

SECTION 220501 - COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 SUBMITTAL REQUIREMENTS

A. Shop Drawings

1. Coordination Drawings: This contractor shall provide necessary coordination drawings required to make sure all disciplines are coordinated and fit into specified spaces (i.e. ceilings, chases, and all others). It is the work of the contractor to prepare complete coordination drawings indicating exact location, clearances and penetrations of all items of all trades.

1.2 GENERAL DIRECTION

- A. Submittal of a bid indicates that the contractor has examined the drawings, specifications, and had an opportunity to visit the site to be able to provide a comprehensive complete bid.
- B. The intent of these specifications and the accompanying drawings is to provide complete and workable systems as shown, specified and required by applicable codes. Interpret these specifications in conjunction with the drawings and provide all work described. If work is shown on drawings and not mentioned in the specifications, or vice versa, it is to be included in the work the same as though clearly set forth by both. Should there be a conflict between the specifications and drawings, provide the greater quantity or better quality. Immediately notify owner's representative and design professional of such conflicts.
- C. The drawings that accompany these specifications are diagrammatic and although size and location of equipment is drawn to scale wherever possible make use of submittal data and verify all dimensions on site. Drawings may not reflect every offset, bend, tee, or elbow which may be required to install work in the space provided and avoid conflicts. Follow the drawings as closely as is practical and install additional bends, offsets and elbows where required by site conditions and codes at no additional cost. Install all new work in such manner as to conform to the structure, avoid obstructions, provide required service clearances and preserve headroom. Do not scale from drawings, all measurements should be taken in the field.
- D. Coordinate all work with all other contractors and installers in addition to existing building obstructions and install accordingly. Comply with requirements of architectural drawings including but not limited to mounting height and locations. Fully research peculiarities and limitations of space available for installation of work with materials being provided. Work around material lead times to not extend project schedule.

- E. Complete work, or part(s) thereof, at times as may be designated by the Owner's Representative, so that it can be used for temporary or permanent use. Do not construe such use of the system as an acceptance of it by Owner.
- F. During mobilization or construction, if an abnormal condition is uncovered either with existing conditions, equipment loads, submittal data, etc. bring these to the attention of the Design Professional for review.
- G. Owner's Representative or Design Professional may relocate devices prior to installation within a 20-foot limit at no additional charge.
- H. All piping shall be run as straight as possible and symmetrical with architectural items. Piping shall be concealed in pipe shafts, pipe spaces and furring wherever possible. Piping installed before coordination with the other trades will be done at the contractor's risk.

1.3 GENERAL STANDARDS

- A. Provide materials, installation methods, workmanship, testing, etc., in strict accordance with the latest edition of applicable standards and adopted codes, including (but not limited to) the following.
 - 1. State and/or local Building Codes.
 - 2. State and/or local Plumbing Codes.
 - 3. American Society of Test Materials (ASTM)
 - 4. Underwriters Laboratories (UL)
 - 5. American Gas Association (AGA)
 - 6. National Sanitation Foundation (NSF)
 - 7. American National Standards Institute (ANSI)
 - 8. National Electric Code (NEC)
 - 9. Building Code Seismic Relative Displacement Requirements

1.4 PERMITS AND REGULATIONS

- A. Obtain and pay for permits, fees, certificates of inspection and approval, etc. required for this branch of the work. Furnish Owner with certificates of final inspection and approval prior to final acceptance of this branch of the work.
- B. Laws and regulations which bear upon or affect the various branches of this work shall be complied with by this contractor and are hereby made a part of this contract.

1.5 DEFINITIONS

- A. Furnish - Procure, supply and deliver to project site, ready for installation, install and warrant (unless indicated otherwise on documents). Include warranty expenses.

- B. Install - To supply labor, tools and incidental materials necessary to handle, store, mount, terminate, program, configure and adjust a product in order render the respective product and system fully operational and usable to the Owner for the intended purpose
- C. Provide - Furnish and Install. Similar Terms: "include", "shall", "equip with", "consisting of".
- D. Equal or Equivalent - Determination of equivalency to be made by design professional for all products not listed as basis-of-design.
- E. Substantial Completion - Where frontend documentation does not define, products and systems must be fully installed as designed, tested, adjusted, labeled, and functionally demonstrated to owner.

1.6 REQUESTS FOR INFORMATION

- A. Submit all questions, requests for information (RFIs) and similar queries through the formally-established RFI process for the project that has been accepted by the Owner's Representative, Design Professionals, Prime Contractor and subcontractors. Submit as a PDF file. Do not submit as text in an email.

