
PROJECT: North 1-25 Port of Entry
Fort Collins, Colorado
RS&H Project No. 124-812-0007

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Not Used

NOT FOR CONSTRUCTION

SECTION 13000 – METAL BUILDING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Design, fabricate and erect the metal building, including
 - a. Structural steel main building frames
 - b. Secondary framing including purlins and girts
 - c. Roof and wall panels and trims
 - d. Gutter and downspouts
 - e. Overhangs
 - f. Walk doors and windows
 - g. Roof ventilators
 - h. Translucent panels
 - i. Insulation

1.02 RELATED SECTIONS

1.03 REFERENCES

- A. AISI S100-16 – North American Specification for the Design of Cold-Formed Steel Structural Members - 2016 Edition
- B. ANSI/AISC 360-16 – Specification for Structural Steel Buildings, 15th Edition, and Steel Design Guide Series 3 – Serviceability Design Considerations for Low-Rise Building – second edition 2003
- C. ASCE/SEI 7-16 – Minimum Design Loads and Associated Criteria for Buildings and Other Structures
- D. ASTM A36 – Specification for Carbon Structural Steel
- E. ASTM A53 – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
- F. ASTM A475 – Specification for Zinc Coated Steel Wire Strand
- G. ASTM A500 – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
- H. ASTM A529 – Specification for High-Strength Carbon-Manganese Steel of Structural Quality
- I. ASTM A572 – Specification for High-Strength Low-Alloy Columbium-Vanadium Steel
- J. ASTM A792 – Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot Dip Process
- K. ASTM A992 – Specification for Structural Steel Shapes
- L. ASTM A1011 SS or ASTM A1011HSLAS – Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
- M. ASTM D1494 – Test Method for Diffuse Light Transmission Factor of Reinforced Plastic Panels
- N. ASTM D2244 – Practice for Calculation of Color Differences from Instrumentally Measured Color Coordinates

- O. ASTM D4214 – Test Method for Evaluating the Degree of Chalking of Exterior Paint Films
- P. ASTM E84 – Test Method for Surface Burning Characteristics of Building Materials
- Q. ASTM E283 – Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
- R. ASTM E331 – Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain Walls by Uniform Static Air Pressure Difference
- S. ASTM E1592 – Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference
- T. ASTM E1646 – Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference
- U. ASTM E1680 – Test Method for Rate of Air Leakage through Exterior Metal Roof Panel Systems
- V. ASTM F1554 – Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength
- W. ASTM F3125 – Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi and 150 ksi Minimum Tensile Strength, Inch and Metric Dimensions
- X. AWS A2.4 – Standard Welding Symbols
- Y. AWS D1.1 – Structural Welding Code - Steel
- Z. AWS D1.3 – Structural Welding Code - Sheet Steel
- AA. FM4471 – Factory Mutual Research Corporation Standard 4471 Class 1
- BB. IAS – International Accreditation Service, Inc.
- CC. MBMA Metal Building Systems Manual – 2018 Edition
- DD. NAIMA 202 – Standard for Flexible Fiberglass Insulation Systems in Metal Buildings
- EE. RCSC – Research Council on Structural Connections, Specification for Structural Joints Using High-Strength Bolts
- FF. SSPC-SP2 – Steel Structures Painting Council, Surface Preparation Specification No. 2, Hand Tool Cleaning
- GG. UL 580 – Underwriters Laboratory -Tests for Uplift Resistance of Roof Assemblies
- HH. UL 790 – Underwriters Laboratory – Test Methods for Fire Tests of Roof Coverings
- II. UL 2218 Underwriters Laboratory – Impact Resistance of Prepared Roof Covering Material

1.04 SYSTEM DESCRIPTION

The building shall include all primary and secondary structural framing members, connection bolts, roof and wall covering, trim, fasteners, closures, sealer, canopies, roof extensions, windows, doors, skylights, insulation, gutters, downspouts, louvers, ventilators and other miscellaneous items as stated in the specifications and/or shown or called for on the drawings.

- A. Primary framing shall consist of transverse rigid frames of rafters and columns with solid webs. The rigid frame shall be fabricated of shop-welded steel plate and designed for erection by field bolting. Frames shall be:
 - a. clear span or modular with intermediate columns
 - b. gabled or single sloped
 - c. with tapered or uniform depth exterior columns.

