SECTION 232416 - INTERNAL-COMBUSTION ENGINE EXHAUST PIPING

This Section includes pipe materials, fittings, and valves normally encountered in engine exhaust piping systems.

Coordinate location of piping, valves, and hangers and supports with other sections in this Division. When Section 230529, Section 230503, and Section 230523 are used consider deleting duplicate requirements and referencing appropriate sections.

Manufacturers found in SpecAgent for this Section were identified as representative and not as an endorsement for meeting the requirements of this specification.

This Section includes performance, proprietary, and descriptive type specifications. Edit to avoid conflicting requirements.

This Section includes the term Architect/Engineer. "Architect" is used in AIA contract documents; "Engineer" is used in EJCDC contract documents. Retain appropriate term.

See the Drawing Coordination Considerations for information needed to coordinate this specification Section with the Drawings.

1. GENERAL
   * + 1. SUMMARY
          1. Section Includes:

Engine exhaust.

Equipment drains and over flows.

Unions and flanges.

Pipe hangers and supports.

Valves.

* + - * 1. Related Sections:

Use the following reference when firestopping is specified in Division 7.

Section 078413 – Penetration Firestopping: Product requirements for firestopping for placement by this section.

Section 099114 and/or 099123 – Exterior Painting / Interior Painting: Product requirements Painting for placement by this section.

Use the following when pipe materials are specified in one location in this Division.

Section 230503 - Pipes and Tubes for HVAC Piping and Equipment: Product and installation requirements for piping materials applying to various system types.

Section 230516 - Expansion Fittings and Loops for HVAC Piping: Product and execution requirements for expansion compensation devices use in heating and cooling piping systems.

Use the following when valves are specified in one location in this Division.

Section 230523 - General-Duty Valves for HVAC Piping: Product requirements for valves for placement by this section.

Retain choice in the following paragraph when firestopping is specified in this Division.

Section 230529 - Hangers and Supports for HVAC Piping and Equipment: Product requirements for pipe hangers and supports, sleeves, [**and firestopping**] for placement by this section.

Section 230553 - Identification for HVAC Piping and Equipment: Product requirements for pipe identification for placement by this section.

Section 230700 - HVAC Insulation: Product requirements for Piping Insulation for placement by this section.

* + - 1. REFERENCES

List reference standards included within text of this section. Edit the following for Project conditions.

* + - * 1. American Society of Mechanical Engineers:

ASME B16.3 - Malleable Iron Threaded Fittings.

ASME B16.4 - Gray Iron Threaded Fittings.

ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.

ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

ASME B31.1 - Power Piping.

ASME B31.9 - Building Services Piping.

ASME Section IX - Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.

* + - * 1. ASTM International:

ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

ASTM A234 - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.

ASTM A395 - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.

ASTM A536 - Standard Specification for Ductile Iron Castings.

ASTM B32 - Standard Specification for Solder Metal.

ASTM B88 - Standard Specification for Seamless Copper Water Tube.

ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.

ASTM F1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications.

* + - * 1. American Welding Society:

AWS D1.1 - Structural Welding Code - Steel.

* + - * 1. Manufacturers Standardization Society of the Valve and Fittings Industry:

MSS SP 58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.

MSS SP 69 - Pipe Hangers and Supports - Selection and Application.

MSS SP 70 - Cast Iron Gate Valves, Flanged and Threaded Ends.

MSS SP 80 - Bronze Gate, Globe, Angle and Check Valves.

MSS SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices.

MSS SP 110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

* + - 1. SYSTEM DESCRIPTION

Use this article carefully; restrict statements to describe components used to assemble system. Do not repeat statements made in Summary article; "Section includes" paragraph.

The following are performance type statements. Retain when Drawings do not indicate these items. Suggest adding a paragraph to describe type of system and design system temperatures. The following paragraph is given as an example. Use carefully and edit to meet project requirements.

