**SECTION 21 0500**

**COMMON WORK RESULTS FOR FIRE SUPPRESSION**

**PART 1 GENERAL**

1. DESCRIPTION
   1. All work specified in this Section is governed by the Common Work Results for Plumbing Section 22 0500.
   2. This Section 21 0500 and the accompanying drawings cover the provisions of all labor, equipment, appliances, and materials and performing all operations in connection with the engineering, design and construction of the fire suppression systems as specified herein and as shown.
   3. Attention is called to the different hazards, classes and types of fire suppression systems required within the facility. Systems shall include, but not be limited to the following:
      1. Light hazard
      2. Ordinary hazard
   4. Coordinate the Seismic Design Category with the Structural and Civil Engineers. Provide and install seismic supports are required.
   5. The work included under this Section 21 0500 shall include, but is not limited to, the following:
      1. Risers including all check valves, indicator valves, alarms, etc.
      2. Standpipes, hose connections, hose cabinets and hoses
      3. Siamese connections
      4. Air compressor, nitrogen generator and controls
      5. Piping and sprinkler heads
      6. Hydraulic design computations
      7. Shop drawings and procurement of all approvals
2. STANDARDS AND APPROVALS
   1. The standpipes and sprinkler systems shall be designed and installed in conformance with the applicable standards of NFPA 13, NFPA 14, NFPA 20, NFPA 24, NFPA 72, Underwriters Laboratories (UL), the standards of the Underwriter (IRI/FM/ISO) and local codes.
   2. The hydraulic calculations, standpipes and sprinkler system design, products, materials, and installation shop drawings shall be submitted and approved by the Authority Having Jurisdiction, Owner's Insurance Underwriter, and the Fire Marshal.
   3. The standpipes and sprinkler systems shall be designed and installed by a firm which is duly licensed to install such systems in the State of Georgia and carries a current certificate from the Georgia State Fire Marshal's Office. This specification section and any Fire Protection plans provided are for performance, material, and design intent requirements only. All aspects of the scope shall ultimately be the responsibility of the Designer and Installer.
3. RECORD DRAWINGS
   1. Upon completion of the work, provide record as-built documentation of the fire protection systems as actually installed to the Owner. Drawings shall be to scale, and shall include all details required to accurately indicate the system as installed. Record drawings shall be produced in electronic format compatible with AUTOCAD. Furnish electronic copies of all drawings in dwg. format, and two (2) bond copies of all drawing sheets.
4. IDENTIFICATION
   1. All control, check, drain, test and alarm valves and alarms shall be provided with identification signs of the standard design as adopted by the sprinkler industry and as recommended for the particular services. The signs shall be securely attached to each piece of equipment.
5. HOSE THREADS
   1. Hose threads shall conform to the standards of the local Fire Department. The exact threads used shall be verified with the Fire Department before ordering materials.
6. FIRESTOPS
   1. Where piping, conduit, etc. pass through fire partitions, fire walls and floors, a firestop shall be provided that will ensure an effective barrier against the spread of fire, smoke and gases. Firestop material shall be packed tight and completely fill gaps between the ductwork, piping, conduit, etc. and the perimeter of their rough openings.
   2. All penetrations shall be in accordance with UL 1479 or ASTM E 814 listed systems, and products used shall be specifically applicable for the appropriate installation conditions. Assemblies shall provide a minimum rating equal to the construction penetrated. Products shall be by HILTI, 3M, or ProSet.
   3. Installation shall be by a Qualified Installer. Installer shall be certified, licensed, or otherwise qualified by the Firestopping Manufacturer as having the necessary training to install the Manufacturer’s specific product. A Manufacturer or Vendor’s willingness to sell the firestopping product to the Contractor or Installer does not in itself confer qualification.
   4. Installer shall have at least one of the following qualifications:
      1. FM 4991 Approved Contractor
      2. UL Approved Contractor
      3. HILTI, 3M, or ProSet Accredited Fire Stop Specialty Contractor
   5. Installing Firm shall have no less than 3 years of experience with firestop installation.
   6. A Manufacturer’s direct Representative (not Distributor or Agent) shall be on site during initial installation of firestop systems to train appropriate Contractor personnel in proper selection and installation procedures.
