

SECTION 15070
VIBRATION CONTROL AND SEISMIC RESTRAINTS

PART 1- GENERAL

1.01 PROVISIONS INCLUDED

- A. The general provisions of the Contract, including General and Supplementary General Conditions, and Division 1 General Requirements, apply to work specified in this Section.
- B. Requirements of Section 15050, "Basic Mechanical Materials and Methods" apply to work specified in this Section.

1.02 SUMMARY

- A. Work Included: Furnish and install inertia bases under the existing pumps P1, P2, P3. Pumps are manufactured by Bell and Gossett. Furnish and install vibration isolators, and seismic restraints.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data and installation instructions for each base and associated isolators. Submit schedule showing size, type, weight, and location for each product furnished.
- B. Shop Drawings: Show designs and calculations, certified by a professional engineer, for the following:
 - 1. Design Calculations: Calculations for selection of vibration isolators, design of vibration isolation bases, and selection of seismic restraints.
 - 2. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to the structure and to the supported equipment. Include auxiliary motor slides and rails, and base weights.
 - 3. Seismic Restraint Details: Detail fabrication and attachment of restraints and snubbers.
- C. Maintenance Data: Submit maintenance data for each type of vibration control and seismic restraint, in accordance with Section 01770, "Closeout Procedures and Submittals".

1.04 QUALITY ASSURANCE

- A. Comply with USM requirements.
- B. Manufacturer's Qualifications: Firms regularly engaged in manufacture of vibration control and seismic restraint products, of type, size, and capacity required, whose products have been in satisfactory use in similar service for not less than 5 years.

1. Except as otherwise indicated, obtain vibration control and seismic restraint products from a single manufacturer.
 2. Engage manufacturer to provide technical supervision of installation of vibration control and seismic restraint products.
- C. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the jurisdiction where the Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installation of vibration isolators bases and seismic restraints that are similar to those indicated for this Project in material, design, and extent.

1.05 COORDINATION

- A. Coordinate the size, location, and special requirements of vibration isolation equipment and systems with other trades. Coordinate plan dimensions with size of housekeeping pads.
- B. Coordinate layout and installation of vibration isolation and seismic-restraint devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.
- C. Supply and install any incidental materials such as mounting brackets, attachments and other accessories as may be needed to meet the requirements stated herein, even if not expressly specified or shown on the drawings, without claim for additional payment.
- D. Verify correctness of equipment model numbers and conformance of each component with manufacturer's specifications.
- E. Coordinate installation of roof curbs, equipment supports, and roof penetrations with Contractor for Division 7.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with specifications, furnish each type of product by one of the manufacturers listed in this Article.
- B. Floor Spring and Neoprene (FSN) Isolators
 1. Amber Booth Company, Type SW
 2. Mason Industries, Inc., Type SLF
 3. Kinetics Noise Control, Inc., Type FDS
 4. Vibration Mountings and Controls, Inc., Series A
- C. Floor Spring and Neoprene Travel Limited (FSNTL) Isolators
 1. Amber Booth Company, Type CT
 2. Mason Industries, Inc., Type SLR
 3. Kinetics Noise Control, Inc., Type FLS
 4. Vibration Mountings and Controls, Inc., Series AWR

- D. Floor Neoprene (FN) Isolators
 1. Amber Booth Company, Type RVD
 2. Mason Industries, Inc., Type ND
 3. Kinetics Noise Control, Inc., Type RD
 4. Vibration Mountings and Controls, Inc., Series RD

- E. Precompressed Fiberglass (PCF) Isolators
 1. Kinetics Noise Control, Inc., Type KIP

- F. Neoprene Pad (NP) Isolators
 1. Amber Booth Company, Type NR
 2. Mason Industries, Inc., Type W
 3. Kinetics Noise Control, Inc., Type NPS
 4. Vibration Mountings and Controls, Inc., Series Shear Flex

- G. Hanger Spring and Neoprene (HSN) Isolators
 1. Amber Booth Company, Type BSRA
 2. Mason Industries, Inc., Type 30N
 3. Kinetics Noise Control, Inc., Type SRH or SFH
 4. Vibration Mountings and Controls, Inc., Type RSH or RFH

- H. Hanger Neoprene (HN) Isolators
 1. Amber Booth Company, Type BRD
 2. Mason Industries, Inc., Type HD
 3. Kinetics Noise Control, Inc., Type RH or FH
 4. Vibration Mountings and Controls, Inc., Type RHD or RFD

- I. Base-Steel Frame (BSF)
 1. Amber Booth Company, Type WX
 2. Mason Industries, Inc., Type WFSL
 3. Kinetics Noise Control, Inc., Type SFB or SRB
 4. Vibration Mountings and Controls, Inc., Series WFB