* + - * 1. Where more than one piping system material is specified, provide compatible system components and joints. Use non-conducting dielectric connections whenever jointing dissimilar metals in open systems.
        2. Provide flanges, union, and couplings at locations requiring servicing. Use unions, flanges, and couplings downstream of valves and at equipment or apparatus connections. Do not use direct welded or threaded connections to valves, equipment or other apparatus.
        3. Provide pipe hangers and supports in accordance with [**ASME B31.1,**] [**ASME B31.9,**] [**ASTM F708,**] [**MSS SP 58,**] [**MSS SP 69,**] [**and**] [**MSS SP 89**].
        4. Use [**gate**] [**or**] [**ball**] valves for shut-off and to isolate [**equipment**] <**\_\_\_\_\_\_\_\_**>.
        5. Use 3/4 inch ball valves with cap for drains at main shut-off valves, low points of piping, bases of vertical risers, and at equipment. [**Pipe to nearest floor drain.**]
        6. Flexible Connectors: Use at or near [**engine driven equipment**] <**\_\_\_\_\_\_\_\_**> where piping configuration does not absorb vibration.
      1. SUBMITTALS

Only request submittals needed to verify compliance with Project requirements.

* + - * 1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
        2. Manufacturer’s installation instructions shall be provided along with product data.
        3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
        4. Section 013300 - Submittal Procedures: Submittal procedures.
        5. Shop Drawings: Indicate schematic layout of <**\_\_\_\_\_\_\_\_**> piping system, including equipment, critical dimensions, and sizes.
        6. Product Data:

Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturer's catalog information.

Valves: Submit manufacturer's catalog information with valve data and ratings for each service.

Hangers and Supports: Submit manufacturer's catalog information including load capacity.

USE PARAGRAPH BELOW WITH EPD REQUIREMENT WHEN PROJECT ESTIMATE IS $1M OR MORE.

* + - * 1. Submit an Environmental Product Declaration (EPD) from the manufacturer for steel pipe within this specification section, if available. A statement of the contractor’s good faith effort to obtain the EPD shall be provided if not available.

Manufacturer-provided EPDs must be Product Specific Type III (Third-Party Reviewed), in adherence with ISO 14025 *Environmental labels and declarations*, ISO 14044 *Environmental management – Life cycle assessment*, and ISO 21930 *Core rules for environmental product declarations of construction products and services.*

Include the following paragraph when Contractor is responsible for pipe sizing.

* + - * 1. Design Data: Indicate pipe size. Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.
        2. Test Reports: Indicate results of <**\_\_\_\_\_\_\_\_**> piping system pressure test.
        3. Manufacturer's Installation Instructions: Submit hanging and support methods, joining procedures and isolation.
        4. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
        5. Welders' Certificate: Include welders' certification of compliance with [**ASME Section IX.**] [**AWS D1.1.**] <**\_\_\_\_\_\_\_\_.**>
      1. CLOSEOUT SUBMITTALS
         1. Project Record Documents: Record actual locations of [**valves**] <**\_\_\_\_\_\_\_\_**>, equipment and accessories.
         2. Operation and Maintenance Data: Submit instructions for installation and changing components, spare parts lists, exploded assembly views.
      2. QUALITY ASSURANCE
         1. Perform Work in accordance with ASME B31.1 “Power Piping” code for installation of piping systems and ASME Section IX “Boiler and Pressure Vessel Code - Welding and Brazing Qualifications” for welding materials and procedures.
         2. Perform Work in accordance with [**applicable authority**] [**AWS D1.1**] for welding hanger and support attachments to building structure.

Include the following paragraph only when cost of acquiring specified standards is justified.

* + - * 1. Maintain one copy of each document on site.
      1. QUALIFICATIONS
         1. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years' [**documented**] experience
         2. Fabricator or Installer: Company specializing in performing Work of this section with minimum three years' [**documented**] experience [**approved by manufacturer**].

Use the following when Contractor is responsible for sizing.

* + - 1. PRE-INSTALLATION MEETINGS
         1. Section 013000 - Administrative Requirements: Pre-installation meeting.
         2. Convene minimum [**one**] <**\_\_\_\_\_\_\_\_**> week prior to commencing work of this section.
      2. DELIVERY, STORAGE, AND HANDLING
         1. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
         2. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
         3. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.
      3. FIELD MEASUREMENTS
         1. Verify field measurements prior to fabrication.

1. PRODUCTS
   * + 1. ENGINE EXHAUST
          1. Steel Pipe: ASTM A53 “Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless”, Schedule 40, [**0.375 inch wall for sizes 12 inch and larger,**] black.

Fittings: ASME B16.3 “Malleable Iron Threaded Fittings”, malleable iron or ASTM A234 “Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service”, forged steel welding type.