- B. Secondary framing shall consist of purlins, girts, eave struts, flange braces and sag angles as required by design.
- C. Horizontal loads not resisted by main frame action shall be resisted by
 - a. standard rod x-bracing in the roof
 - b. standard rod x-bracing, rigid portal frames, or shear wall by others in the sidewalls
 - c. panel diaphragm, standard rod x-bracing, rigid portal frames, or shear wall by others in the endwalls
- D. Roof and Wall System consists of preformed steel panels, trim, and accessories as required for a complete installation.
- E. Building overall dimensions, bay spacing, post spacing, eave height, clear dimensions and roof pitch shall be as indicated on the drawings and as defined here.
 - a. The building "Width" shall be the measurement from outside face to outside face of the sidewall girts.
 - b. The building "Length" shall be the measurement from outside face to outside face of the endwall girts.
 - c. "Eave" to be determined as the line along the sidewall formed by the intersection of the planes of the roof and sidewall.
 - d. "Eave Height" is defined as the vertical dimensions as measured from the finished floor to the intersection of the planes of the roof and sidewall.
 - e. The "Bay Spacing" shall be the distance between the centerlines of frames for interior bays and the distance from the outside face of endwall girt to the centerline of the adjacent interior frame for end bays.
 - f. The "Module Spacing" shall be measured between the centerlines of interior columns for interior modules and the distance from the outside face of sidewall girts to the centerline of the adjacent interior column
 - g. "Roof Pitch" shall be the inches of vertical rise per inches of horizontal run, expressed as inches of rise per 12 inches of run.

1.05 DESIGN REQUIREMENTS

- A. Design primary and secondary structural members and exterior covering materials for applicable load and combinations of loads in accordance with the specified building code. Design loads shall be combined to produce maximum stresses within the structure in accordance with the specified building code.
- B. The design loads plus Dead Load shall be used in the structure design.
 - a. Roof Live Load shall be applied on the horizontal projection of the roof. Live Load reduction shall be applied according to the specified building code.
 - b. Wind Load shall be applied as pressure and suction in accordance with the specified building code.
 - c. The Ground Snow Load shall be used with the exposure factor, thermal factor, slope factor and importance factor to determine the Roof Snow Load.
 - d. The Roof Snow Load shall be applied on the horizontal projection of the roof.
 - e. The metal building system shall be designed for drifting and/or sliding snow conditions if required based on the specified building code and project features.
 - f. Collateral loads shall be those other than the basic design loads for which the building must be adequately designed. Loads of this type include, but shall not be limited to, suspended ceilings, sprinkler, electrical or mechanical systems, or any suspended or roof mounted HVAC units.
- C. The building components shall be designed to the following minimum deflection requirements, unless a specific deflection is required by the building code. Deflection based on wind shall be based on a 10-year map.

- | | |
|---|-----------|
| a. Rafter and purlins without ceiling under Snow Load, Wind Load, or Live Load | *L / 180 |
| b. Rafter and purlins with non-plaster ceiling under Snow Load, Wind Load, or Live Load | L / 240 |
| c. Rafter and purlins supporting plaster ceiling under Snow Load, Wind Load, or Live Load | L / 360 |
| d. Frame sidesway with metal walls under 10-year wind load | EH / 60 |
| e. Frame sidesway with brittle wall material under 10-year wind load | **H / 240 |
| f. Girts with metal wall panel under 10-year wind load | L / 90 |
| g. Girts supporting brittle wall material under 10-year wind load | L / 240 |
| h. Roof panel under Dead Load + Live Load | L / 60 |
| i. Wall panel under 10-year wind load | L / 60 |

* Live Load L / 150 supporting metal roof

** Brittle finish walls must be designed with hinge at the base unless noted otherwise

1.06 SUBMITTALS

- A. Erection Drawings including:
 - a. Anchor rod setting plan, base plate details and column reactions
 - b. Roof framing plan
 - c. Wall framing elevations
 - d. Transverse cross sections
 - e. Panel layout
 - f. Exact location of factory located openings
 - g. Approximate location of field located openings
 - h. Framing details
 - i. Flashing details
 - j. Accessory details
- B. Design calculations, stamped by a Professional Engineer registered in the state where building will be erected, including:
 - a. Summary of primary and secondary framing member and their connections
 - b. Details and additional calculations as appropriate for special conditions
- C. Letter of Certification, prepared and signed by a Professional Engineer, confirming that building design meets indicated loading requirements and specified building code.

