



WSU Project: Alumni House Chiller

WSU Project Number: 042-322411

General Notes:

- Dimensions and sketches for reference only
 - WSU Design and Construction standards apply to this project, the link for the standards is https://facilities.wayne.edu/design/d_c_standards_nov_2018.pdf
 - This is design and build project
 - Asbestos abatement is WSU scope of work
 - The basement space is used as a storage area for WSU dining, access is limited and shall be coordinated with WSU project manager
 - Working hours 8:00AM-4:00PM
 - The elevation between the storage area floor and the ground is 10'
 - All local, state and federal codes apply to this project
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MECHANICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 INDUSTRY STANDARDS

- Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

1.2 PERFORMANCE REQUIREMENTS

- Systems Components Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

1.3 QUALITY ASSURANCE

- Furnish all labor, material, equipment, technical supervision, and incidental services required to complete, test and leave ready for operation the mechanical systems as specified and as indicated.
- Ordinances and Codes: Perform all Work in accordance with applicable Federal, State and local ordinances and regulations, the Rules and Regulations of ASHRAE, NFPA, SMACNA and UL, unless otherwise indicated.
- Tests and Inspections: Perform all tests required by state, city, county and/or other agencies having jurisdiction. Provide all materials, equipment, etc., and labor required for tests.
- Performance Requirements: Perform all work in a first class and workmanlike manner, in accordance with the latest accepted standards and practices for the trades involved.

1.4 CODES, PERMITS AND FEES

- All required permits, licenses, inspections, approvals and fees for Mechanical Work shall be secured and paid for by the Contractor. All Work shall conform to all applicable codes, rules and regulations.



1.5 DRAWINGS

- The drawings show the location and general arrangement of equipment, piping and related items. They shall be followed as closely as elements of the construction will permit.
- Deviations from the drawings, with the exception of minor changes in routing and other such incidental changes that do not affect the functioning or serviceability of the systems, shall not be made without the written approval of WSU.

1.6 SUBMITTALS

- Submit project specific submittals for review.
- Prepare shop drawings to scale for WSU for review.
- Submit detailed shop drawings of piping systems showing pipe routing and types and locations of all pipe hangers.
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1.7 DELIVERY, STORAGE, AND HANDLING

- Storage locations will be designated by the Owner's Representative. Equipment stored in unprotected areas must be provided with temporary protection.

1.8 PROTECTION AND HANDLING OF EQUIPMENT AND MATERIALS

- Equipment and materials shall be protected from theft, injury or damage.
- Protect conduit openings with temporary plugs or caps.
- Provide adequate storage for all equipment and materials delivered to the job site. Location of the space will be designated by the Owner's representative or Architect/Engineer. Equipment set in place in unprotected areas must be provided with temporary protection.

1.9 COORDINATION

- Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations. Coordinate with other trades to ensure accurate locations and sizes of mechanical spaces, chases, slots, shafts, recesses and openings.
- Install Work to avoid interference with work of other trades including, but not limited to, Architectural and Electrical Trades. Remove and relocate any work that causes interference at Contractor's expense.
- The mechanical trades shall be responsible for all damage to other work caused by their work or through the neglect of their workers.
- All patching and repair of any such damaged work shall be performed by the trades which installed the work. The cost shall be paid by the Mechanical Trades.

1.10 INSTRUCTION OF OWNER PERSONNEL

- Before final inspection, instruct Owner's designated personnel in operation, adjustment, and maintenance of mechanical equipment and systems at agreed upon times. A minimum of 24 hours of formal instruction to Owner's personnel shall be provided.

1.11 CLEANING

- All debris shall be removed daily as required to maintain the work area in a neat, orderly condition.



- Final cleanup shall include, but not be limited to, washing of fixture lenses or louvers, switchboards, substations, motor control centers, panels, etc. Fixture reflectors and lenses or louvers shall be left with no water marks or cleaning streaks.

1.12 WARRANTY

- Warranty: Contractor shall warranty that the mechanical installation is free from defects and agrees to replace or repair, to the Owner's satisfaction, any part of this mechanical installation which becomes defective within a period of one year (unless specified otherwise in other

PART 2 - PRODUCTS

- Refer to WSU Design and construction standards for approved manufacturers

2.1 PIPE, TUBE, AND FITTINGS

- Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.2 JOINING MATERIALS

- Unions: Pipe Size 2 Inches and Smaller:
 - Ferrous pipe: Malleable iron ground joint type unions.
 - Unions in galvanized piping system shall be galvanized.
 - Copper tube and pipe: Bronze unions with soldered joints.
- Flanges: Pipe Sizes 2-1/2 Inch and Larger:
 - Ferrous pipe: Standard weight, forged steel weld neck flanges.
 - Copper tube and pipe: Slip-on bronze flanges.
- Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
 - Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
 - AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated. Square head bolts and nuts are not acceptable.
- Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- Solder Filler Metals: ASTM B 32, lead-free, antimony-free, silver-bearing alloys. Include water-flushable flux according to ASTM B 813.
- Brazing Filler Metals: Alloys meeting AWS A5.8.
 - Use Type BcuP Series, silver-bearing, copper-phosphorus alloys for joining copper or bronze socket fittings with copper pipe. Flux is prohibited unless used with bronze fittings.
 - Use Type Bag Series, cadmium-free silver alloys for joining copper with steel, stainless steel, or other ferrous alloys.
- Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- Welding Materials: Comply with Section II, Part C, of ASME Boiler and Pressure Vessel Code for welding materials appropriate for wall thickness and for chemical analysis of pipe being welded.



