat copper adapters.

f. If rubber gasket concrete or clay pipe is used, installation and jointing shall be in strict conformance with manufacturer's recommendations.

g. Where gasket type and no-hub type connections are used, extra precautions shall be taken to assure rigidity of the systems by providing extra hangers, braces, and use of lead caulked joints.

15130 SANITARY SEWER AND STORM DRAIN LINES

a. Sanitary sewer and storm drain lines beyond 5'O" from building line, except under paving, or as indicated on the plans, shall be standard socket type vitrified clay pipe complying with ASTM Designation C-13, latest revision or schedule "40" PVC soil pipe with neoprene hub fittings. Note that the PVC piping shall comply and be permanently stamped as per Arkansas State Health Department requirements. If PVC piping is utilized the piping shall be laid in a pea gravel bed and provided with a minimum of 6" of pea gravel cover. Standard fittings of same material shall be supplied as necessary for proper installation and connections of all lines. Piping under pavement, walks, driveways, etc., shall be same as interior piping or as noted. Use approved plastic or preformed rubber ring joints.

15131 DRAINAGE SYSTEM TESTS

a. The drainage systems shall have all necessary openings plugged to permit the entire system to be filled with water to the level of the highest stack above the roof. The system shall hold this water for one hour without showing a drop greater then eight inches. All leaks shall be repaired and the system retested and proved tight before any fixtures are connected. The Contractor shall make any other tests which may be required under local codes.

DIVISION 15 - MECHANICAL

SECTION 15300 - PLUMBING FIXTURES AND ACCESSORIES

15301 GENERAL

a. Plumbing fixtures shall be furnished and installed complete with all trimmings, escutcheons, and fittings unless otherwise specified under the item. Fixtures shall have smooth impervious surfaces free from defects and concealed fouling surfaces. Generally, all fixtures except water closets and urinals shall have the water supply above the rim. Fixtures with the supply discharges below the rim shall be equipped with backflow preventors. Angle stops, straight stops, stops integral with the faucets, or concealed type of lockshield loose key pattern stops for concealed supplies shall be furnished and installed with all fixtures. Exposed traps and supply pipes for all fixtures and equipment shall be connected to the rough piping system at wall unless otherwise specified under the item. All fixtures and trimmings shall be designed to prevent the backflow of polluted water into the water supply system.

15302 FIXTURE CONNECTIONS

a. Connections between earthenware fixtures and flanges on soil pipe shall be made absolutely gas tight and watertight with a high quality closet setting compound or with gaskets. Rubber gaskets or putty will not be permitted. Closet bolts shall be not less than 1/4" in diameter and equipped with brass nuts and washer covered with chromium caps unless otherwise specified. Fixtures and outlet flanges shall be set the proper distance from floor or wall to make a first class joint with the closet setting compound or gasket and fixture. No fixture shall be set in place until Architect has examined and approved such flange. All exposed piping, fittings and trim shall be heavily chromium plated.

15303 FIXTURE AND EQUIPMENT SUPPORTS AND FASTENINGS

a. All fixtures and equipment shall be supported and fastened in a satisfactory and workmanlike manner. Where secured to concrete or brick walls, they shall be fastened with brass bolts or machine screws in lead sleeve type anchorage units or with 1/4" brass expansion bolts. Expansion bolts shall be of sufficient length to extend at least 3" into solid concrete or brickwork.

b. Where wood screws are used, screws shall go into solid wood, such as wood inserts, floor joists, studs, or solid pieces set between studs. Where through bolts are used, they shall be provided with plates or washers at back, set so that heads, nuts and washers will be concealed with plaster. Bolts and nuts shall be hexagon and exposed bolts, nuts, and screws shall be chromium plated and shall be provided with chromium plated brass washers.

15304 FIXTURES

a. (See plans for fixture specifications.)

15335 CLEANOUTS

a. Wall Cleanouts. Zurn #Z1445-3 cleanout, tee, complete with polished nickel-bronze round access cover and securing screw. Shoulder plug shall be tapered, straight threaded type which seals against caulked lead set in extension body.

b. Floor Cleanouts (Composition Floor Covering). Zurn #Z1400-6 inlay type, "Duracoated", adjustable, cast iron body, cadmium-plated plugs (nickel-bronze access cover and frame). Access cover shall be specified under wall cleanouts; see architectural finish schedules for areas required.

c. Floor Cleanouts: Zurn #Z1400-2 with scoriated nickel-bronze access cover and round adjustable frame. Cleanout plug shall be as specified under wall cleanouts.

d. Cleanouts to Grade. Zurn #Z1420-27 "Duracoated" cast iron body and extension body with cadmium-plated nonslip flush top. Cleanout plug shall be as specified under wall cleanouts.