Joints: Threaded for pipe 2 inch and smaller; welded for pipe 2-1/2 inches and larger.

* + - 1. EQUIPMENT DRAINS AND OVERFLOWS
         1. Steel Pipe: ASTM A53 “Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless” Schedule 40, galvanized.

Fittings: ASME B16.3 “Malleable Iron Threaded Fittings”, malleable iron or ASME B16.4 “Gray Iron Threaded Fittings”, cast iron.

Joints: Threaded for pipe 2 inch and smaller; flanged for pipe 2-1/2 inches and larger.

* + - * 1. Steel Pipe: ASTM A53 “Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless” Schedule 40, galvanized, [**cut**] [**rolled**] grooved ends.

Fittings: [**ASTM A395 and ASTM A536 ductile iron,**] [**or**] [**ASTM A234 carbon steel,**] grooved ends.

Joints: Grooved mechanical couplings meeting ASTM F1476 “Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications”.

Housing Clamps: ASTM A395 “Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures” and ASTM A536 “Standard Specification for Ductile Iron Castings” ductile iron, [**enamel coated**] [**hot dipped galvanized**] <**\_\_\_\_\_\_\_\_**>, compatible with steel piping sizes, [**rigid**] [**or**] [**flexible**] type.

Gasket: Elastomer composition for operating temperature range from [**-30**] [**86**] <**\_\_\_\_\_\_\_\_**> degrees F to [**230**] [**180**] <**\_\_\_\_\_\_\_\_**> degrees F.

Accessories: [**Steel**] [**Stainless steel**] bolts, nuts, and washers.

* + - * 1. Copper Tubing: ASTM B88 “Standard Specification for Seamless Copper Water Tube”, Type [**K,**] [**L,**] [**M,**] drawn.

Fittings: ASME B16.18 “Cast Copper Alloy Solder Joint Pressure Fittings”, cast brass, or ASME B16.22 “Wrought Copper and Copper Alloy Solder Joint Pressure Fittings” solder wrought copper.

ASTM B32 permits up to 0.1 percent lead content in solders not classified as containing lead.

Joints: ASTM B32 “Standard Specification for Solder Metal”, Alloy Grade Sb5 tin-antimony, or Alloy Grade Sn95 tin-silver, [**lead free**] solder.

* + - 1. UNIONS AND FLANGES
         1. Unions for Pipe 2 inches and Smaller:

Ferrous Piping: Class [**150**] [**250**] [**300**], malleable iron, threaded.

Copper Piping: Class 150, bronze unions with [**soldered**] [**brazed joints**].

Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

* + - * 1. Flanges for Pipe 2-1/2 inches and Larger:

Ferrous Piping: Class [**150**] [**250**] [**300**], forged steel, slip-on flanges.

Copper Piping: Class 150, slip-on bronze flanges.

Gaskets: 1/16 inch thick preformed neoprene gaskets.

Valves included in this section are those applicable to piping system. Numbers used in Section 230523 have been retained for ease of cross referencing. Possibly renumber valves after editing section for project.

* + - 1. GATE VALVES

In this paragraph, list manufacturers acceptable for this Project.

* + - * 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Apollo Valves; a part of Aalberts Integrated Piping Systems.

Crane Fluid Systems; Crane Co.

Jenkins Valves; a Crane Co. brand.

KITZ Corporation

Lance Valves.

Powell Valves.

Approved equivalent.

Edit the following descriptive specifications to identify project requirements and to eliminate conflicts with manufacturers' products specified above.

* + - * 1. [**GA-1**] 2 inches and Smaller: MSS SP 80 “Bronze Gate, Globe, Angle and Check Valves”, [**Class 125**] [**Class 150**] <**\_\_\_\_\_\_\_\_**>, bronze body, bronze trim, [**threaded**] [**union**] bonnet, [**non-rising**] [**rising**] stem, [**lock-shield stem**] [**hand-wheel**], inside screw [**with back-seating stem**], [**solid**] [**split**] wedge disc, [**alloy seat rings,**] [**solder**] [**or**] [**threaded**] ends.
        2. [**GA-2**] 2-1/2 inches and Larger: MSS SP 70 “Cast Iron Gate Valves, Flanged and Threaded Ends”, [**Class 125**] <**\_\_\_\_\_\_\_\_**>, cast iron body, bronze trim, bolted bonnet, [**rising**] [**non-rising**] stem, hand-wheel, outside screw and yoke, solid wedge disc with bronze seat rings, flanged ends. Furnish chain-wheel operators for valves 6 inches and larger mounted over 8 feet above floor.
      1. BALL VALVES

In this paragraph, list manufacturers acceptable for this Project.