   7. The Firestop Contractor or Installer shall supply As-Built documentation of each individual penetration location on the project. Documentation shall include a sequential location number, detailed description of the penetration location, size, and type, tested system number, type of assembly penetrated, and rating to be achieved. As-Built documentation shall be included with the close-out materials.
   8. Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach label permanently on both sides of penetrated construction in a visible location. The label shall include the following:
      1. The words “Warning – Through Penetration Firestop System-Do Not Disturb”
      2. Through Penetration firestop system designation and Manufacturer
      3. Date of Installation

**PART 2 PRODUCTS**

1. MINIMUM QUALITY LEVEL
   1. All equipment and materials provided under this Section 21 0500 shall be new and of the best grade commercial quality, shall be of the latest design of the Manufacturer, and shall be listed and approved by UL and the Underwriter. Materials and equipment manufactured outside of the United States will not be acceptable. All components shall be suitable for the pressures indicated on the flow test.
2. FIRE PUMP AND ACCESSORIES
   1. The fire pump, jockey pump, controllers, automatic transfer switch and all associated accessories shall be provided in accordance with NFPA 20 for a full and complete package. The fire pump and accessories shall be as manufactured by Peerless, Patterson, Fairbanks-Morse, Firetrol, or an approved equal. Fire pump shall be horizontal split-case type. The controller/starter shall be wye-delta, closed transition type or shall have a digital solid-state soft starter.
   2. Fire pump, fire pump controller, jockey pump, and jockey pump controller shall be factory pre-piped and wired per all requirements of NFPA 20. Sensory lines will be piped to controllers and all wiring shall be complete from the controllers to the motors. A line size bypass with valves shall be provided, as well as a test loop with Venturi flow sensor with meter. Entire package shall require only suction and discharge piping connection and electrical power connections to fire jockey pump controller. Entire package shall be rated and hydrostatically tested to 300 psig.
   3. A listed surge protection device shall be installed in or on the fire pump controller in accordance with the current edition of the National Electric Code. Provide a Type I surge protection device per the current edition of UL 1449; Current Technologies SL3 Series or approved equal. The unit’s withstand rating shall be coordinated with Division 26 and shall comply with all UL 96A requirements for surge protection.
3. AIR COMPRESSOR AND TRIM
   1. Air compressor shall be a Reliable Model A, minimum ¾ HP. All trim, such as, but not limited to, the following shall also be provided to accomplish a dry-pipe installation:
      1. Air maintenance device
      2. Dry pipe valve
      3. Automatic controls
4. VALVES
   1. All fittings shall be products of a domestic Manufacturer and made in the USA.
   2. Materials shall be as follows:
      1. Valves 2" and smaller: Bronze body
      2. Valves over 2": Iron body with bronze trim
   3. Connections shall be as follows:
      1. Valves 4" and smaller: Threaded or flanged
      2. Valves over 4": Flanged
   4. Gate valves shall be double seat; type as follows:
      1. Valves 2" and smaller: Rising stem type, except where space requires non-rising stem, solid wedge with union bonnet and replaceable seat rings
      2. Valves over 2": Outside screw and yoke type with solid wedge and replaceable seat rings
   5. Butterfly valves shall have bronze or ductile iron discs, stainless steel shaft and lock bolts, Buna N liner and as follows:
      1. Valves through 6": Full lug type with wheel operators
      2. Valves over 6": Full lug type, gear operators
   6. Fire Department Connections (FDC) shall be 2 1/2" screwed, UL approved, brass hose valves for working pressure of 175 psig with 2 1/2" male hose threads, 1 1/2" removable reducer, polished brass cap and chain. FDC shall be sized per applicable NFPA. Contractor shall confirm this meets the local Fire Department requirements. Labeling shall be in accordance with local Fire Department requirements.
   7. Provide and install Test Headers of quantity, location, and type as required by the local Fire Department and AHJ.
   8. Swing checks shall be gravity operated with renewable composition discs. Wafer checks shall have renewable clapper facings and non-stick coated clappers, valve shall be approved for both horizontal and vertical installation.