1.07 QUALIFICATIONS

- A. The company manufacturing the products specified in this Section shall:
 - a. be a member of MBMA

- b. be in compliance with the International Accreditation Service, Inc., Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems (IAS AC472)
- c. have a minimum of 20 years' experience in the manufacturing of steel building systems
- d. have obtained a Notice of Acceptance (NOA) from the State of Florida
- e. have obtained a Notice of Acceptance (NOA) from the Miami-Dade County in the State of Florida
- B. Acceptable Manufacturers
 - a. CHIEF Buildings
- C. Erector's Qualifications
 - a. Minimum of 5 years' experience in this or similar trade
 - b. Five similar installation references in the past 3 years

1.08 WARRANTY

- A. The metal building manufacturer shall warrant for 5 years that components were free from defects in composition of material and workmanship and in accordance with industry standard for such components.
- B. The exterior polyvinylidene fluoride (PVDF) color finish of factory coated roof panels shall be warranted by the metal building manufacturer for 35 years against peeling, cracking, checking, and flaking. The panel shall not color change more than 5 NBS units as per ASTM D2244. Chalking shall not exceed a number 8 rating when measured per ASTM D 4214, method A.
- C. The exterior polyvinylidene fluoride (PVDF) color finish of factory coated wall panels shall be warranted by the metal building manufacturer for 35 years against peeling, cracking, checking, and flaking. The panel shall not color change more than 5 NBS units as per ASTM D 2244. Chalking shall not exceed a number 8 rating when measured per ASTM D 4214, method A.
- D. Provide the owner with a copy of all warranties.

PART 2 - PRODUCTS

2.01 MATERIALS – STRUCTURAL FRAMING

- A. General
 - a. Structural steel members shall be sheared, plasma cut, formed, punched, welded and painted in the plant of the manufacturer. All shop connections shall be welded in accordance with AWS D1.1 "Structural Welding Code for Steel".
 - b. All structural framing members shall be prepared according to SSPC-SP2 and given one shop coat of KMAA148: "VectroCoat 300 Gray" modified acrylic paint applied by Anodic Electrocoat process.
 - c. All framing members shall carry an easily visible identifying mark to aid the erector in the erection of the building.
 - d. Field connections shall be bolted with high strength bolts and nuts.
- B. Primary Structural Members
 - a. The primary structural members shall be rigid framing manufactured of solid web members having tapered or uniform depth rafters rigidly connected to tapered or uniform depth columns.

- b. Steel used to fabricate built up framing members shall be 50,000 PSI minimum yield material and shall conform to the physical characteristics of ASTM A1011, ASTM A572 or ASTM A529.
 - c. Steel used for interior pipe columns, if required, shall be 35,000 PSI minimum yield material.
 - d. The building manufacturer shall have on file certified mill test reports that verify that these requirements have been met.
- C. Secondary Structural Members
- a. Secondary structural framing shall distribute the loads to the primary structural system and shall include endwall columns and rafters, purlins, girts, eave struts, base support, headers, jambs, flange bracing, clips, and other miscellaneous structural framing.
 - b. Steel used for cold-formed members shall be 55,000 PSI minimum yield material and shall conform to the physical characteristics of ASTM A1011 Grade 55.
 - c. Light gauge cold-formed sections shall be manufactured by precision roll or brake forming. All dimensions shall be true, and the formed member shall be free of fluting, buckling or waviness.
 - d. Endwall rafters shall be manufactured from built-up sections of adequate size and thickness as determined by the design criteria.
 - e. Endwall columns shall consist of built-up sections or cold formed "C" sections of adequate size and thickness as determined by the design criteria.
 - f. Purlins and girts shall be precision roll-formed 8" or 10" deep "C" sections or "Z" sections of adequate size and thickness as determined by the design criteria, minimum 16 gauge. Purlins and girts shall be either simple span or continuous span members.
 - g. Eave struts shall be precision roll-formed and/or press brake formed "C" sections, minimum 14 gauge. The upper flange shall slope with the normal roof slope, and the web shall be vertical and free to receive the sidewall covering.
 - h. Base support shall consist of a continuous base angle, base "C", or an 18 gauge one-piece base member to which the base of the wall covering shall be attached. The base support shall be securely fastened into the concrete by the erector.
 - i. Headers and jambs shall be precision roll-formed "C" sections of the same depth as the girts.
 - j. Flange bracing shall consist of angle members connected to the web of the purlin or girt and to the inside/bottom flange of the primary structural member.
 - k. Clips shall be fabricated from 55,000 PSI minimum yield material and be factory punched for field bolted connections.
- D. Bracing
- a. Horizontal load resisting bracing shall be accomplished by diagonal rod bracing, portal frames, and/or diaphragm action of the roof and wall covering.
 - b. Rod bracing shall be fabricated from minimum 5/8" diameter steel rod conforming to the provisions of ASTM A36.
 - c. Portal frames shall be fabricated of built-up sections and conform to the same specifications as primary framing.