* + - * 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Apollo Valves; a part of Aalberts Integrated Piping Systems.

Bray Commercial.

DynaQuip Controls.

FNW; Ferguson Enterprises, Inc.

Hammond Valve.

Jomar Valve.

Lance Valves.

Milwaukee Valve Company.

Stockham; a Crane Co. brand.

Viega LLC.

WATTS; A Watts Water Technologies Company.

Approved equivalent.

Edit the following descriptive specifications to identify project requirements and to eliminate conflicts with manufacturers' products specified above.

The following valve is economy type ball valve.

* + - * 1. [**BA-1**] 2 inches and Smaller: MSS SP 110 “Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends”, [**400 psi WOG**] [**600 psi WOG**] <**\_\_\_\_\_\_\_\_**>, [**one**] [**two**] piece bronze body, chrome plated brass ball, [**regular**] [**full**] port, teflon seats, blow-out proof stem, [**solder**] [**or**] [**threaded**] ends [**with union**], [**lever handle**] [**wing or tee handle**] [**locking lever handle**] [**extended lever handle**] [**round handle**] [**oval handle**] [**with balancing stops**].
        2. [**BA-2**] 2 inches and Smaller: MSS SP 110 “Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends”, [**Class 150**] <**\_\_\_\_\_\_\_\_**>, bronze, two piece body, [**chrome plated bronze**] [**type 316 stainless steel**] ball, [**regular**] [**full**] port, teflon seats, blow-out proof stem, [**solder**] [**or**] [**threaded**] ends [**with union**], [**lever handle**] [**wing or tee handle**] [**locking lever handle**] [**extended lever handle**] [**round handle**] [**oval handle**] [**with balancing stops**].

The following is 3-piece repairable ball valve.

* + - * 1. [**BA-3**] 2 inches and Smaller: MSS SP 110 “Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends”, [**Class 150**] <**\_\_\_\_\_\_\_\_**>, bronze, three piece body, [**chrome plated bronze**] [**type 316 stainless steel**] ball, [**regular**] [**full**] port, teflon seats, blow-out proof stem, [**solder**] [**or**] [**threaded**] ends, [**lever handle**] [**wing or tee handle**] [**locking lever handle**] [**extended lever handle**] [**round handle**] [**oval handle**] [**with balancing stops**].

The following ball valve has full port with vent hole.

* + - * 1. [**BA-4**] 2 inches and Smaller: MSS SP 110 “Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends”, [**Class 150**] <**\_\_\_\_\_\_\_\_**>, bronze, [**two**] [**three**] piece body, type 316 stainless steel ball with vent hole, full port, reinforced teflon seats, stainless steel stem, threaded ends, [**lever handle**] [**wing or tee handle**] [**locking lever handle**] [**extended lever handle**] [**round handle**] [**oval handle**] [**with balancing stops**].
      1. PIPE HANGERS AND SUPPORTS

In this article, list manufacturers acceptable for this Project.

* + - * 1. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

McMaster-Carr

Metaflex, Inc.

Panther Industries

Approved equivalent.

Edit the following descriptive specifications to identify project requirements and to eliminate conflicts with manufacturers' products specified above.

* + - * 1. Conform to [**ASME B31.1,**] [**ASME 31.9,**] [**ASTM F708,**] [**MSS SP 58,**] [**MSS SP 69,**] [**and**] [**MSS SP 89**].
        2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: [**Malleable iron**] [**Carbon steel**], adjustable swivel, split ring.
        3. Hangers for Pipe Sizes 2 to 4 inches: Carbon steel, adjustable, clevis.
        4. Hangers for Pipe Sizes 6 inches and Larger: Adjustable steel yoke, cast iron roll, double hanger.
        5. Wall Support for Pipe Sizes 4 inches and Larger: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.
        6. Vertical Support: Steel riser clamp.
        7. Floor Support for Pipe 4 inches and Smaller: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
        8. Floor Support for Pipe Sizes 6 inches and Larger: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.
        9. Copper Pipe Support: Carbon steel rings, adjustable, copper plated.
        10. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
        11. Inserts: Malleable iron case of [**galvanized**] steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