2.3 PIPE THREAD COMPOUNDS

- Pipe thread compounds for the fluid service compatible with piping materials provided.
- Compounds for potable water service and similar applications acceptable to U.S. Department of Agriculture (USDA) or Food and Drug Administration (FDA). Compounds containing lead are prohibited.

2.4 DIELECTRIC FITTINGS

- Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- Insulating Material: Suitable for system fluid, pressure, and temperature.
- Brass Unions, Brass Nipples, Brass Couplings: For systems up to 286 deg F.
- Dielectric-Flange Kits: Include full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.
- Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; female NPT threaded ends; and 300-psig minimum working pressure at 225 deg F.
- Dielectric Nipple/Waterway Fittings: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, male NPT threaded, or grooved ends; and 300-psig minimum working pressure at 230 deg F.

2.5 MODULAR MECHANICAL SEALS

- Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve or pipe and core drilled hole.
 - Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - Pressure Plates: Stainless steel. Include two for each sealing element.
 - Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.6 FLEXIBLE CONNECTORS

- Rubber Flexible Connectors/Expansion Joints: ASTM F 1123, fabric-reinforced rubber with external control rods or cables, and complying with FSA's "Technical Handbook: Non-Metallic Expansion Joints and Flexible Pipe Connectors."
 - Arch Type: Single or multiple arches.
 - Spherical Type: Single or multiple spheres.
 - a. Minimum Pressure and Temperature Ratings for NPS 1-1/2 to NPS 4: 150 psig at 220 deg F.
 - b. Minimum Pressure and Temperature Ratings for NPS 5 and NPS 6: 140 psig at 200 F.
 - c. Minimum Pressure and Temperature Ratings for NPS 8 to NPS 12: 140 psig at 180 F.
 - 3. Material: EPDM.
 - 4. End Connections: Full-faced, integral, steel flanges with steel retaining rings and female union.
 - 6. Coating: Factory applied Hypalon paint.



2.7 PLASTIC-CASE, LIQUID-IN-GLASS THERMOMETERS

- Manufacturers:
 1. AMETEK, Inc.; U.S. Gauge Div.
 2. Marsh Bellofram.
 3. Miljoco Corp.
 4. REOTEMP Instrument Corporation.
 5. Trerice, H. O. Co.
 6. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.
- Case: Plastic, 9 inches long.
- Tube: Red, blue, or green reading, organic-liquid filled, with magnifying lens.
- Tube Background: Satin-faced, nonreflective aluminum with permanently etched scale markings.
- Window: Glass or plastic.
- Connector: Adjustable type, 180 degrees in vertical plane, 360 degrees in horizontal plane, with locking device.
- Stem: Metal, for thermowell installation and of length to suit installation.
- Accuracy: Plus or minus 1 percent of range or plus or minus 1 scale division to maximum of 1.5 percent of range.

2.8 THERMOWELLS

- Manufacturers: Same as manufacturer of thermometer being used.
- Description: Pressure-tight, socket-type metal fitting made for insertion into piping and of type, diameter, and length required to hold thermometer. Brass for compatible services less than 353 degrees F (178 degrees C); ANSI 18-8 stainless steel for all others to suit service. Furnish extension neck to accommodate insulation where applicable.

2.9 PRESSURE GAGES

- Manufacturers:
 1. AMETEK, Inc.; U.S. Gauge Div.
 2. Cambridge.
 3. Dwyer Instruments, Inc.
 4. Marsh Bellofram.
 5. Miljoco Corporation.
 6. Trerice, H. O. Co.
 7. Weiss Instruments, Inc.
 8. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.
- Direct-Mounting, Dial-Type Pressure Gages: Indicating-dial type complying with ASME B40.100.
 1. Case: Stainless steel, aluminum, or FRP, 4-1/2-inch diameter.
 2. Pressure-Element Assembly: Bourdon tube, unless otherwise indicated.
 3. Pressure Connection: Brass, NPS 1/4, bottom-outlet type unless back-outlet type is indicated.
 4. Movement: Mechanical, with link to pressure element and connection to pointer.
 5. Dial: Satin-faced, nonreflective aluminum with permanently etched scale markings.
 6. Pointer: Red or other dark-color metal.
 7. Window: Glass or plastic.
 8. Ring: Stainless steel or chrome plated metal.



9. Accuracy: Grade A, plus or minus 1 percent of middle half scale.
 10. Vacuum-Pressure Range: 30-in. Hg of vacuum to 15 psig of pressure.
 11. Water: 0-100 PSIG (1 psi divisions to 50 psi; 5 psi divisions above 50 psi), liquid filled.
 12. Steam (15 psig and less): 30 inches Hg vacuum-30 PSIG (1 inch divisions below 0 psi; 1 psi divisions above 0 psi), silicone dampened.
 13. Steam (16 to 60 psig): 30 inches Hg vacuum-100 PSIG, silicone dampened.
 14. Range for Fluids under Pressure: 1-1/2 times expected working pressure. If not a standard scale, select next largest scale.
- Pressure-Gage Fittings:
 1. Valves: NPS 1/4 brass ball type.
 2. Syphons: NPS 1/4 coil of brass tubing with threaded ends.
 3. Snubbers: ASME B40.5, NPS 1/4 brass bushing with corrosion-resistant, porous-metal disc of