2.02 MATERIALS – ROOF SYSTEM

Roof panel shall be one of the following types.

- A. Standing seam roof system
- a. Roll formed profile shall be MSC (Mechanically Seamed Construction) as manufactured by CHIEF Buildings. Panels shall have an interlocking seam 3" deep spaced at 24" or 18" on center, with minor ribs between major ribs. Each panel shall provide a net coverage width of 24" or 18".
 - b. High ribs shall be sealed with factory-applied hot melt mastic. The side laps shall be field seamed using a mechanical seaming device provided by the manufacturer.
 - c. Panels shall be manufactured from 24 gauge ~~or 22 gauge~~, 50,000 PSI minimum yield material.
 - d. The MSC roof system shall have concealed clips. Clips shall be floating (sliding) to allow for thermal movement.
 - e. Panels shall be one piece without splices for lengths less than 52'-0". Roof panel splices, if required, shall have tape mastic sandwiched between the top and bottom panel at the endlap with a rigid metal backer plate.
 - f. Roof panel assemblies shall have a UL Class 90 uplift rating in accordance with UL 580 "Tests for Uplift Resistance of Roof Assemblies".
 - g. Roof panel assemblies shall have a UL Class A Fire Rating in accordance with UL 790 "Test Methods for Fire Tests of Roof Coverings".
 - h. Roof panel assemblies shall have a UL Class 4 Impact Rating in accordance with UL 2218 "Impact Resistance of Prepared Roof Covering Material".
 - i. Roof system must have been tested according to the procedures in ASTM E 1592 (structural performance by uniform static air pressure differential).
 - j. Roof panel assemblies shall have permanent resistance to air leakage through assembly of not more than 0.008 cfm/sf of fixed roof area when tested according to ASTM E1680 at a static pressure differential of 6.25 psf.
 - k. Roof panel assemblies shall have no water penetration as defined in the test method when tested according to ASTM E1646 at a static pressure differential of 12.0 psf.
 - l. Panels shall be reversible end for end and no field notching shall be required.
- OR
- n. Substrate shall be Galvalume® AZ50 coating in accordance with ASTM A792. Panels shall be coated with a fluoropolymer topcoat containing not less than 70% polyvinylidene fluoride (PVDF) over primer with total DFT of 0.8 – 1.0. The reverse side shall be coated with pigmented polyester. Exterior color to be selected from Chief standard color choices.

2.02 MATERIALS – WALL SYSTEMS

- A. Exterior wall panel
 - a. Roll formed profile shall be CS (Chief Standard) or AP (Architectural Panel) configuration as manufactured by CHIEF Buildings. Panels shall have 1 1/8" deep major ribs spaced at 12" on center, with minor ribs between major ribs. Each panel shall provide a net coverage width of 36".
 - b. Manufactured from 26 gauge ~~or 24 gauge~~, 50,000 PSI minimum yield material.
 - c. Wall panel assemblies (when installed with mastic in the walls) shall have permanent resistance to air leakage through assembly of not more than 0.006 cfm/sf of fixed wall area when tested according to ASTM E283 at a static pressure differential of 6.24 psf.
 - d. Wall panel assemblies (when installed with mastic in the walls) shall have no water penetration as defined in the test method when tested according to ASTM E331 at a static pressure differential of 12.0 psf
 - e. Substrate shall be Galvalume® AZ50 coating in accordance with ASTM A792.
 - f. Panels shall be coated with a fluoropolymer topcoat containing not less than 70% polyvinylidene fluoride (PVDF) over primer with total DFT of 0.8 – 1.0. The reverse side shall be coated with pigmented polyester. Exterior color to be selected from Chief standard color choices.