15409 GAS PIPING - NATURAL GAS:

a. This system shall consist of gas piping as shown on the drawings including connection and distribution to every gas appliance furnished and installed or connected under this contract, or provided by others.

b. Provide a gas cock and appliance regulator at each gas using appliance if not furnished with the appliance.

c. Provide full size drip legs in all low points of the system.

d. 1. Low Pressure Gas Piping (two pounds and under) shall be Schedule 40 black steel, assembled with 150 pound black malleable iron fittings.

2. All gas piping outdoor or under ground shall be coated with "Polyken 900" tape. All fittings and joints shall be wrapped same as pipe. No exposed pipe or fittings will be allowed. Pipes 1-1/2" or larger may be welded. All valves shall be screwed.

3. Minimum depth below finished grade shall be 18".

e. Gas pipe (pressure in excess of two pounds) shall conform to the Southern Standard Gas Code requirements for installation and connection. Any pipe located inside the building shall not be concealed in any manner. An accessible lubricated cock shall be installed outside above grade where the gas piping enters the building.

f. Any pound gas line laid under concrete outside the building perimeter shall be encased in suitable pipe of proper size from a point six inches (6") above the ground at the building to a point twelve inches (12") beyond the concrete cover. The ends shall be permanently sealed, and a vent of proper size shall be installed at one end, and its opening protected against the entrance of water and insects. The casing shall be of material and installed in a manner acceptable to the gas company and local authority.

g. All piping in the pound portion of the system shall be marked at the beginning above ground, at all ends, and at not more than ten foot intervals along its length with a bright orange paint or wrapped with orange polyethylene tape, for 12" along the pipe.

h. All regulators within the building shall be vented to the atmosphere with pipe or metal rubbing no smaller than the tapping in the regulator for this purpose, and shall comply with Section 301.1 of the Southern Standard Gas Code.

i. All buried piping not encased shall be mill wrapped or protected in a manner acceptable to the City and the Gas Company. All joints shall be wrapped with two (2) thicknesses of polyethylene tape for a distance of six inches (6") overlap on mill wrapping, or poured over completely with hot pitch after testing, or a rust preventive coating acceptable to the Gas Company or local authority.

j. Each system will be tested in its entirety by not less than 100 pounds of air or nitrogen for 24 hours by a spring gauge which will not register more than 160 pounds and having a dial not less than three inches (3"), in diameter, and in good condition. Wherever regulators occur in the system, a "jumper" connection will be installed in place of the regulator for test purposes only, and will be removed at completion of test and regulator inserted. No plugged openings will be acceptable on the high pressure side of the regulators.

DIVISION 15 - MECHANICAL

SECTION 15820 - HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT

15821 HEATING & AIR CONDITIONING EQUIPMENT

a. (See plans for specifications.)

15822 FILTERS

a. After the project is completed, remove filters from system; clean and install clean new filters; leave one complete extra set for each system with Owner.

15823 METAL DUCTWORK

a. Ductwork shall be complete with grille, registers, diffusers, deflecting devices, turning vanes, controlling devices, splitters, flexible connections, louvers, etc.

b. All the ductwork shall be installed in accordance with the arrangement and sizes as indicated on the drawings. The ductwork shall be complete with all necessary elbows, deflector plates, dampers, etc., and shall be constructed and erected in a neat and workmanlike manner. All longitudinal ducts shall be inside groove type; over these sliding slip joints shall be used. Transverse seams on joints shall be drive slip joints. No standing seams shall be permitted when duct is exposed. All dimensions on plans are actual outside.

c. All ducts over 18" in either dimension shall be cross broken, except those where rigid board insulation is applied or area of duct where outlet or duct connection is to be installed.

d. Ductwork and fittings shall be constructed of zinc coated copper bearing steel sheets of the following gauges:

1. Ducts with the longest side not over twelve inches (12") wide - number twenty-six (#26) gauge.

2. Ducts with the longest side not over thirty inches (30") wide - number twenty-four (#24) gauge.

3. Ducts with the longest side not over forty-two inches (42") wide - number twenty-two (#22) gauge.

e. On metal ducts wider than thirty inches (30"), extra galvanized sheet metal angle bracing shall be used to keep the ducts from buckling or vibrating. Use ASHRAE guide schedule on bracing.

f. It shall be required that all ducts, both vertical and horizontal, shall be properly supported. All ducts shall be supported at least every four feet (4') with galvanized angles or heavy strips.

g. Ductwork shall conform to the regulation of The National Board of Fire Underwriters For The Installation of Air Conditioning, Warm Air Heating, Etc., latest issue.

h. Provide flexible canvas connections between ducts and fan equipment per ASHRAE guide recommendations.

i. Where locking devices occur in ceiling or wall for dampers, they shall be of the flush type equal to ventlock #688 exposed damper regulator and approved by the Architect.

j. All dimensions on plans are actual outside.

k. Short round duct runouts shall be PPG Industries "glass-flex flexible duct", Gustin-Bacon or Johns-Manville. Duct shall be one inch (1") thick, maximum 2'0".