2.10 FLOW MEASURING DEVICES

- Manufacturers:
 - Dietrich Standard Subsidiary of Rosemount Division of Emerson Process Management; Diamond II - Flo-Tap Model.
 - Preso Meters Corporation.
 - Taco, Inc.
- Flow measuring device shall be used where indicated on the drawings and in sizes NPS 6 and larger and shall be annular primary flow elements. The annular primary flow elements shall be type 316, stainless steel, diamond shape or elliptical shape in cross-section. Pressure rating shall meet or exceed system minimum pressure rating as indicated for each system. Provide permanent, rust-proof metal identification tag on a chain indicating design flow rates, metered fluid and line size. Flow measuring devices shall be weld insert type. Units shall be capable of being inserted without system shut-down.
- Accuracy shall be plus or minus 1 percent over a flow turndown at least 10 to 1, independent of Reynold's number. Repeatability shall be plus or minus 0.1 percent.
- Sensors shall be installed in strict accordance with the manufacturer's recommendations with special attention given to alignment and straight run requirements.
- Flow gages which read in actual GPM shall be provided for all flow measuring devices on pumps 200 GPM or larger. Gage scale shall be linear to flow. Maximum flow rate on scale shall be selected at 120 percent of the pump's scheduled flow rate. Gage scale shall be 2.5 inch x 6 inch minimum, or 4 inch diameter minimum, and shall be mounted at eye level on unistrut support.

2.11 ISOLATION VALVE

- Isolation valves are shown on the Drawings.
 1. Throttling Service: Ball or butterfly valves.
- Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- For valves not indicated in the sketches, select valves with the following end connections:
 - For Copper Tubing, NPS 2 and Smaller: Solder-joint or threaded ends, except provide valves with threaded ends for condenser water, heating hot water, steam, and steam condensate services.
 - For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged, solder-joint, or threaded ends.



- For Copper Tubing, NPS 5 and Larger: Flanged ends.
- For Steel Piping, NPS 2 and Smaller: Threaded ends.
- For Steel Piping, NPS 2-1/2 to NPS 4: Flanged or threaded ends.
- For Steel Piping, NPS 5 and Larger: Flanged ends.
- For Grooved-End Systems: Valve ends may be grooved.
- Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.
- Valve Sizes: Same as upstream pipe, unless otherwise indicated.
- Extended Valve Stems: On insulated valves.
- Valve Flanges: ASME B16.1 for cast-iron valves, ASME B16.5 for steel valves, and ASME B16.24 for bronze valves.
- Valve Grooved Ends: AWWA C606.
- Solder Joint: With sockets according to ASME B16.18.
 - Caution: Disassemble valves when soldering, as recommended by the manufacturer, to prevent damage to internal parts.
- Threaded: With threads according to ASME B1.20.1.
- Valve Bypass and Drain Connections: MSS SP-45.

2.12 BRONZE BALL VALVES

- Bronze Ball Valves, General: MSS SP-110 and have bronze body complying with ASTM B 584, except for Class 250 which shall comply with ASTM B 61, full-depth ASME B1.20.1 threaded or solder ends, and blowout-proof stems.
- Two-Piece, Full-Port, Bronze Ball Valves with Stainless-Steel Trim: Type 316 stainless-steel ball and stem, reinforced TFE seats, blow-out-proof stem, with adjustable stem packing, soldered or threaded ends; 150 psig SWP and 600-psig CWP ratings.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Apollo Valves; by Conbraco Industries, Inc.;
 - b. Crane Valve Group; Crane Valves.
 - c. Milwaukee Valve Company.
 - d. NIBCO INC
 - e. Watts Water Technologies, Inc.

2.13 GENERAL SERVICE BUTTERFLY VALVES

- General: MSS SP-67, for bubble-tight shutoff, extended-neck for insulation, disc and lining suitable for potable water, unless otherwise indicated, and with the following features:
 1. Full lug, and grooved valves shall be suitable for bi-directional dead end service at full rated pressure without the use or need of a downstream flange.
 2. Valve sizes NPS 2 through NPS 6 shall have lever lock operator; valve sizes NPS 8 and larger shall have weatherproof gear operator.
- B. Lug-Style (Single-Flange) Size NPS 2-1/2 through NPS 12, 200-psig CWP Rating, Aluminum-Bronze Disc, EPDM Seat, Ferrous-Alloy Butterfly Valves: Full-lug type with ductile-iron body, Type 416 stainless-steel stem, copper bushing, aluminum-bronze disc, and molded-in EPDM seat (liner).
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Apollo Valves; by Conbraco Industries, Inc.; Series 143.
 - b. Bray International, Inc.



- c. Crane Valve Group; Center Line.
 - d. Milwaukee Valve Company.
 - e. NIBCO INC.; LD-2000-3/5.
 - f. SPX Valves and Controls; DeZurik Unit.
 - g. Tyco Flow Control; Grinnell Flow Control.
 - h. Tyco Flow Control; Keystone.
 - i. Watts Water Technologies.
- C. Grooved-End Butterfly Valves with EPDM-Encapsulated Ductile-Iron Disc: Bronze body with grooved or shouldered ends, or ductile-iron body with grooved or shouldered ends and polyamide coating inside and outside; Type 416 stainless-steel stem, PTFE bronze sintered on steel bushing, and 300-psig CWP Rating for Valves NPS 2 through NPS 8, 200 psig CWP Rating for Valves NPS 10 through NPS 12.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Anvil International, Inc.
 - b. NIBCO INC.; Model GD-4765-3/5.
 - c. Tyco Fire & Building Products; Grinnell Mechanical Products.
 - d. Victaulic Co. of America.

