SECTION 23 05 29
SUPPORTS AND ANCHORS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Furnish all labor, materials, equipment, small tools, and supervision required to complete the installation of hangers, supports, anchors, and seismic bracing for equipment, piping and ductwork related to the mechanical systems shown on the drawings. Supports shall be furnished with all necessary inserts, bolts, nuts, rods, and other accessories.

B. In general, the drawings will not indicate supports and hangers explicitly; it is the contractor's responsibility to provide supports as required for all piping, ductwork, and equipment installed under this contract, including miscellaneous secondary support members as specified herein, based on the routing of services and the spacing of available support points within the building structure.

C. Seismic bracing shall be provided in accordance with the State Building Code for components and piping related to the wet and pre-action sprinkler systems. In accordance with this Code Section, and based on the occupancy of the building, seismic bracing is not required for the HVAC equipment, piping, or ductwork included in this contract.

D. Equipment supports to be furnished and installed under this contract shall include:

1. Miscellaneous structural steel for support of piping accessories as required.
2. Seismic bracing for fire protection piping as required by the State Building Code.
3. Vibration isolation supports as specified herein.
4. Piping supports shall include roller hangers, clevis hangers, stanchions, riser clamps, and strut-type supports for floor-mounted and wall-mounted piping and accessories, as specified in Part 2.

E. Ductwork supports shall include strap hangers and beam clamps as specified in Section 23 30 00.

1.2 REFERENCES

A. Pipe hangers and supports shall conform as applicable to ANSI B31.9 - Building Services Piping Standard, to NFPA 13 - Standard for the Installation of Sprinkler Systems, and to MSS-SP 58 and MSS-SP 69 - Manufacturers Standardization Society, Pipe Hangers and Supports.

B. Ductwork supports shall conform to SMACNA Standards.

C. Section 23 00 10 – General mechanical Requirements, is an integral part of this section. Requirements and work indicated in 23 00 10 are not repeated in this section.

D. Section 23 23 00 – Refrigerant Piping.

E. Section 23 81 23 – Refrigerant Based Precision Cooling System

1.3 QUALITY ASSURANCE

A. Hangers and supports used in fire protection piping systems shall be listed and labeled by Underwriters Laboratories.

B. Pipe hangers and supports shall have the manufacturer's name, part number, and applicable size stamped in the part for identification.

1.4 SUBMITTALS

A. Submit product data for all hanger and support devices, including shields and attachment methods. Product data shall include but not be limited to materials, finishes, approvals, load ratings, and dimensional data.

B. Submit product data for all vibration isolation mounts and products.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers for pipe hangers and supports include Cooper B-Line, Carpenter & Patterson, ITT Grinnell, or other manufacturer only if submitted and approved at time of bid.

B. Basis of design for vibration isolation devices is Novia Associates Inc. Acceptable manufacturers are Mason and Vibration Eliminator.

C. Floor stands for CRAC units shall be furnished by the unit's manufacturer.

2.2 PIPE HANGERS AND SUPPORTS

A. For all piping 2½" and smaller, use adjustable clevis or band type hanger for suspended piping, and use strut-type base with split clamp for floor-mounted or wall-mounted piping. Provide copper plated or epoxy coated hangers for use with copper tubing.

B. Provide sleeves, fire-stopping, and escutcheons at each penetration as specified herein. Provide pipe hanger for horizontal piping within 6 ft of vertical pipe. Use resilient mounting of pipe clamps at any penetrations of the roof.

C. For all insulated piping, use oversized hangers to suit insulation thickness, and provide galvanized sheet metal shield for protection between hanger and pipe. For all piping 4" and larger, use either wood block or steel support saddle at base of pipe within insulation, or use rigid insulation with adequate compressive strength at each hanger location to fully support the pipe without crushing the insulation.

2.3 HANGER RODS

A. Hanger rods shall be threaded on both ends, or continuous threaded rods of circular cross-section. Use adjusting locknuts at upper attachments and hangers. No wire, chain, or perforated straps are allowed.

B. Shields shall be 180º galvanized sheet metal, 12-inch minimum length, 18-gauge minimum thickness, designed to match the outside diameter of the insulated pipe.

C. Pipe protection saddles shall be formed from carbon steel, 1/8" minimum thickness, sized for insulation thickness. Saddles for pipe sizes greater than 12 inch shall have a center support rib.

2.4 INSERTS, CLAMPS, AND BOLTS

A. Use clamps and/or inserts as appropriate for connection of pipe supports to the existing building structure. Do not drill or cut primary structural steel, and do not use drilled or power-driven inserts in existing concrete decks without written permission of the building owner and structural engineer. Provide secondary support steel to span between available support points as specified below.

B. Beam clamps shall be used where piping is to be suspended from building steel or fabricated pipe racks. Type of clamp shall be selected based on the weight and configuration of the load to be supported, and the type and shape of structural steel available. Use C-clamps or top flange C-clamps with locknuts and cup point set screws for supporting from sides of beams, and adjustable double-jaw clamps for loads to be supported directly beneath beams, or for loads requiring more support area. Provide retaining straps where needed to hold clamp position.

2.5 VIBRATION ISOLATION MOUNTS

A. Description

1. All vibration isolation devices described in this section shall be the product of a single supplier. NAI (Novia Associates, Inc.) is the preferred supplier. Products manufactured by Vibration Eliminator or Mason Industries may be acceptable provided their systems strictly comply with intent and submittal requirements of these specifications.