1.7 AVAILABILITY OF ELECTRONIC DRAWINGS

- A. If expressly permitted by the Owner and the terms of the Contract, editable electronic drawings may be made available for the creation of shop and as-built drawings upon request. Drawings will be made available at the discretion of the Engineer.
- B. "Request Drawings" form can be accessed, filled out and submitted at <http://www.klhengrs.com> (right hand side of page - Contractor Resources). Direct access to this form can be found here: <http://files.klhengrs.com/requestdrawings.html>

1.8 QUALITY ASSURANCE

- A. Contractor shall have a minimum five (5) years experience in the installation of systems similar to the systems specified. Contractor, if requested, shall demonstrate his ability to perform all work to be included under the contract. Assurance if requested, shall be in the form of a list of past projects of similar size and complexity and a list of six (6) references pertaining to those projects. Failure to demonstrate these quality assurances shall be taken as a statement of the contractor's inability to perform.

1.9 WARRANTY / GUARANTEE

- A. Provide a warranty/guarantee in written form as part of O&M manual stating that all work, materials, equipment and parts are warranted to be free of defect for a minimum period of one year from the date of Substantial Completion. Warranty period and requirements may be expanded in drawings or subsequent specification sections. Repair or replace (owner's option) any defects or failures at no cost to the owner within the warranty period. Issues arising within warranty period must be attended to in a timely

manner and in no case exceed four (4) working days. State this in writing as part of O&M manual. Replace defective items to the satisfaction of the Owner's Representative and the Design Professional.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Provide materials that are new, full weight, and of the best quality. Obtain equipment, components and materials from single manufacturer for products of the same kind or category. Provide materials that are listed and labeled and marked for intended location and application.
- B. Provide basis of design products or listed products equivalent in quality, performance, aesthetics, and product support (factory and local) to that specified as basis of design. Products not basis of design are subject to review by the Design Professional and possible rejection. Listing of a product manufacturer by name alone as an equivalent manufacturer shall not equate all products offered by that manufacturer to the basis of design.
- C. Bear all costs incurred from deviation from basis-of-design materials, methods, labor, services, etc. Use of materials, methods, labor, services, etc. that deviate from the basis-of-design will be considered a statement that capacities, requirements, clearances, arrangements, performance, etc. have been checked, verified, found satisfactory, and align with intent of specified work and applicable codes and regulations.
- D. Should deviation from basis of design equipment impact other contractors scope of work it shall be the responsibility of this contractor to coordinate with and cover these costs in addition to their own. This specifically includes electrical deviations from basis of design.
- E. All manufacturer or contractor provided electrical disconnect switches shall comply with current National Electric Code requirements and rated to meet or exceed the overcurrent device serving the equipment.
- F. Products shall not contain asbestos, lead, mercury, or mercury compounds and shall be suitable for piping service fluids, materials, working pressures, and working temperatures. Potable-water piping and components shall be deemed lead-free and comply with NSF 61 and NSF 14.

PART 3 - EXECUTION

3.1 GENERAL DIRECTION

- A. Unless specifically indicated, provide all specified and drawn work as required to render all equipment and systems fully operational, including all ancillary, accessory,

and support work. Install equipment and materials in strict accordance with manufacturer's written instructions.

- B. In cases where products / materials are furnished by Owner or others, provide the following services: receive, transport and securely store materials on site; remove materials and components from packaging; assemble all materials and components per factory instructions; install, wire and connect materials and components as recommended by manufacturer for a fully operational installation.
- C. Remove and replace items that impede new work installation including but not limited to fencing, doors, gypsum, lift-out panels, and structures to provide pathway for moving equipment into place.
- D. Examine surfaces to receive products for suitable mounting conditions and verify compliance with installation tolerances and other conditions affecting performance of the work. Proceed with installation only after unsatisfactory conditions have been corrected.
- E. Equipment shall be installed in accordance with manufactures installation recommendations. Provide and maintain service, maintenance and operating clearances as required by the manufacturer.

3.2 SUPERVISION AND WORKMANSHIP

- A. Workmanship throughout shall conform to the standards of best practice and all labor employed must be competent and qualified to do all the work required.
- B. Contractor shall furnish the services of an experienced superintendent to be in constant charge of the work at all times. The superintendent's qualifications are subject to the review and acceptance by the Owner's Representative. Utilize the same plumbing superintendent throughout the duration of the project.
- C. Provisions shall be made for owner's representative or design professional to make rough-in and open ceiling inspections prior to covering up work.
- D. Coordinate sizes and locations of concrete bases with architectural and structural elements. Concrete base shall be provided with all equipment provided.
- E. Protect all piping, fixtures, and equipment exposed to physical damage.
- F. Handling Flammable Liquids: Remove and dispose of liquids from existing gas piping according to requirements of authorities having jurisdiction.