2.14 DRAIN VALVES

- Ball-Valve-Type, Hose-End Drain Valves:
 - 1. Bronze ball valve as specified in this Section.
 - 2. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.15 INSULATION MATERIALS, GENERAL REQUIREMENTS

- Products shall not contain asbestos, lead, mercury, or mercury compounds.
- Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- Adhesives used shall be fire resistant in their dry states and UL listed.

PART 3 - EXECUTION

3.1 WORK IN EXISTING BUILDINGS

- The Owner will provide access to existing buildings as required. Access requirements to occupied buildings shall be identified on the project schedule.
- Adequately protect and preserve all existing and newly installed Work. Promptly repair any damage to same at Contractor's expense.
- Consult with the Owner's Representative as to the methods of carrying on the Work so as not to interfere with the Owner's operation any more than absolutely necessary.
- Prior to starting work in any area, obtain approval for doing so from a qualified representative of the Owner who is designated and authorized by the Owner to perform testing and abatement, if necessary, of all hazardous materials including but not limited to, asbestos. The Contractor shall not perform any inspection, testing, containment, removal or other work that is related in any way whatsoever to hazardous materials under the Contract.



3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

- Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems
- During the progress of construction, protect open ends of pipe, fittings, and valves to prevent the admission of foreign matter. Place plugs or flanges in the ends of all installed work whenever work stops. Plugs shall be commercially manufactured products.
- Prior to and during laying of pipe, maintain excavations dry and clear of water and extraneous materials. Provide minimum 4 inches of clearance in all directions for pipe passing under or through building grade beams.
- Weld-o-lets and thread-o-lets can be used for annular flow measuring devices, temperature control components, and thermal wells. Pipe taps shall be drilled and deburred. Torch cutting is not acceptable.
- Clean and lubricate elastomer joints prior to assembly.
- Clean damaged galvanized surfaces and touch-up with a zinc rich coating.
- Install piping to conserve building space and not interfere with use of space.
- Group piping whenever practical at common elevations.
- Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- Slope piping and arrange systems to drain at low points.
- Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- In concealed locations where piping, other than black steel, cast-iron, or galvanized steel, is installed through holes or notches in studs, joists, rafters or similar members less than 1-1/2 inches from the nearest edge of the member, the pipe shall be protected by shield plates. Protective shield plates shall be a minimum of 1/16 inch thick steel, shall cover the area of the pipe where the member is notched or bored, and shall extend a minimum of 2 inches above sole plates and below top plates.
- Install valves with stems upright or horizontal, not inverted.
- Provide clearance for installation of insulation and access to valves and fittings.
- Install piping to permit valve and equipment servicing. Do not install piping below valves and/or terminal equipment. Do not install piping above electrical equipment.
- Install piping at indicated slopes. Provide drain valves with hose end connections and caps at all piping low points, where piping is trapped and at all equipment.
- Install piping free of sags and bends.
- Install fittings for changes in direction and branch connections.
- Select system components with pressure rating equal to or greater than system operating pressure.

3.3 PIPING JOINT CONSTRUCTION

- Remove scale, slag, dirt, oil, and debris from inside and outside of pipe and fittings before assembly.
- Use standard long sweep pipe fittings for changes in direction. No mitered joints or field fabricated pipe bends will be permitted. Short radius elbows may be used where specified or specifically authorized by WSU.
- Make tee connections with screwed tee fittings, soldered fittings or specified welded connections. Make welded branch connections with either welding tees or forged branch outlet fittings in accordance with ASTM A234, ANSI B16.9 and ANSI B16.11. For forged



branch outlets, furnish forged fittings flared for improved flow where attached to the run, reinforced against external strains and to full pipe-bursting strength requirements. "Fishmouth" connections are not acceptable.

- Use eccentric reducers for drainage and venting of pipe lines; bushings are not permitted.
- Provide pipe openings using fittings for all systems control devices, thermometers, gauges, etc. Drilling and tapping of pipe wall for connections is prohibited.
- Provide temperature sensing device thermal wells and similar piping specialty connections.
- Provide instrument connections except thermal wells with specified isolating valves at point of connection to system.
- Locate instrument connections in accordance with manufacturer's instructions for accurate read-out of function sensed. Locate instrument connections for easy reading and service of devices.
- Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."
- Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.
- Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
 - Weld-o-lets and thread-o-lets can be used for annular flow measuring devices, temperature control components, and thermal wells. Pipe taps shall be drilled and deburred. Torch cutting is not acceptable.
- Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on gaskets and bolt threads.
 - Assemble flanged joints with fresh-stock gasket and hex head nuts, bolts or studs. Make clearance between flange faces such that the connections can be gasketed and bolted tight without strain on the piping system. Align flange faces parallel and bores concentric; center gaskets on the flange faces without projection into the bore.
 - Lubricate bolts before assembly to insure uniform bolt stressing. Draw up and tighten bolts in
 - Staggered sequence to prevent unequal gasket compression and deformation of the flanges. Do not mate a flange with a raised face to a companion flange with a flat face; machine the raised face down to a smooth matching surface and use a full face gasket. After the piping system has been tested and is in service at its maximum temperature, check bolting torque to provide required gasket stress.
- Dissimilar-Metal Piping Joints: Construct joints using dielectric fittings compatible with both piping materials. Refer to Application Schedules on the Drawings.
- Remake joints which fail pressure tests with new materials including pipe, fittings, gaskets and/or a filler.