   9. All valves shall comply with requirements of NFPA and shall be Underwriters' Laboratories, Inc. (UL) listed.
   10. Working pressure of all valves shall be minimum 300 psig at 70°F water temperature.
   11. All valves utilized for shut-off service shall be lockable in the open position.
   12. Alarm valves shall have electrical circuit closers.
5. ROOF MANIFOLDS
   1. Roof manifolds shall be Y-type, 4" x 2 1/2" x 2 1/2"; brass construction complete with caps and chains. Contractor shall confirm connections with the local Fire Department and AHJ.
6. DRAINS
   1. Drains shall be provided in all risers and auxiliary drains at all low points in the system. Inspector's test drains shall be installed on each sprinkler system.
   2. Pipe the main drain and test lines full size to the outside. Do not spill on walkways. Branch drain lines that are expected to be seldom used may be provided with standard size hose end connections if allowed by the local Fire Department and the AHJ.
   3. Pipe small drips and drains to the outside of the building or to an indirect drain within the building.
7. WATER FLOW SWITCHES
   1. Water flow switches with normally closed electrical contacts shall be provided in all required locations to open the electrical contacts at any time water flows in the associated riser or zone piping system.
8. TAMPER SWITCHES
   1. Tamper switches with normally closed electrical contacts shall be provided in all required locations to open the electrical contacts at any time the associated valve is not fully open.
9. ALARM SYSTEM
   1. Provide a supervised sprinkler alarm system to be tied into an approved remote location with adequate monitoring equipment. Make all provisions for an automatic dialing system and communication system to alert the local fire department. Connection and leased line shall be provided by Owner.
10. SPRINKLER HEADS
    1. All sprinkler heads shall be automatic, closed-type, quick-response, standard spray heads.
    2. Sprinkler Heads in Ceilings
       1. All areas with suspended ceilings, except specialty ceilings, shall have heads equal to Reliable Model G, semi-recessed type. Finish shall be as selected by the Architect.
       2. All public areas shall be provided with concealed, fully recessed heads. Finish shall be as selected by the Architect.
       3. All hard and specialty ceiling areas, including metal panel and plank ceilings, shall be provided with concealed, fully recessed heads. Cover finish shall be as selected by the Architect. Finish shall be by the Manufacturer and be incorporated in the manufacturing facility.
    3. Sprinkler heads installed in storage, utility, mechanical equipment rooms and similar “back-of-house” areas without ceilings shall be bronze heads in the upright position unless otherwise noted.
    4. Areas subject to freezing conditions with heated spaces above or adjacent to them shall be provided with dry sprinkler heads. Seal all penetrations and provide wet sprinkler piping inside the heated space with insulation.
    5. The temperature rating of the sprinkler heads shall be in accordance with applicable code and the recommendations of the Underwriter. Specific attention is called to sprinkler heads within cooking areas, generator rooms, or other areas with temperature levels over 120°F expected.
    6. Sprinkler guards shall be provided for all heads within seven feet of the floor, in mechanical, electrical and storage rooms, and elsewhere as required by the Underwriter.
    7. Provide to the Owner a cabinet containing two (2) head wrenches and a minimum of six (6) spare heads of each type and temperature rating used in the systems.
    8. All heads installed in areas with tile ceilings shall have the heads centered in the tile.
11. PIPING
    1. All piping shall be products of a domestic Manufacturer and made in the USA.
    2. Piping shall be Schedule 40 black steel, grade A53 or A120; except that Schedule 10 piping is acceptable on pipe sizes 2 1/2” and larger where permitted by the applicable codes and standards. Schedule 10 piping shall not be threaded in the field, nor shall be cut-grooved in the field or by a Manufacturer. Couplings and fittings shall be threaded or grooved, Viking, Victaulic, or approved equal.
    3. The use of light-wall threaded pipe such as Allied XL is prohibited.
    4. When specifically approved by the Engineer and allowed by the Fire Marshal, and AHJ, piping and fittings shall be CPVC and comply with NFPA 13R, 13D, and 13. Piping shall be Schedule 40 up to 12”, UL Listed and FM Approved for fire protection use, and shall comply with ASTM F 442. CPVC piping and fittings in return air plenums shall be ICC certified. When CPVC materials are used, the Construction Team shall be responsible for the compliance with all compatibility issues. CPVC fittings shall be UL Listed and FM Approved and joined in accordance with the listings of the pipe and fittings. Cure times shall be in accordance with manufacturer’s recommendations but not less than 24 hours. CPVC piping shall only be used in system locations that do not exceed its listed maximum pressure and temperature.