2.03 MATERIALS – SOFFIT

- A. Soffit Panel
 - a. Roll formed profile shall be FSP-12 (Flat Soffit Panel) configuration as manufactured by CHIEF Buildings. Panels shall attach to framing members using concealed fasteners. Each panel shall provide a net coverage width of 12" and have one stiffening rib.
 - b. Panels shall be manufactured from 24 gauge, 50,000 PSI minimum yield material.
 - c. Substrate shall be Galvalume® AZ50 coating in accordance with ASTM A792.
 - d. Panels shall be coated with a fluoropolymer topcoat containing not less than 70% polyvinylidene fluoride (PVDF) over primer with total DFT of 0.8 – 1.0. The reverse side shall be coated with pigmented polyester. Exterior color shall be Polar White.

OR

2.04 MATERIALS – TRIM

- A. Trim shall be 26 gauge with a fluoropolymer topcoat containing not less than 70% polyvinylidene fluoride (PVDF) typical to wall panels. The reverse side shall be

coated with pigmented polyester. Exterior color to be selected from Chief standard color choices.

OR

- B. Provide all trim pieces necessary to achieve a finished appearance. Gable trim and eave trim or gutter shall have a roll formed face to maintain uniformity. Provide corner boxes to transition from gable trim to eave trim or gutter. Gutter, if required, shall have a horizontal bottom leg and the front leg shall not project above the bottom of roof panel.
- C. Provide trim at all corners of the building and for all sides of framed openings. Provide trim for base of building if required.
- D. Downspouts, if required, shall be 26 gauge with a fluoropolymer finish and shall have a minimum cross sectional area of 15.85 square inches. Downspouts shall terminate with an elbow at approximately 75° or transition to an underground drainage system.

2.10 ACCESSORIES

- A. Fasteners to be manufacturer's standard long life fasteners. Exposed fastener heads to be factory painted to match the panel color. Pop rivets shall be used at end laps of eave and gable trims.
- B. Closed cell foam closure strips, die cut to match panel configuration, shall be used with CS or AP panel. Metal closures shall be used with STC/MS and MVF/ MVP panel.
- C. Mastic for roof side laps, end laps, and flashings to be a non-hardening butyl tape, non-corrosive to the substrate, of 100% solids. Tape size to be minimum 3/32" x 3/4", supplied in rolls.
- D. Caulk shall be manufacturer's standard product as appropriate for the application.
- E. Thermal blocks of expanded polystyrene shall be supplied with standing seam roof systems when required for the requested insulation thickness. The thickness of the thermal block shall be compatible with the clip height and insulation thickness.
- F. Roof curbs shall be used at all roof penetrations except pipes 13" diameter and less. Roof curb shall have a structural sub-frame. Curb and sub-frame shall be designed to support the weight of the unit. Curb shall be designed specifically for the model number of the roof top unit. Curb shall be supplied with rib covers and all necessary fasteners and mastic for a weathertight installation. The roof curb shall be a two-piece floating curb when required by building conditions.
- G. Roof Jacks shall be used at all 13" diameter and less pipes that penetrate the roof. Roof jacks shall be EPDM with a flexible aluminum base to form a weathertight seal at the roof panel.

2.11 FABRICATION

- A. Fabricate built-up members in accordance with MBMA Low Rise Building Systems Manual, Common Industry Practices.
- B. Fabricate hot rolled members in accordance with AISC Specification for pipe, tube, and rolled structural shapes.
- C. Fabricate cold formed members in accordance with MBMA Low Rise Building Systems Manual, Common Industry Practices.

- D. Provide factory drilled or punched framing members for field bolted connections.
- E. All framing members shall be prepared according to SSPC-SP2 and given one shop coat of KMAA148: "VectroCoat 300 Gray" modified acrylic paint applied by Anodic Electrocoat process.
- F. Clearly and legibly, mark each piece to correspond with previously prepared erection drawings.

PART 3 - EXECUTION

3.01 ERECTION – FRAMING

- A. Erect framing in accordance with MBMA Low Rise Building Systems Manual, Common Industry Practices.
- B. The erector shall furnish temporary guys and bracing where needed for squaring, plumbing, and securing the structural framing against loads, such as wind loads acting on the exposed framing and seismic forces, as well as loads due to erection equipment and erection operation, but not including loads resulting from the performance of work by others. Bracing furnished by the manufacturer for the metal building system cannot be assumed adequate during erection. The temporary guys, braces, falseworks and cribbing are the property of the erector, and the erector shall remove them immediately upon completion of erection.
- C. Do not field cut or alter structural members without approval of the metal building manufacturer.
- D. After erection, prime welds, abrasions, and surfaces not shop primed.