3.4 EQUIPMENT CONNECTIONS

- Make connections to equipment, fixtures, and other items included in the work in accordance with the submittals and rough-in measurements furnished by the manufacturers of the particular equipment furnished.
 - Any and all additional connections not shown on the drawings but shown on the equipment manufacturer's submittal or required for the successful operation of the equipment shall be installed as part of this Contract at no additional charge to the Owner.
- All piping connections to pumps, coils, and other equipment shall be installed without strain at the pipe connection of this equipment. When directed, remove the bolts in flanged connections or disconnect piping to demonstrate that piping has been so connected.

3.5 PIPING CONNECTIONS

- Make connections according to the following, unless otherwise indicated:
 - Install unions, in piping NPS 2 and smaller, where indicated on Drawings, at final connection to each piece of equipment and at all control valves.
 - Install flanges, in piping NPS 2-1/2 and larger, where indicated on Drawings, at final connection to each piece of equipment and at all control valves.

3.6 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- Install equipment to allow maximum possible headroom unless specific mounting heights are indicated. Housekeeping pad locations and sizes shall be coordinated by mechanical contractor prior to the placement of concrete slabs.
- Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- Install equipment to allow right of way for piping installed at required slope.
- For suspended equipment, furnish and install all inserts, rods, structural steel frames, brackets and platforms required. Obtain approval of Architect for same including loads, locations and methods of attachment.
- Equipment Rigging Over Roof Areas: Protect building structure against damage during equipment rigging. Make provisions to distribute load of equipment to main roof structure, and to prevent damage to roof decking, roofing, or purlins.
- The Contract Documents indicate items to be purchased and installed. The items are noted by a manufacturer's name, catalog number and/or brief description. The catalog number may not designate all the accessory parts for a particular application. Arrange with the manufacturer for the purchase of all items required for a complete installation.

3.7 CONCRETE BASES

- Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
 - Construct concrete bases as shown on Drawings.
 - Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.



- Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
- Install anchor bolts to elevations required for proper attachment to supported equipment.
- Install anchor bolts according to anchor-bolt manufacturer's written instructions.
- Use 3000-psi, 28-day compressive-strength concrete and reinforcement

3.8 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.
- Where pipe and/or equipment support members must be welded to structural building framing, Contractor shall seek prior approval from Architect and structural engineer. Scrape, brush clean, and apply one coat of zinc rich primer after welding.
- Field Welding: Comply with AWS D1.1.

3.9 JACKING OF PIPE

- Do not jack pipe in place except upon prior approval of proposed materials and complete details of methods.

3.10 FLEXIBLE CONNECTOR APPLICATIONS

- Use rubber flexible pipe connectors at the inlet and outlet water connections of base mounted pumps, chillers, and cooling towers, unless otherwise indicated.
 - Rubber Flexible Connectors for Pipe Sized NPS 2 and Smaller: Twin-sphere with females union end connections.

3.11 PRE-PURCHASED CHILLER

- Before chiller installation, examine roughing-in for equipment support, housekeeping pads, anchorbolt sizes and locations, piping, and electrical connections to verify actual locations, sizes, and other conditions affecting water chiller performance, maintenance, and operations.
 1. Chiller location indicated on sketches is approximate. Determine exact locations before roughing-in for piping and electrical connections.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.12 CHILLER INSTALLATION

- Equipment Mounting: Install chiller on concrete bases with vibration isolation devices.
- Maintain manufacturer's recommended clearances for service and maintenance.
- Charge chiller with refrigerant if not factory charged and fill with oil if not factory installed.
- Install and wire separate devices furnished by manufacturer and not factory installed.

3.13 CONNECTIONS

- Connect the chiller to piping per manufacturer recommendation

3.14 STARTUP SERVICE

- A factory-authorized service representative has been engaged by the Owner to perform startup service. Assist with start-up as required.



3.15 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- Comply with NECA 1.
- E. Right of Way: Give to raceways and piping systems installed at a required slope.

3.16 CUTTING, PATCHING AND DAMAGE TO OTHER WORK

- Refer to General Conditions for requirements.
- All cutting, patching and repair work shall be performed by the Contractor through approved, qualified subcontractors. Contractor shall include full cost of same in bid.

3.17 EQUIPMENT CONNECTIONS

- Make connections to equipment, motors, and other items included in the work in accordance with the approved shop Drawings and rough-in measurements furnished by the manufacturers of the particular equipment furnished. All additional connections not shown on the Drawings, but called out by the equipment manufacturer's shop Drawings shall be provided.

3.18 ACCEPTANCE PROCEDURE

- Upon successful completion of start-up and recalibration, but prior to building acceptance, substantial completion and commencement of warranties, WSU shall be requested in writing to observe the satisfactory operation of all mechanical control systems.
- The Contractor shall demonstrate operation of equipment and control systems, including each individual component, to the Owner.