- J. Base-Inertia Base (BIB)
 1. Amber Booth Company, Type CPF
 2. Mason Industries, Inc., Type KSL
 3. Kinetics Noise Control, Inc., Type CIB-L or CIB-H
 4. Vibration Mountings and Controls, Inc., Series WPF

- K. Roof Rail (RR)

- L. Roof Spring Curb(RC-2):
 1. Mason Industries, Inc., Type RSC
 2. Kinetics Noise Control, Inc., Type SSR
 3. Vibration Mountings and Control, Type RIC

- M. Resilient Lateral Guides
 1. Amber Booth Company, Type Custom
 2. Mason Industries, Inc., Type ADA

3. Kinetics Noise Control, Inc., Type RGN
4. Vibration Mountings and Controls, Inc., Type MDPA

N. Flexible Pipe Connections

1. Amber Booth Company, Type 2600 or 2655
2. Metraflex, Type Twin Sphere
3. Mason Industries, Inc., Type MFTNC or MFTFU

O. Thrust Restraints

1. Amber Booth Company, Type TRK
2. Mason Industries, Inc., Type WB
3. Kinetics Noise Control, Inc. Type HSR

P. Grommets

1. MIBS, Inc., Isogrommets
2. Barry Controls, Isogrommets

Q. Acoustical Sealant

1. D.A.P.
2. Pecora, BR-96
3. Tremco
4. U.S.G.

2.02 VIBRATION

2.02 VIBRATION ISOLATORS

A. General:

1. Isolators installed outdoors: cadmium-plated, zinc electroplated or powder-coated after fabrication; hardware and other metal parts cadmium-plated, or galvanized meeting ASTM Salt Spray Test Standards and Federal Test Standard No. 14. Include base plates with bolt holes for fastening isolators to support members.
2. Isolator types are scheduled to establish minimum standards. At Contractor's option, laborsaving accessories can be an integral part of isolators supplied to provide initial lift of equipment to operating height, hold piping at fixed elevations during installation and initial system filling operations, and similar installation advantages. Accessories and seismic restraint features must not degrade the isolation performance of isolators.
3. Static deflection of isolators is specified in PART 3 - EXECUTION. All static deflections stated are the minimum acceptable deflection for the mounts under actual load. Isolators selected solely on the basis of rated deflections are not acceptable.

B. Type FSN (Floor Spring and Neoprene):

1. FSN Isolators: freestanding and laterally stable without any housing; spring diameter not less than 0.8 of compressed height of spring at rated load; minimum spring additional travel-to-solid equal to 50% of rated deflection. Springs designed with a ratio of

horizontal stiffness to vertical stiffness of approximately one. Provide leveling bolts for all mounts.

2. Spring element in isolator set in a neoprene cup with a steel washer or a flat surface in contact with the neoprene to distribute load evenly over bearing surface of neoprene. Alternatively, each isolator mounted on a Type NP isolator. If NP isolator is used, provide a rectangular bearing plate of appropriate size to load pad uniformly within manufacturer's recommended range. If isolator is to be fastened to building and NP isolator is used, provide neoprene grommets for each bolt hole in base plate.
3. If basic spring isolator has a neoprene friction pad on its base and an NP isolator is to be added to the base, provide a galvanized steel, stainless steel or aluminum plate between the friction pad and the NP isolator. Galvanized steel plate not acceptable for outdoor use. Permanently adhere NP isolator, separator plate and friction pad to one another and to bottom of bearing plate.

C. Type FSNTL (Floor Spring and Neoprene Travel Limited):

1. Spring isolators shall be free-standing and laterally stable without any housing. Spring diameter shall be not less than 0.8 of the compressed height of the spring at the rated load. Spring shall have a minimum additional travel-to-solid equal to 50% of the rated deflection. Springs shall be so designed that the ratio of horizontal stiffness is approximately 1 (one). All mounts shall have leveling bolts. All mounts shall have vertical travel limit stops to control extension when weights is removed. The travel limit stops shall be capable of serving as blocking during erection of the equipment. A minimum clearance of 1/4" shall be maintained around restraining bolts and between the limit stops and the spring to avoid interference with the spring action.
2. The spring element in the isolator shall be set in a neoprene cup and have a steel washer or a flat surface in contact with the neoprene to distribute the load evenly over the bearing surface of the neoprene. Alternatively, each isolator shall be mounted on a Type NP isolator. If the NP isolator is used, a rectangular bearing plate of appropriate size shall be provided to load the pad uniformly within the manufacturer's recommended range. If the isolator is to be fastened to the building and the NP isolator is used, neoprene grommets shall be provided for each bolt hole in the base plate.
3. If the basic spring isolator has a neoprene friction pad on its base and an NP isolator is to be added to the base, a galvanized steel, stainless steel or aluminum plate shall be used between the friction pad and the NP isolator. If the isolator is outdoors, the plate shall not be made of galvanized steel. The NP isolator separator plate and friction pad shall be permanently adhered to one another and to the bottom of the bearing plate.