15824 REGISTERS, GRILLES AND DIFFUSERS

a. All grilles, registers and diffusers shall be as scheduled and where shown on the plans. They shall fit tightly against the mounting surfaces and shall be equipped with felt or rubber gaskets and shall have frames to match the mounting surfaces. Verify all surfaces.

b. All air distribution devices shall be Titus or approved equal.

15825 BALANCING AND ADJUSTING

a. All systems shall be balanced and adjusted to the satisfaction of the Owner and the Engineer. Include the following items:

1. Adjust all fan belts to the proper tension.
2. Check all motor amperages and set speeds to avoid overloading.
3. This Contractor shall have all air systems, including exhaust systems balanced to provide performance specified.
4. Check all systems for noise and vibration which may be objectionable.
5. After you are satisfied that all systems may be acceptable to the Design Engineer, call for an inspection.
6. Systems will not be accepted until properly balanced.
7. After completion of balancing, submit data sheets to Engineer for approval. Data sheets shall show all motor HP's, nameplate amps, initial an final amp readings, A.H. unit specified, submitted, initial and final performance data - three readings on air balance showing specified, initial, middle and final.

15826 AIR SYSTEMS BALANCING PROCEDURE

a.

1. Open all volume controls, shut doors with door grilles, insert clean filters, set outside air and return air dampers.
2. Set patterns for sidewall supply grilles.
3. Set deflectrols, velocitrols or other devices at takeoffs for uniform flow through registers or diffusers.
4. Make preliminary settings on splitters.
5. Take first readings on all devices. Do not adjust as you go.
6. Analyze readings, total CFM, high and low CFM areas, etc.
7. Make adjustments on splitters and fan speed if necessary.
8. Take a second set of complete readings. Again, do not adjust as you go.
9. Analyze readings and make corrective adjustments on splitters and volume controls.
10. 10. Take a third complete set of readings and a fourth if necessary.

b. NOTES:

1. Outside air quantity and duct leakage can be judged by subtracting total return air readings from total of supply readings.
2. Try to do as much balancing with splitters as possible and use volume controls on grilles and diffusers to trim. This will generally give a more quiet job.
3. Use a velocity measuring device, such as an alnor velometer, which will give instantaneous velocity reading.
4. It may be helpful to number each air distribution device, and mark the plans accordingly.
5. All restroom exhaust fans must be operating.

DIVISION 15 - MECHANICAL

SECTION 15900 - AUTOMATIC CONTROLS

15911 AUTOMATIC CONTROLS

a. Controls shall be furnished by the Mechanical Contractor and installed by the Mechanical Contractor.

b. Control system shall consist of programmable digital thermostats control system as per plans.

c. Installation Instructions. Upon completion of work, the Contractor shall instruct operating personnel in the use of the automatic control system. The Owner shall be furnished three copies of reference brochures covering equipment, control diagrams and sequence of operation.

d. Control wiring shall be installed in strict accordance with the Electrical Specifications.

15950 FINALLY:

a. Systems shall not be accepted for final payment until the following have been submitted and approved by this Engineer.

1. Construction Drawings (As-Built)
2. Guarantee
3. Operation and Maintenance Instructions
4. Systems Balancing Data
5. Compressor extended warranty certificate (Total Warranty to be 60 months)

AS-BUILT

AIR EDUCATION & TRAINING COMMAND

LITTLE ROCK A.F.B.
ARKANSAS

MIKE TRUSTY ENGINEERING
PHONE: (501)224-9013
FAX: (501)421-0151
miketrusty@msn.com

No.	Revision/Issue	Date	BY	APP'D

PROJECT TITLE
REPAIR & RENOVATE MEDICAL CLINIC PH V
LITTLE ROCK AIR FORCE BASE
JACKSONVILLE, ARKANSAS
CHANGE ORDER TO PHASE V - 100% SUBMITTAL

SHEET TITLE
MECHANICAL SPECIFICATIONS

DRAWN BY: GMT
LEAD DESIGNER: GMT
TECH REVIEWER:
PROJECT NUMBER: NKAK#06-8006-5
DESIGNED BY: GMT
SHEET: MS-201
DATE: DEC. 3, 2010
SCALE: AS SHOWN
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