1. EXECUTION
   * + 1. PREPARATION
          1. Ream pipe and tube ends. Remove burrs. [**Bevel plain end ferrous pipe.**]
          2. Remove scale and dirt on inside and outside before assembly.
          3. Prepare piping connections to equipment with flanges or unions.
          4. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.
       2. INSTALLATION - INSERTS
          1. Provide inserts for placement in concrete forms.
          2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
          3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe 4 inches and larger.
          4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
          5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut [**above**] [**flush with top of**] [**recessed into and grouted flush with**] slab.
       3. INSTALLATION - PIPE HANGERS AND SUPPORTS
          1. Install in accordance with [**ASME B31.9**] [**ASTM F708**] [**and**] [**MSS SP 89**].
          2. Support horizontal piping as scheduled.
          3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
          4. Place hangers within 12 inches of each horizontal elbow.
          5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
          6. Support vertical piping at every [**other**] floor. Support riser piping independently of connected horizontal piping.
          7. Provide [**copper plated hangers and supports for copper piping**] [**sheet lead packing between hanger or support and piping**].

Manufactured hangers are normally supplied in black steel.

* + - * 1. Prime coat exposed steel hangers and supports. [**Refer to Section 099114 and/or 099123.**] Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
        2. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

* + - * 1. Install pipe hangers and supports in accordance with Section 230529.
      1. INSTALLATION - ABOVE GROUND PIPING SYSTEMS
         1. Install engine exhaust piping in accordance with ASME B31.9 “Building Services Piping”.
         2. Route piping parallel to building structure and maintain gradient.
         3. Install piping to conserve building space, and not interfere with use of space.
         4. Sleeve pipe passing through partitions, walls and floors. Refer to Section [**230529**] <**\_\_\_\_\_\_\_\_**>.
         5. Install firestopping at fire rated construction perimeters and openings containing penetrating sleeves and piping. Refer to Section [**078413**] [**230529**] <**\_\_\_\_\_\_\_\_**>.
         6. Install pipe identification in accordance with Section [**230553**] <**\_\_\_\_\_\_\_\_**>.
         7. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section [**230516**] <**\_\_\_\_\_\_\_\_**>.
         8. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.
         9. Prepare unfinished pipe, fittings, supports, and accessories, ready for finish painting. Refer to Section 099000.
         10. Insulate piping [**and equipment**]; refer to Section 230700.
      2. FIELD QUALITY CONTROL
         1. Test engine exhaust piping in accordance with [**ASME B31.9**] [**ASME B31.1**].
      3. SCHEDULES

Include schedules when pipe hanger spacing and size are not defined by code.

Consider the following examples when developing Project schedule.

* + - * 1. Valve Service:

In following subparagraphs indicate whether service is "shutoff," "throttling," or "check."

Equipment Drains and Overflows: <**\_\_\_\_\_\_\_\_**>.

Engine Exhaust: <**\_\_\_\_\_\_\_\_**>.

Consider including following examples if pipe hanger spacing and size are not defined by code. Refer to manufacturer recommendations for grooved-end piping systems.

* + - * 1. Copper Tube Hanger Spacing:

Pipe Size 1/2 Inch:

Maximum Hanger Spacing: 5 feet.

Hanger Rod Diameter: 3/8 inch.

Pipe Size 3/4 Inch:

Maximum Hanger Spacing: 5 feet.

Hanger Rod Diameter: 3/8 inch.

Pipe Size 1 Inch:

Maximum Hanger Spacing: 6 feet.

Hanger Rod Diameter: 3/8 inch.

Pipe Size 1-1/4 Inches:

Maximum Hanger Spacing: 7 feet.

Hanger Rod Diameter: 3/8 inch.

Pipe Size 1-1/2 Inches:

Maximum Hanger Spacing: 8 feet.

Hanger Rod Diameter: 3/8 inch.

Pipe Size 2 Inches:

Maximum Hanger Spacing: 8 feet.

Hanger Rod Diameter: 3/8 inch.

Pipe Size 2-1/2 Inches:

Maximum Hanger Spacing: 9 feet

Hanger Rod Diameter: 1/2 inch.

Pipe Size 3 Inches:

Maximum Hanger Spacing: 10 feet.