D. Type HSN (Hanger Spring and Neoprene):

1. HSN Vibration Isolation Hangers: free standing and laterally stable steel spring and a neoprene element in series, contained within a steel housing. Spring diameter and hanger housing lower hole sizes large enough to permit hanger rod to swing through a 30 degree arc before contacting housing. Alternatively, make other provisions to allow for a 30 degree arc of movement of bottom hanger rod without contacting isolator housing.

2. Spring diameter not less than 0.8 of compressed height of spring at rated load; minimum spring additional travel-to-solid equal to 50% of rated deflection. Design neoprene element with a 0.3-inch minimum static deflection. Include deflection of both spring element and neoprene element in determining overall deflection of Type HSN isolators.

E. Type HN (Hanger Neoprene):

1. HN Vibration Isolation Hangers: neoprene-in-shear element contained within a steel housing. Provide a neoprene neck bushing where the hanger rod passes through hanger housing to prevent rod from contacting hanger housing. Hole diameter in housing sufficient to permit hanger rod to swing through a 30-degree arc before contacting hanger housing.

F. Type FN (Floor Neoprene): FN Neoprene Isolators: neoprene-in-shear type with steel reinforced top and base. All metal surfaces covered with neoprene; top and bottom surfaces ribbed. Provide bolt holes in base and a threaded fastener in top. Provide leveling bolts for mounts that may be rigidly connected to equipment.

G. Type NP (Neoprene Pad): NP Neoprene Pad Isolators: one layer of 1/4-inch to 3/8-inch thick ribbed or waffled neoprene; sized to be loaded within manufacturer's recommended range.

2.03 EQUIPMENT BASES

A. Type BIB (Base - Inertia Base): Form of stone-aggregate concrete (150 lb./cu.ft.) and appropriate steel reinforcing cast between welded or bolted perimeter structural steel channels. Inertia bases built to form a rigid base that will not twist, rack, deform, deflect, or crack in any manner which will negatively affect operation of supported equipment or vibration isolation mounts. Inertia bases adequately sized to support basic equipment and motors plus any associated pipe elbow supports, duct elbow supports, electrical control elements, or other components closely related and requiring resilient support in order to prevent vibration transfer to building structure. Inertia base depth a minimum of 1/12 the longest dimension of inertia base, but not less than 6 inches nor more than 12 inches. Base footprint of sufficient size to provide stability for supported equipment.

1. Include side mounting brackets on inertia base for attachment to vibration isolators; locate on sides of base parallel to the axis of rotation of supported equipment.

2.04 RESILIENT PENETRATION SLEEVE/SEAL

A. Resilient Penetration Sleeve/Seals: field-fabricated from pipe or sheet metal 1/2-inch to 3/4-inch larger than penetrating element in all directions around element, used to provide a sleeve through construction penetrated. Sleeve to extend 1-inch beyond penetrated construction on each side. Pack space between sleeve and penetrating element with glass fiber or mineral wool to within 1/4-inch of ends of sleeve; full remaining 1/4 inch space on each end with acoustical sealant to form an airtight seal. Penetrating element to pass through sleeve without contact.

B. Alternatively, prefabricated sleeves accomplishing same result are acceptable.

2.05 RESILIENT LATERAL GUIDES

- A. Resilient Lateral Guides: incorporate neoprene isolation elements similar to Type FN specifically designed to provide resilient lateral bracing of ducts or pipes. Standard product of vibration isolation mounting manufacturer or custom fabricated from standard components.

2.06 FLEXIBLE PIPE CONNECTIONS

- A. Flexible Pipe Connections: fabricated of multiple plies of nylon cord, fabric, and neoprene; vulcanized so as to become inseparable and homogeneous; formed in a double sphere shape; able to accept compressive, elongating, transverse, and angular movements.
- B. Select and specially fit flexible connections, if necessary, to suit system temperature, pressure, and fluid type. Select flexible connections which do not require rods or cables to control extension of connector.
- C. Connectors for pipe sizes 2-inch or smaller to have threaded female union couplings on each end. Larger sizes fitted with metallic flange couplings.

2.07 THRUST RESTRAINTS

- A. Thrust Restraints: spring element in series with a neoprene pad; designed to have same deflection due to thrust-generated loads as specified for isolators supporting equipment. Spring element contained within a steel frame and designed to be precompressable at factory to allow for a maximum of 1/4-inch movement during starting or stopping of equipment. Allowable movement field-adjustable. Furnish thrust restraints complete with rods and angle brackets for attachment to both the equipment and the adjacent fixed structural anchor. Install thrust restraints on discharge of fan with restraint rods in tension. Thrust restraints that place rods in compression are not acceptable. Oversize holes in spring restraint brackets through which restraint rods pass to prevent contact between brackets and rods.