3.02 ERECTION – WALL AND ROOFING SYSTEM

- A. Install in accordance with manufacturer's instructions.
- B. Exercise care when cutting prefinished material to ensure cuttings do not remain on finish surface.
- C. Fasten cladding system to structural supports, aligned level and plumb.

3.03 ERECTION – GUTTER AND DOWNSPOUTS

- A. Install gutters and downspouts in strict accordance with manufacturer's instructions.
- B. Connect downspouts to storm sewer system or install splash pans.

3.04 INSTALLATION – ACCESSORIES

- A. Install accessories in accordance with manufacturer's instructions.
- B. Seal wall and roof accessories weathertight.

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SECTION 211000 - SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Pipes, fittings, and specialties.
2. Specialty valves.
3. Sprinklers.
4. Pressure gages.
5. Seismic Restraints.
6. General Duty Valves.
7. Escutcheons.
8. Sleeves.
9. Backflow Preventers.

- B. Related Requirements:

1. Refer to Plumbing sections for underground piping, metering, and additional requirements.

1.3 DEFINITIONS

- A. Standard-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure of 175-psig maximum.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

- B. Shop Drawings: For sprinkler systems.

1. Include plans, elevations, sections, and attachment details.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Provide combined coordination drawings using input from installers of the other building services in accordance with the Division 23 requirements.
- B. Qualification Data: For qualified Installer and Designer.
- C. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.
- D. Welding certificates.
- E. Seismic Restraint Calculations
- F. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."
- G. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For sprinkler systems and specialties to include in emergency, operation, and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover, and with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler used on Project.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems. Where necessary, base calculations on the water supply as indicated on the drawings.
 - a. Designer Responsibility: Preparation of working plans, calculations, and field test reports by a qualified designer meeting the minimum state requirements.

- B. Welding Qualifications: Qualify procedures and operators according to 2010 ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTIONS

- A. Wet Pipe Sprinkler System: System with automatic sprinklers attached to piping system containing water and connected to water supply so that water discharges immediately from sprinklers when they are opened by fire.

2.2 PERFORMANCE REQUIREMENTS

- A. Sprinkler and standpipe system equipment, specialties, accessories, installation, and testing shall comply with NFPA 13.
- B. Standard-Pressure Piping System Component: All system components shall be listed for 175-psig minimum working pressure.
- C. NFPA 13 Compliance: the system shall comply with NFPA 13 except as modified on the contract drawings. The modifications to NFPA are approved by the fire marshal and summarized as follows:
 - 1. The hydraulic calculations shall include the 2 most remote sprinklers.
 - 2. Components such as flow switches, tamper switches, and fire department connections are not required.
- D. Design: provide working drawings meeting the requirements of NFPA 13, except as noted on the drawings. The drawings shall be developed from the contract drawings and specifications. Provide general configuration, routing, and sizing as indicated and shall be coordinated with all trades and building components. Pipe sizes shall not be reduced from those indicated.
 - 1. Where hydraulic calculations are performed, they shall be based on the water supply as indicated on the drawings.
 - 2. Sprinkler system design shall be approved by authorities having jurisdiction. Provide density, design areas and hazard classifications, as indicated.
 - 3. Maximum Protection Area per Sprinkler:
- E. Seismic Performance: Sprinkler piping shall withstand the effects of earthquake motions determined according to NFPA 13. Refer to structural for design criteria for seismic systems. All components shall be designed and installed per NFPA 13 and/or their listing.
- F. Manufacturers: Subject to compliance with requirements, provide products by one of the following, except where otherwise indicated:
 - a. Globe Fire Sprinkler Corporation

- b. Reliable Automatic Sprinkler Co., Inc.
- c. Tyco Fire & Building Products LP.
- d. Victaulic Company.
- e. Viking Corporation.

2.3 STEEL PIPE AND FITTINGS

- A. Schedule 40, Black-Steel Pipe: ASTM A 53, A 135, or A 795, with wall thickness not less than Schedule 40. Pipe ends may be factory or field formed to match joining method. Joints shall be threaded, welded, or grooved.
- B. Uncoated- Steel Couplings: ASTM A 865, threaded.
- C. Uncoated, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.
- D. Cast-Iron Flanges: ASME 16.1, Class 125.
- E. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.
 1. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick, ASME B16.21, nonmetallic and asbestos free or EPDM rubber gasket.
 - a. Class 125 and Class 250, Cast-Iron, Flat-Face Flanges: Full-face gaskets.
 - b. Class 150 and Class 300, Ductile-Iron or -Steel, Raised-Face Flanges: Ring-type gaskets.
 2. Metal, Pipe-Flange Bolts and Nuts: Carbon steel unless otherwise indicated.
- F. Steel Welding Fittings: ASTM A 234 and ASME B16.9.
 1. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- G. Grooved-Joint, Steel-Pipe Appurtenances:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Anvil International, Inc.
 - b. Tyco Fire & Building Products LP.
 - c. Victaulic Company
 2. Painted Grooved-End Fittings for Steel Piping: ASTM A 47, malleable-iron casting or ASTM A 536, ductile-iron casting, with dimensions matching steel pipe.
 3. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213 rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