3.3 PROJECT CONDITIONS

- A. Do not interrupt existing utility service(s) to any facility occupied by Owner or others until notification of no fewer than seven days in advance of proposed interruption of existing utility has been submitted to the Architect, Construction Manager, and/or

Owner for approval. It is the contractor's responsibility to obtain written permission from the Architect and/or Owner prior to any interruptions of service. Failure to perform the above shall result in contractor proceeding at their risk and accepting full responsibility for incorrect connections.

3.4 CHANGE OF WORK

- A. In the event of revised scope or work formally issued through Change of Work order, contractor shall provide an itemized breakdown of pricing and receive approval prior to commencing work.

3.5 ARCHITECTURAL COORDINATION ITEMS

A. Cutting and Patching:

- 1. Cut and drill all openings in roofs, walls, and floors required for the installation. Neatly patch all openings cut. Hold cutting and patching to a minimum by arranging with other contractors for all sleeves and openings before construction is started. When drilling/cutting concrete slabs, utilize ground penetrating radar (GPR) and/or X-ray scanning equipment to verify the location is free from obstructions, including but not limited to: structural rebar/strands/tendons, electrical conduit/wiring, and/or piping/ductwork.

B. Fire Caulking:

- 1. Patching through fire rated walls and enclosures shall not diminish the rating of that wall or enclosure. Patch shall be equal to rockwool, firestop, caulk or approved "rated" patch.
- 2. Provide products equivalent to the following:
 - a. For Floor Openings: 3M; Fire Barrier Sealant CP 25WB+
 - b. For Wall Openings: 3M; Fire Barrier Sealant CP 25WB+
 - c. Mineral Felt: Rockwool; Firepro Firestop Compound
 - d. For Insulated Pipes: 3M; Fire Sealant System CAJ5211
 - e. For Fill Areas: 3M; Fire Barrier Packing Material PM 4
- 3. For larger openings where pipes penetrate fire rated enclosures that cannot be sealed with products described above, utilize approved UL products equal to 3M FireDam Spray 200.

C. Access Panels:

- 1. Provide all access panels required for proper servicing of equipment. Provide fire rated access panels at fire rated assembly penetrations rated at or above the fire rating of the assembly. Provide frame as required for finish. Coordinate installation with General Contractor as they may elect to install access panel. Exact location(s) must be approved by the Architect. Minimum size to be 12" x

12", units to be 16-gauge steel, primed for paint, and locking device shall be screwdriver cam locks.

2. For equipment above gypsum board or "hard ceilings", provide equipment access panels sized to permit complete holistic removal of the unit in its entirety. Access panel shall also be sized to accommodate removal of the largest piece of equipment in the case where such access panel is used as a removal pathway for multiple pieces of equipment.

3.6 PROTECTION OF SURFACES

- A. Make every effort to protect roofs, walls and floors from dust, debris, water, sewage, foot traffic, equipment, carts, lifts, etc. prior to and during construction phase(s).
- B. Make roof penetrations and install roof flashing in accordance with roofing manufacturer's recommendations. Obtain written certification from roofing manufacturer that work has been performed properly and that roof warranty is intact.

3.7 UTILITY VERIFICATION REQUIREMENTS

- A. Field verify locations of underground and aboveground utilities, or those otherwise obscured from view, in the vicinity of work prior to commencing work. Utilize "811" call before you dig and hire locating service to identify, locate and mark remaining utilities and private lines.
- B. Camera scope and dye testing existing piping, ductwork and pathways to confirm existing conditions and use including, but not limited to, voltage, natural gas pressure, sanitary, storm, chilled water, steam, etc.)
- C. Obtain on-site approval from local utility prior to connecting to existing services.
- D. Failure to perform the above shall result in contractor proceeding at their risk and accepting full responsibility for incorrect connections.

3.8 DELIVERY, STORAGE, HANDLING, AND PROTECTION

- A. Receive, inspect, store and protect all materials required for new work. Do not accept or install any product damaged in any way.
- B. Comply with all manufacturer guidelines and requirements for movement, storage, and protection of new work. All new work must be stored in a clean, dry place protected from weather and construction traffic. Maintain acceptable temperature and humidity per manufacturer recommendations. When stored inside or during transport through building, do not exceed structural capacity of the floor.
- C. Coordinate and account for sizes of all new work included shipping materials with available openings. Account for rigging of all new work as required and as intended by manufacturer.