       1. Any piping or fittings that contacts non-compatible materials shall be replaced with new.
       2. Manufacturer’s material compatibility requirements or recommendations shall be posted on CPVC products in not less than 100’ intervals during construction. In addition, Manufacturer’s compatibility requirements shall be permanently posted in the fire service entrance, backflow preventer location, and all mechanical and utility rooms or closets as applicable, and at any transition from metal to CPVC piping. Coordinate postings with Owner.
    5. At the Contractor’s option, individual drops to sprinkler heads may be flexible corrugated stainless steel hose with stainless steel braid, approved by both Factory Mutual and UL. Flexible hose shall be secured above the ceiling with galvanized sheetmetal brackets and clamps. Flexible hose, brackets and clamp shall be as manufactured by Flexhead Industries, Inc. or an approved equal.
    6. Underground sprinkler entrance piping shall be Class 150 ductile iron pipe with mechanical joints. Underground piping shall have thrust blocks at changes in direction.
12. PIPE HANGERS AND SUPPORTS
    1. Provide all necessary hangers, supports, bracing, accessories, etc., as required for proper installation of the work, and only approved type hangers shall be used. All sprinkler piping shall be supported from building structure; sprinkler lines under ducts shall not be supported from ductwork but shall be supported from building structure with trapeze hangers where necessary.
    2. Sprinkler piping 4” and larger shall have lateral supports at all elbows and changes of direction. Lateral supports shall be capable of restraining the pipe due to thermal expansion and the hydraulic forces of design water flow.
    3. At a minimum, sprinkler piping supports shall be at intervals defined by code.
    4. Piping supported from floors shall be provided with steel support bases.
13. ESCUTCHEONS
    1. Each penetration through walls and ceilings shall be equipped with a escutcheon, finish to be selected by the Architect, at the point the pipe passes through the wall or ceiling.

**PART 3 EXECUTION**

1. DESIGN AND INSTALLATION
   1. The design and installation of the fire suppression systems shall be based on the hazards and classes required by the occupancies indicated.
   2. Underground piping shall be provided with a minimum of 3'-0" of ground cover or below the frost line, whichever is deeper. Concrete thrust blocks shall be provided at all changes of direction. Provide restraining rods at all mechanical joints.
   3. Dry pipe sprinkler systems shall be nitrogen filled. Provide and furnish nitrogen to be located in the dry valve room.
   4. All materials and equipment shall be listed according to Landmark’s Construction Appendix A – Product Selection.
2. CLEANING, LUBRICATION AND ADJUSTMENT
   1. The exterior surfaces of all equipment, piping, conduit, etc., shall be cleaned and free of all dirt, grease, oil, paint splatter, and other construction debris.
   2. Bearings that require lubrication shall be lubricated in strict accordance with the manufacturer’s recommendations.
   3. All control equipment, valves, equipment settings, pressure tanks, etc. shall be adjusted to the settings required for the performance specified.
   4. All materials, equipment, etc. subject to weather, corrosion, dust, debris, water etc. to be installed or utilized for the project shall be fully protected. This is inclusive of piping and duct openings and internal fan ventilation intakes and discharges. This Division’s scope includes protection and remediation of any and all Division materials, etc. including cleaning, vacuuming, dusting, etc. required for a clean system and operation. Insulation and equipment with electrical connections subject to water shall be replaced in their entirety. Coordinate with all other trades and schedules.
3. PAINTING
   1. Steel items exposed outside the building, such as equipment supports, uninsulated piping and hangers, which are not factory painted or galvanized, shall be cleaned and painted with one coat of rust inhibiting primer and two coats of asphaltic base aluminum paint. Insulated steel pipes outside the building shall be cleaned and painted with one coat of rust inhibiting primer before installing insulation.