B. General

1. Hardware for outdoor applications shall be cadmium or zinc plated, all other outdoor metal parts shall be hot dipped galvanized or zinc electroplated.
2. All non-galvanized materials shall be prime paint finished. Review equipment sections of these specifications and contract drawings for additional requirements.
3. Operating height for support shall be as shown on the drawings.
4. Provide pre-drilled holes on all supports for attachment to the building structure.
5. Refer to Vibration Isolation Schedule at the end of this section for specific requirements.

C. Provide neoprene isolators for the pre-purchased air cooled condensers. Isolators shall be anchored to the steel grillage and installed in accordance with the manufacturer's instructions.

1. Neoprene mountings: Provide neoprene mountings consisting of neoprene element bonded between 2 steel plates that are neoprene-covered to prevent corrosion. Provide minimum rated deflection of 0.35". Provide threaded hole in upper plate and 2 holes in base plate for securing to equipment and to substrate.

D. Type A: Spring Isolator – Free Standing

1. Adjustment bolt counter bored and tapped with interlocking cap screw.
2. Model SM as manufactured by NAI.

E. Type F: Combination Spring/Elastomer Hanger Isolator

1. Molded 1-1/4" minimum thickness neoprene element in series with the spring, located inside a four sided steel box.
2. Model SNH as manufactured by NAI.

F. TYPE L: Elastomer Isolator

1. Non-skid top and bottom surfaces with drilled tie-down bolt holes. Threaded bolting sleeves shall be embedded in the isolator.

2. Model "FMD" by NAI.

2.6 SECONDARY STRUCTURAL STEEL

A. Secondary structural steel shall be provided where required to span available support points or to avoid the work of another trade. Steel angles and channels shall be sized to support the intended load within the allowable stress on the load and the building, with less than 1/8" deflection at mid-span, and secured to primary steel using clamps with locknuts.

B. All fabricated steel framework shall be cleaned and primed with a rustproof primer prior to installation, then touched-up after installation. All exposed structural steel shall be painted with two coats of gray machinery enamel after installation

2.7 FINISHES

A. Hangers and clamps for support of bare copper pipe shall be copper-plated, epoxy-coated, or plastic-coated to prevent contact of dissimilar metals.

B. Hangers for steel pipe located indoors shall be zinc-plated in accordance with ASTM B633-SC3, or shall have an epoxy finish. All hangers and supports located outdoors shall be hot-dip galvanized after fabrication in accordance with ASTM A123. All hanger hardware shall be hot-dip galvanized or stainless steel.

PART 3 - EXECUTION

3.1 PIPE HANGERS AND SUPPORTS

A. Pipe shall be adequately supported by pipe hanger and supports specified in Part 2 - Products. Hangers for insulated pipes shall be sized to accommodate insulation thickness.

B. Support piping from the building structure only, with secondary steel as required; do not support piping from other pipes, ductwork, or equipment.

C. Horizontal copper piping shall be supported in accordance with MSS SP-69 Tables 3 and 4, as noted below:

Nominal Pipe Size	Rod Diameter	Maximum Spacing
½" - 3/4"	3/8"	5'-0"
1"	3/8"	6'-0"
1-1/4"	3/8"	7'-0"
1-1/2" - 2"	3/8"	8'-0"
2-1/2"	½"	9'-0"

D. Provide means of preventing dissimilar metal contact such as plastic coated hangers, or copper plated hangers.

E. Install hangers to provide a minimum clearance of ½" between the finished pipe surface and adjacent work or structure.

F. Place a hanger within 12" of any horizontal elbow or tee. Support piping at each equipment connection to eliminate any stress on the equipment, and if flexible connections are used for expansion or vibration isolation, install support within 12" of the connector.

G. Install spring type hangers (Type F) on refrigerant piping within 50 ft of CRAC units.

H. Where several pipes can be installed in parallel, provide trapeze hangers as specified in Part 2, spaced according to the smallest pipe size, or use intermediate supports for small pipes.

I. Support vertical piping independently of connected horizontal piping, and support risers at every floor. Wherever possible, locate riser clamps directly below pipe couplings or shear lugs.

3.2 CLAMPS

A. Support hangers from building steel using C-clamps, top flange C-clamps, or adjustable double-jaw beam clamps as appropriate for the load and structure as indicated in Part 2. For open-web joists, support from top chord where possible, and as close to panel points as possible to minimize stress on the structure.

3.3 EQUIPMENT BASES AND SUPPORTS

A. Install floor stands for CRAC units specified in Section 238123, located as shown on the plans, and leveled to the height of the raised access floor.

B. Install neoprene mounts beneath air cooled condensers as noted above. All mounts shall be firmly bolted to the structural steel and to the equipment being supported in accordance with the manufacturer's recommendations.

C. Support piping on finished floor in the sub-floor plenum as shown in detail drawings. Coordinate elevation of piping in sub-floor plenum with installation of conduit and cable trays by others.

3.4 VIBRATION ISOLATION SCHEDULE

VIBRATION ISOLATION SCHEDULE

TAG	ISOLATION	DEFL	BASE	HGT	NOTES	MOUNTING TYPE
CRAC-01 thru 32	INTERNAL COMPONENTS	-	MFG'S STAND	`		FLOOR
ACC-01 thru 32	INTERNAL COMPONENTS	-	TYPE L			STRUCT FRAME
H-01 thru 04	Type F	0.75"	-	-	-	-
FPTs	Type F	0.75"	-	-	-	-
In-Line EFs	Type F	0.75"	-	-	-	-
RTU-09	INTERNAL COMPONENTS	-	MFG'S CURB	-	-	MFG'S CURB
MUA-01, 02	INTERNAL COMPONENTS	-	MFG'S CURB	-	-	MFG'S CURB

END OF SECTION