- D. Do not install work until work area is sufficiently weathertight, all wet work in area is complete and all work above is complete.
- E. Prior to installation, all products shall have the ability to be returned to the supplier or manufacturer after purchase and charged a reasonable restocking fee equal to a small portion of the cost.
- F. Protect all new work through construction from damage. Take safeguards necessary to protect from damage. Items damaged during construction will not be accepted and shall be replaced with new.
- G. Remove and replace all materials that have been installed improperly, physically damaged, moisture or water damaged, or mold damaged.
- H. Fully remove all packaging materials inside and out prior to startup.
- I. Retain all shipping protective covers and protective coatings during storage.
- J. Fixtures and equipment being shipped and/or stored shall be covered with plastic sheeting and enclosed in a cardboard or wood crate.
- K. Protect drains throughout all phases of construction to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- L. Place plugs in ends of uncompleted piping at end of each day or when work stops.

3.9 EXCAVATING AND BACKFILLING

- A. Perform all excavation and backfilling required for admittance of work. Execute work safely providing slope sides, shoring and bracing as required for stability.
- B. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by excavation operations. Properly restore streets, sidewalks, concrete and blacktop surfaces that were broken during the excavation process.
- C. Remove materials of every nature encountered in obtaining indicated lines and grades as shown on drawings. Excess excavated earth materials shall be removed from the site.
- D. Where soft or poor load-bearing quality soils are found at the bottom of the trench, the trench shall be over-excavated by not less than two pipe diameters.
- E. Where trenches are over-excavated, or rock is encountered during excavation the trench shall be backfilled and compacted in 6" lifts to the bottom level of the bedding course with a sand/gravel mix with a maximum 3/8" particle size.

- F. Underground drainage piping shall be laid on a 6" of well-tamped bedding course of a sand/gravel mix with a maximum 3/8" particle size. Bedding shall be scooped out at the bells or couplings to ensure the piping is well supported throughout its entire length. Sand/gravel mix should be firmly compacted under, around, and above the pipe in 6" lifts to grade. Compaction should be a minimum of 95 percent of standard proctor according to ASTM D698.
- G. Underground piping installations shall conform with ASTM D2321/F1668 and CISPI 301.
- H. Install piping materials in accordance with the manufacturer's requirements and in conjunction with the standards referenced in this specification. Installation methods shall comply with the more restrictive standards.

3.10 STARTUP, TESTING AND ADJUSTMENTS

- A. Adjust fixtures, equipment, accessories, and moving parts to function smoothly and lubricate as recommended by manufacturer.
- B. Provide necessary power to fixtures, equipment, and accessories to ensure proper functionality.
- C. Complete installation and startup checks according to manufacturer's written instructions.
- D. Perform the following adjustments before operation:
 - 1. Check piping connections for tightness.
 - 2. Close drain valves, hydrants, and hose bibbs.
 - 3. Open shutoff valves to fully open position.
 - 4. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
 - 5. Remove and clean strainer screens. Close drain valves and replace drain plugs.
 - 6. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
 - 7. Set pre-charge pressure on expansion and accumulator tanks.
 - 8. Adjust and set all temperature, pressure, and flow set points for all fixtures, equipment, and/or accessories as required by authorities having jurisdiction or manufacturers recommendations, whichever carries the highest importance.
 - 9. Charge and test for leaks all plumbing systems, rectify all installation issues prior to putting any systems into service.
 - 10. Test each all backflow-prevention assemblies according to authorities having jurisdiction and the device's reference standard.
 - 11. Perform the following startup checks for each pump before starting:
 - a. Clean strainers on pump suction piping.
 - b. Verify bearing lubrication.
 - c. Verify that pump is free to rotate by hand.

- d. Verify that pump is rotating in the correct direction.
- 12. Prime pump by opening suction valves and closing drains, and prepare pump for operation.
- 13. After electrical circuitry has been energized, start pumps to confirm proper motor rotation and pump operation.
- 14. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- 15. Noise Test.
- 16. Open discharge valve slowly.

3.11 CLEANING EQUIPMENT AND PREMISES

- A. Vacuum, clean and wipe down all new work and equipment inside and out. Exposed parts which are to be painted shall be cleaned of all foreign objects and prepped for paint.
- B. During the progress of work, clean up and leave the premises and portions of the building in which work has occurred in a clean and safe condition. Provide this cleaning on a per-shift basis.

3.12 DEMONSTRATION / TRAINING

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain equipment. Refer to product specific specification for training types and duration.

END OF SECTION 220501