2.4 VALVES

- A. Listed in UL's "Fire Protection Equipment Directory" and FM Global's "Approval Guide."
- B. Body Material: Cast or ductile iron, unless otherwise indicated.
- C. Size: Same as connected piping.
- D. End Connections: Flanged, threaded or grooved.
- E. General Duty Valves:
 - 1. UL Listed: Valves shall be listed in UL's "Online Certifications Directory" under the headings listed below and shall bear UL mark:
 - a. Main Level: HAMV - Fire Main Equipment.
 - 1) Level 1: HCBZ - Indicator Posts, Gate Valve.
 - 2) Level 1: HLOT - Valves.
 - a) Level 3: HLUG - Ball Valves, System Control.
 - b) Level 3: HLXS - Butterfly Valves.
 - c) Level 3: HMER - Check Valves.
 - d) Level 3: HMRZ - Gate Valves.
 - b. Main Level: VDGT - Sprinkler System & Water Spray System Devices.
 - 1) Level 1: VQGU - Valves, Trim and Drain.
 - 2. FM Global Approved: Valves shall be listed in its "Approval Guide," under the headings listed below:
 - a. Automated Sprinkler Systems:
 - 1) Valves.
 - a) Gate valves.
 - b) Check valves.
 - 2) Miscellaneous valves.
 - 3. Source Limitations for Valves: Obtain valves for each valve type from single manufacturer.
 - 4. ASME Compliance:
 - a. ASME B16.1 for flanges on iron valves.
 - b. ASME B1.20.1 for threads for threaded-end valves.
 - c. ASME B31.9 for building services piping valves.
 - 5. AWWA Compliance: Comply with AWWA C606 for grooved-end connections.

2.5 TRIM AND DRAIN VALVES

- A. Ball Valves:
 - 1. Description:
 - a. Body Design: Two piece.
 - b. Body Material: Forged brass or bronze.
 - c. Port size: Full or standard.
 - d. Seats: PTFE.
 - e. Stem: Bronze or stainless steel.
 - f. Ball: Chrome-plated brass.

g. Actuator: Handlever.

B. Angle Valves:

1. Description:

- a. Body Material: Brass or bronze.
- b. Ends: Threaded.
- c. Stem: Bronze.
- d. Disc: Bronze.
- e. Packing: Asbestos free.
- f. Handwheel: Malleable iron, bronze, or aluminum.

C. Globe Valves:

1. Description:

- a. Body Material: Bronze with integral seat and screw-in bonnet.
- b. Ends: Threaded.
- c. Stem: Bronze.
- d. Disc Holder and Nut: Bronze.
- e. Disc Seat: Nitrile.
- f. Packing: Asbestos free.
- g. Handwheel: Malleable iron, bronze, or aluminum.

2.6 SPRINKLER PIPING SPECIALTIES

A. Flexible Sprinkler Hose Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Tyco.
 - b. Viking.
 - c. FlexHead Industries.
 - d. Victaulic.
2. Standard: UL 1474.
3. Type: Flexible braided hose for connection to sprinkler, and with listed bracket for connection to ceiling grid or ceiling system.
4. Size: Same as connected piping, for sprinkler.

2.7 SPRINKLERS

A. Automatic Sprinklers with Heat-Responsive Element:

1. Nonresidential Applications: UL 199
2. Characteristics: Nominal 1/2-inch orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.

B. Sprinkler Finishes: Chrome plated, bronze, and painted.

- C. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.
1. Ceiling Mounting: Chrome-plated steel, two piece, with 1-inch vertical adjustment.

- D. Sprinkler Guards:
1. Standard: UL 199.
 2. Type: Wire cage with fastening device for attaching to sprinkler.

2.8 ESCUTCHEONS

- A. Split-Casting Brass Type: With polished, chrome-plated (where exposed) and rough-brass finish and with concealed hinge and setscrew.