Scope of Work:

This overview of scope of work is included to give the contractor a general overview of the project requirements. This overview of scope includes, but not limited to the following:

- New cement pad
- The Pad's dimensions based on chiller selected, minimum 12" around the chiller
- Chiller manufacturer will deliver the chiller to contractor yard, contractor is responsible to inspect the chiller and confirm no physical damages.
- Install air cooled 30 Ton chiller (Chiller by WSU)
- Chiller's cold side to north, panel side to south
- Run underground chilled water in a duct bank through the basement wall. It's close enough that an open through with gravel drain and grate top could get made to allow the pipes to remain accessible on the exterior.
- Provide and install isolator pads and isolator hangers
- Connect new chilled water piping to existing chilled water piping. Replace existing 90° elbow by a tee.
- Install isolation valves (Ball valve) for supply and return chilled water loop per the sketch, total 4 valves.
- Provide drain valves with hose end connections and caps at all piping low points, where piping is trapped and at all equipment
- Insulate and label all chilled water piping
- Provide and install all temperature and pressure gauges needed
- Provide all materials and equipment to insure smooth chiller operation
- Provide water balancing for the new chiller
- Electrical work: 200A breaker is available at the electrical panel inside the mechanical room
- Relocate fire strobe 3' to the north.
- Control work: Run all control wires from mechanical room to new chiller, equipment by WSU
- Work with chiller manufacturer to start up the chiller
- Provide and install 8' fence around the chiller, provide a swing gate on the south side
- Fence shall be black decorative type with posts and flat mount brackets
- Provide mesh fence above the chiller
- Work with chiller manufacturer to provide training
- Provide One year warranty on products and labor

-Chiller Specifications:

Factory assembled air cooled chiller with all necessary equipment

Refrigerant: 410A

Fluid type: Chilled water

Leaving temperature: 40 F°

Entering temperature: 55 F°

Condenser Type: Air cooled

Compressor type: Scroll

Entering air temperature: 95 F°

Integrated pump

Voltage: 208/230 V

Power: 3 Ph, 60Hz

Total power: 30-40KW



Evaporator heater
Non-Fused disconnect
Digital compressor
GFI outlet
Micro channel
Single point power connection
Vibration isolation package
Operating weight: Not to exceed 3,000 lb
Recommended dimensions: not to exceed 85' height, 45" width, 120" length
Factory installed hardware and software building automation system to enable WSU BAS to monitor and control the chiller. BACnet communication

Control features and monitoring points shall be displayed locally at the chiller panel
External inputs and outputs control and monitor points include but not limited to:

- Remote Start/Stop
- Owner alarm relay
- Chilled water flow switch input.
- Condenser water flow switch input.
- Full load indicator relay.
- Condenser pump relay.

Chiller safety controls system provided with the unit as a minimum include:

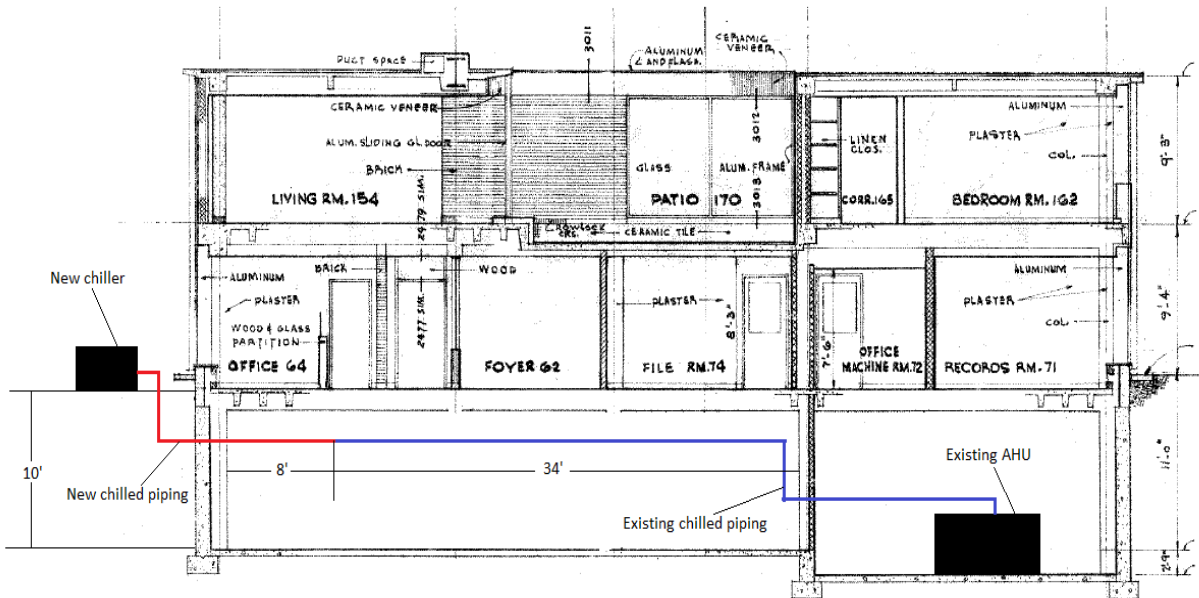
- Low refrigerant pressure.
- Loss of flow through evaporator.
- Loss of flow through condenser.
- High condenser refrigerant pressure.
- High compressor motor temperature.
- Low suction gas pressure.
- Low leaving water temperature.