Hanger Rod Diameter: 1/2 inch.

Pipe Size 4 Inches:

Maximum Hanger Spacing: 12 feet.

Hanger Rod Diameter: 1/2 inch.

Pipe Size 5 Inches:

Maximum Hanger Spacing: 13 feet.

Hanger Rod Diameter: 1/2 inch.

Pipe Size 6 Inches:

Maximum Hanger Spacing: 14 feet.

Hanger Rod Diameter: 5/8 inch.

Pipe Size 8 Inches:

Maximum Hanger Spacing: 16 feet.

Hanger Rod Diameter: 3/4 inch.

Pipe Size 10 Inches:

Maximum Hanger Spacing: 18 feet.

Hanger Rod Diameter: 3/4 inch.

Pipe Size 12 Inches:

Maximum Hanger Spacing: 19 feet.

Hanger Rod Diameter: 3/4 inch.

Pipe Size 14 Inches:

Maximum Hanger Spacing: 22 feet.

Hanger Rod Diameter: 7/8 inch.

Pipe Size 16 Inches:

Maximum Hanger Spacing: 23 feet.

Hanger Rod Diameter: 7/8 inch.

Pipe Size 18 Inches:

Maximum Hanger Spacing: 25 feet.

Hanger Rod Diameter: 1 inch.

Pipe Size 20 Inches:

Maximum Hanger Spacing: 27 feet.

Hanger Rod Diameter: 1 inch.

Pipe Size 24 Inches:

Maximum Hanger Spacing: 28 feet.

Hanger Rod Diameter: 1-1/4 inches.

* + - * 1. Steel Pipe Hanger Spacing:

Pipe Size 1/2 Inch:

Maximum Hanger Spacing: 7 feet.

Hanger Rod Diameter: 3/8 inch.

Pipe Size 3/4 Inch:

Maximum Hanger Spacing: 7 feet.

Hanger Rod Diameter: 3/8 inch.

Pipe Size 1 Inch:

Maximum Hanger Spacing: 7 feet.

Hanger Rod Diameter: 3/8 inch.

Pipe Size 1-1/4 Inches:

Maximum Hanger Spacing: 7 feet.

Hanger Rod Diameter: 3/8 inch.

Pipe Size 1-1/2 Inches:

Maximum Hanger Spacing: 9 feet.

Hanger Rod Diameter: 3/8 inch.

Pipe Size 2 Inches:

Maximum Hanger Spacing: 10 feet.

Hanger Rod Diameter: 3/8 inch.

Pipe Size 2-1/2 Inches:

Maximum Hanger Spacing: 11 feet.

Hanger Rod Diameter: 1/2 inch.

Pipe Size 3 Inches:

Maximum Hanger Spacing: 12 feet.

Hanger Rod Diameter: 1/2 inch.

Pipe Size 4 Inches:

Maximum Hanger Spacing: 14 feet.

Hanger Rod Diameter: 5/8 inch.

Pipe Size 5 Inches:

Maximum Hanger Spacing: 16 feet.

Hanger Rod Diameter: 5/8 inch.

Pipe Size 6 Inches:

Maximum Hanger Spacing: 17 feet.

Hanger Rod Diameter: 3/4 inch.

Pipe Size 8 Inches:

Maximum Hanger Spacing: 19 feet.

Hanger Rod Diameter: 3/4 inch.

Pipe Size 10 Inches:

Maximum Hanger Spacing: 22 feet.

Hanger Rod Diameter: 7/8 inch.

Pipe Size 12 Inches:

Maximum Hanger Spacing: 23 feet.

Hanger Rod Diameter: 7/8 inch.

Pipe Size 14 Inches:

Maximum Hanger Spacing: 25 feet.

Hanger Rod Diameter: 1 inch.

Pipe Size 16 Inches:

Maximum Hanger Spacing: 27 feet.

Hanger Rod Diameter: 1 inch.

Pipe Size 18 Inches

Maximum Hanger Spacing: 28 feet.

Hanger Rod Diameter: 1 inch.

Pipe Size 20 Inches:

Maximum Hanger Spacing: 30 feet.

Hanger Rod Diameter: 1-1/4 inches.

Pipe Size 24 Inches:

Maximum Hanger Spacing: 32 feet.

Hanger Rod Diameter: 1-1/4 inches.

END OF SECTION 232416