2.9 SLEEVES

- A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. Galvanized-Steel Wall Pipes: ASTM A 53, Schedule 40, with plain ends and welded steel collar; zinc coated.

2.10 BACKFLOW PREVENTERS

- A. Double-Check, Backflow-Prevention Assemblies:
1. Manufacturers: Subject to compliance with requirements and local approval, provide products by one of the following:
 - a. Ames Fire & Waterworks
 - b. Conbraco Industries, Inc.
 - c. FEBCO
 - d. Mueller Co
 - e. Watts
 - f. Zurn Industries, LLC
 2. Standard: ASSE 1015 or AWWA C510.
 3. Operation: Continuous-pressure applications unless otherwise indicated.
 4. Pressure Loss: 7 psig maximum, through middle one-third of flow range.
 5. Body Material: Bronze for NPS 2 and smaller.
 6. End Connections: Threaded for NPS 2 and smaller.
 7. Configuration: Designed for horizontal, straight through flow.
 8. Lock valves open with method approved by the fire marshal.

2.11 PRESSURE GAGES

- A. Standard: UL 393.

PART 3 - EXECUTION

3.1 WATER-SUPPLY CONNECTIONS

- A. Connect sprinkler piping to building's interior water-distribution piping. Comply with requirements for interior piping in Division 22.
- B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water-distribution piping.
- C. Install drain at connection to water supply.

3.2 PIPING INSTALLATION

- A. Locations and Arrangements: Drawing plans and diagrams indicate general location and arrangement of piping. Install piping as indicated.
 - 1. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.
- B. Piping Standard: Comply with the NFPA 13 requirements for installation of sprinkler piping.
- C. Install seismic restraints on piping where required. Comply with NFPA 13 requirements for seismic-restraint device materials and installation.
- D. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
- E. Install sprinkler piping with drains for complete system drainage. All drains serving more than 5 gallons shall discharge directly to the exterior.
- F. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13.
- G. Install pressure gage on riser. Include pressure gages with connection not less than NPS 1/4 and with soft-metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they are not subject to freezing.
- H. Ground piping as required by NFPA 70.
- I. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves.
- J. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons.

3.3 JOINT CONSTRUCTION

- A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.
- B. Install unions adjacent to each valve and backflow preventer in pipes NPS 2 and smaller.
- C. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- D. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- E. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.
- F. 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:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- G. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.
 - 1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.
- H. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.
- I. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.
- J. Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Brazed Joints" Chapter.
- K. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.4 VALVE AND SPECIALTIES INSTALLATION

- A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.

- B. Install permanent identification signs indicating portion of system controlled by each valve.
- C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.
- D. Specialty Valves:
 - 1. Install valves in vertical position for proper direction of flow, in main supply to system.

3.5 SPRINKLER INSTALLATION

- A. Install sprinklers in suspended ceilings in center of acoustical ceiling panels.
- B. Sprinklers may be installed into flexible, sprinkler hose fittings, and install hose into bracket on ceiling grid.

3.6 IDENTIFICATION

- A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.

3.7 BACKFLOW PREVENTER INSTALLATION

- A. Install backflow preventers of type, size, and capacity indicated. Include valves and test cocks. Install according to requirements of plumbing and health department and authorities having jurisdiction.
- B. Do not install backflow preventers that have relief drain in vault or in other spaces subject to flooding.
- C. Do not install bypass piping around backflow preventers.

3.8 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
- B. Sprinkler piping system will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.9 CLEANING

- A. Clean dirt and debris from sprinklers.
- B. Only sprinklers with their original factory finish are acceptable. Remove and replace any sprinklers that are painted or have any other finish than their original factory finish.

3.10 PIPING SCHEDULE

- A. Provide pipe and fittings as specified in Part 2.

3.11 SPRINKLER SCHEDULE

- A. Use sprinkler types in subparagraphs below for the following applications:
 - 1. Rooms without Ceilings: Upright sprinklers.
 - 2. Rooms with Suspended Ceilings: Recessed pendent sprinklers
- B. Provide sprinkler types in subparagraphs below with finishes indicated.
 - 1. Recessed pendent Sprinklers: Bright chrome, with bright chrome escutcheon.
 - 2. Sprinklers: Chrome plated and painted in finished spaces exposed to view; rough bronze in unfinished spaces not exposed to view; wax coated where exposed to acids, chemicals, or other corrosive fumes.

END OF SECTION 211000