   2. Items in exposed ceiling areas shall be painted a color in coordination with the Architect as allowed by code.
4. SUBMITTALS
   1. Before preparing submittals, study all Contract Drawings and specifications in detail, obtain manufacturer's recommended instructions, and have submittals prepared based on specific equipment and material proposed for installation. An officer of the contracting firm shall sign all shop drawings (certifying conformance with plans and specifications) before submitting to the Architect or releasing to the field.
   2. The submittal process shall not be utilized as an avenue to substitute products after the execution of the contract. Should an unspecified or unequal product be submitted, it will be rejected. If a second attempt at substitution is made during the resubmittal of the same product, then no more reviews of that product will be performed without direct compensation to the Engineer being paid for the additional services required for the third review and any further reviews.
   3. All submittals shall be submitted and returned electronically.
   4. Submittals will not be accepted for review unless they:
      1. Comply with the requirements of Division 1.
      2. Include complete information pertaining to all appurtenances and accessories.
      3. Are submitted as complete packages which pertain to all related items in Division 21. Separate packages shall be submitted as follows:
         1. All fire protection equipment, piping, specialties, and components
      4. Are properly marked with equipment, service or function identification as related to the project and are marked with pertinent specification paragraph number.
   5. Submit catalog information, factory assembly drawings, field installation drawings and certifications as required for complete explanation and description of all items of equipment. The submittal data shall provide ample, unquestionable compliance with the Contract Documents.
   6. Review of submittals shall not be construed as authorizing any deviations from the plans and specifications unless such deviations are clearly identified and separately submitted in the form of a letter that is enclosed with the submittals.
   7. Submittals are required on all manufactured equipment, especially energy consuming equipment. Submittals shall include, but are not limited to, the following items of equipment:
      1. Piping and Piping Specialties
      2. Sprinkler Heads
      3. Piping Shop Drawings
      4. Hydraulic Calculations
      5. \*\*Fire Pump, Jockey Pump, and Controllers
      6. \*\*Air Compressor/Nitrogen Generator
5. BIM AND COLLISION DETECTION
   1. The Contractor shall utilize 3D modeling for coordination and collision / interference detection software simulation. This model will be used for coordination, collision detection and inference from all trades: mechanical, plumbing, electrical, fire protection, etc. Each SubContractor is responsible for preparation of a 3D/BIM model of their system for Contractor collision detection and coordination. This model shall be used for As-Built documentation for the Owner. Contractor 3D Model shall be latest version of Revit, Navisworks, or equal. BIM shall abide by the space priority requirements in this Division.
   2. Upon completion of the BIM Model, provide the Engineer a full set of shop drawings for their review. Shop drawings shall meet the below requirements.
6. SHOP DRAWINGS
   1. Shop drawings per the submittal requirements shall be submit to the Design Team with adequate time for multiple rounds of review. Shop drawings shall show “As-Built” conditions including elevations, offsets, transitions, and accessories. Shop drawings shall indicate all code and manufacturer’s recommended clearances, access, and coordinate the clearance and access requirements with all other trades.
   2. Shop drawings that use keynotes direct from the Design Documents shall not be acceptable as they do not demonstrate coordinate with all other trades, necessary transitions, etc.
   3. Shop drawings shall be provided as complete packages in parallel with all trades to document coordination. Floor-by-floor or otherwise piecemeal shop drawings are generally not acceptable.
7. FLUSHING
   1. All underground lines, before connecting to the sprinkler systems, shall be flushed thoroughly in accordance with NFPA procedures.
8. TESTING
   1. The entire sprinkler system shall be tested at not less than 200 psi for not less than 2 hours. The 300 psi sections shall be tested at not less than 300 psi for not less than 2 hours. All leaks discovered shall be repaired by tightening, replacing or re-working the leaking component or joint. Caulking or similar is not permitted.
9. WARRANTY
   1. All work provided under this Division 21 shall be subject to a minimum one year warranty. The warranty shall include prompt repair or replacement of equipment or system failures and shall include all parts and labor. In addition, all compressors shall carry an additional four year parts-only warranty. Extended warranties shall be provided on all other equipment so specified in other Sections.

**END OF SECTION**