Approved testing and balancing agents:

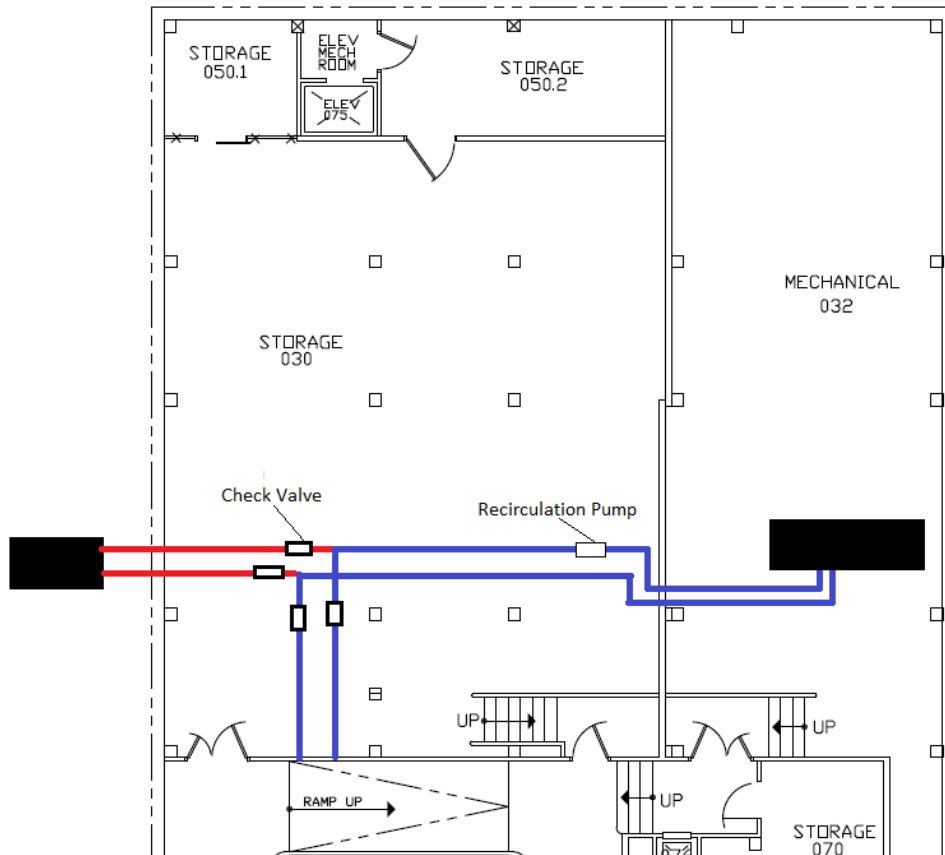
Enviro-Air
Testing Engineering & Consultants



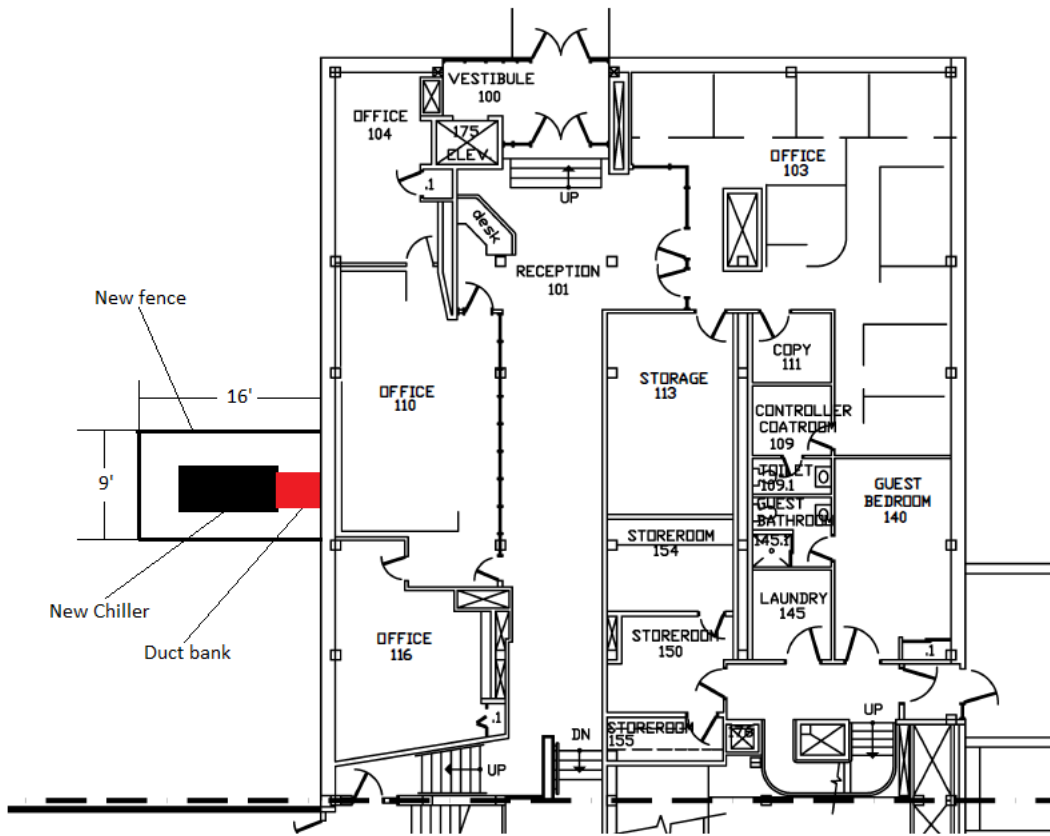
Recommended installation:



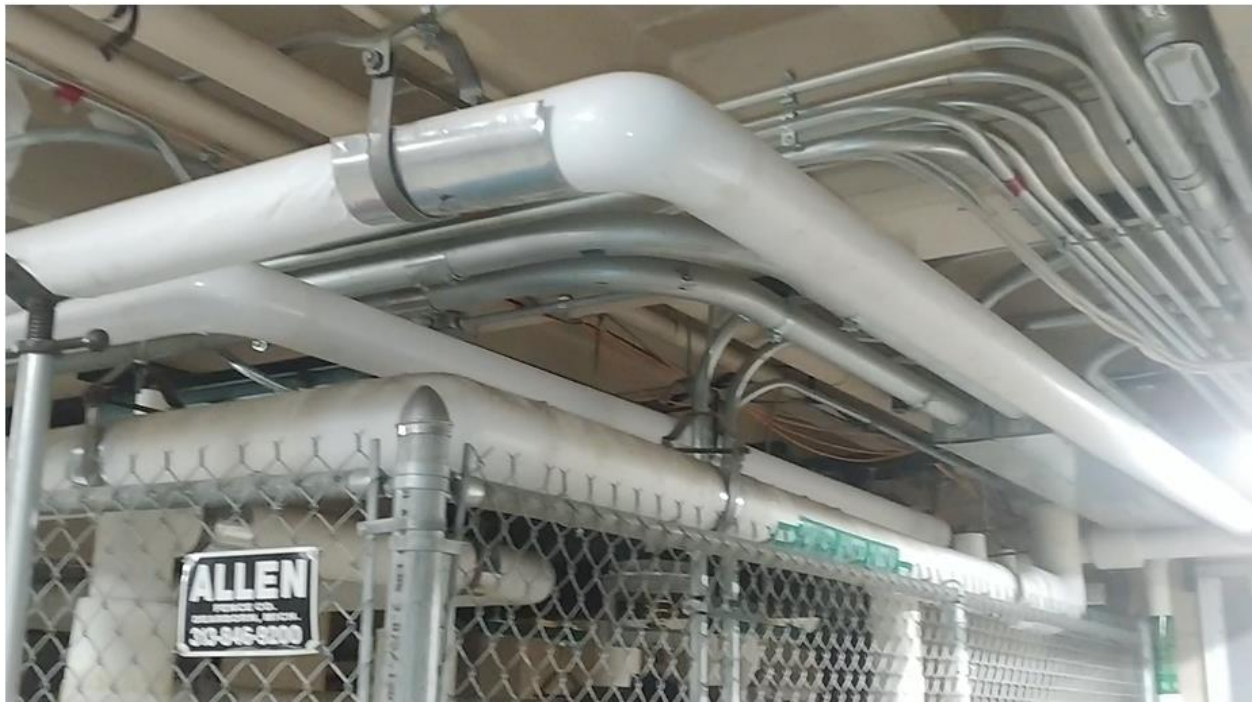
South View



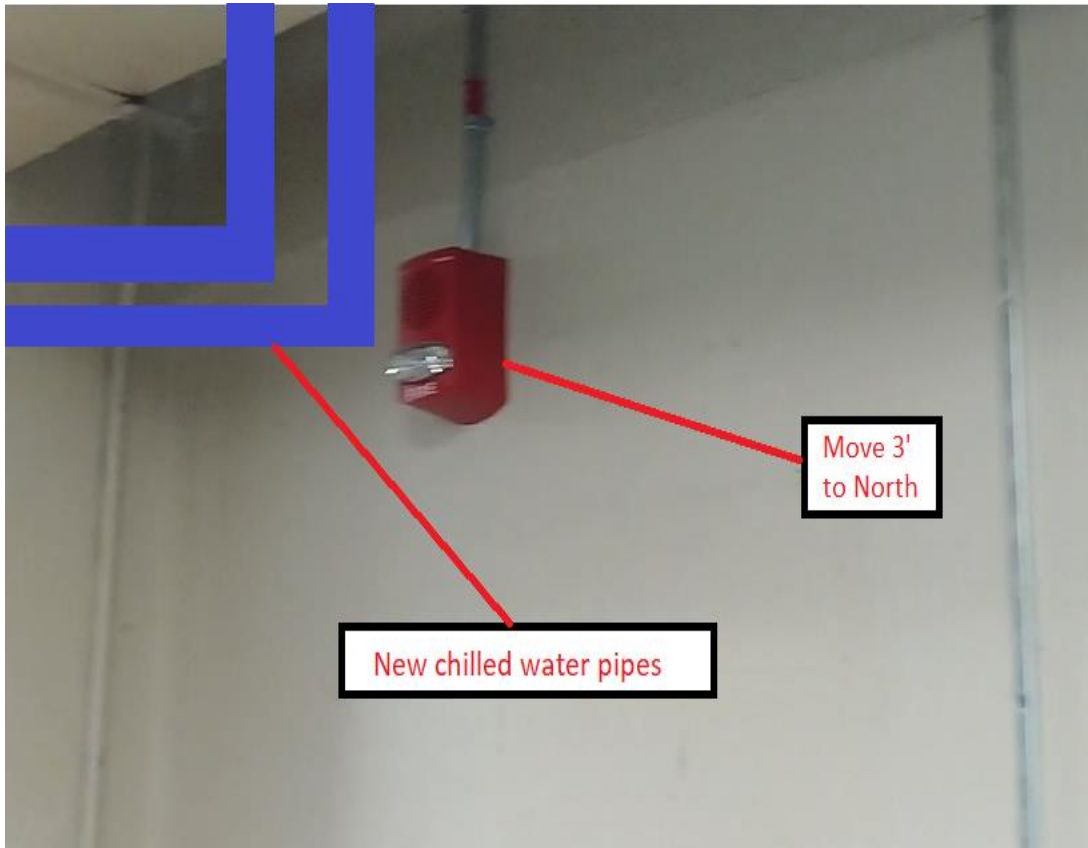
Basement Level



Ground Level



New piping and old piping future connection location



Fire strobe and chilled water pipes



New chiller location