2.08 GROMMETS

- A. Grommets: factory fabricated "Isogrommets" or custom made by combining a neoprene washer and sleeve; sized to be loaded within manufacturer's recommended load range; specially formed to prevent bolts from directly contacting isolator base plate.

2.09 ACOUSTICAL SEALANT

- A. Acoustical Sealant: silicone or one of the nonsetting sealants listed in 2.01 Acceptable Manufacturers.

2.10 SEISMIC CONTROLS

- A. General: Design seismic equipment to safely accept, distribute, and transfer external seismic forces in any direction, without failure or permanent displacement. Calculate the seismic force (F_p) using equations and coefficients in the IBC 2003 Building Code, for Seismic Hazard Exposure Group III, to maintain the equipment in a captive position, and not short circuit isolation during normal operating conditions. Isolators to have provisions for bolting and welding to structure.

1. Provide attachment plates to be cast into housekeeping pads, concrete inserts, beam clamps, etc., that may be required for seismic compliance.
- B. Seismic Restraints - Type I: Comply with general characteristics of Type FSN spring isolators with the following additional features: Incorporate snubbing restraint in all directions, and capable of supporting equipment at fixed elevations during installation. Cast or aluminum housings, except ductile iron, are not acceptable.
1. Product: Mason Industries, Type SSLFH
- C. Seismic Restraints - Type II: Minimum 5/8-inch thick all-directional resilient pad limit stop; fabricated of plate, structural members or square metal tubing. Angle bumpers are not acceptable.
1. Product: Mason Industries, Type Z 1011 or Type Z 1225
- D. Seismic Restraints - Type III: Multiple metal cable type with approved fastening devices to equipment and structure. Field bolt system to deck or overhead structural members using two sided beam clamps or appropriately designed concrete inserts. All parts of system including cables (excluding fasteners) to be from same manufacturer.
1. Product: Mason Industries, Type SCB
- E. Seismic Restraints - Type IV: Double deflection neoprene isolator (min. 0.3 inch) encased in ductile iron or steel casing.
1. Mason Industries, Type BR or Type RBA

3.01 GENERAL

- A. Install isolation and seismic restraint systems in strict accordance with manufacturer's written instructions. Vibration isolators shall not cause any change of position of equipment resulting in stress on equipment connections.
- B. Anchor mounts, isolators, hangers, and snubbers to vibration isolation bases. Bolt isolator baseplates to structural floors as required by authorities having jurisdiction.

3.02 VIBRATION ISOLATION EQUIPMENT INSTALLATION

- A. Isolate equipment in accordance with Vibration Isolation Schedule at end of this Section.
- B. Mount vibration isolators and/or bases on housekeeping pads.
- C. Install flexible pipe connections at all pipe connections to vibration-isolated equipment, including chillers, pumps and elsewhere as shown on contract drawings.
- D. Electrical connections to vibration-isolated equipment to be flexible, as specified in Division 16.
- E. Install thrust restraints on all suspended fans, and on all floor-mounted fans developing 4-inches or more of static pressure, unless horizontal component of the thrust force can be

demonstrated to be less than 10% of equipment weight. Attach thrust restraints on each side of fan at vertical centerline of thrust. The two rods of thrust restraint to be parallel to thrust force. Adjust thrust restraints to constrain equipment movement to specified limit.

- F. Miscellaneous Mechanical Equipment: vibration-isolate miscellaneous pieces of mechanical equipment such as converters, dryers, strainers, storage tanks, expansion tanks, etc. which are connected to isolated piping systems, from building structure by Type NP or Type HN isolators (selected for 0.1-inch static deflection) unless their position in piping system requires a higher degree of isolation as called for under Piping and Ductwork Isolation.
- G. Additional requirements:
1. Maintain a minimum operating clearance under inertia bases of two inches.
 2. Maintain a minimum operating clearance under other bases of one inch.
 3. Place all bases in position and temporarily support by blocks or shims, as appropriate, prior to installation of equipment, isolators and restraints.
 4. Install isolators without raising equipment.
 5. After the entire installation is complete, and under full operational load, adjust isolators so that load is transferred from the blocks to the isolators. When isolators are properly adjusted, remove blocks. Remove all debris from beneath equipment and verify that there are no short circuits of the isolation. The equipment shall be free in all directions.
 6. Install equipment with flexibility in wiring.
- H. Isolators:
1. Align all vibration isolators squarely above or below mounting points of supported equipment.
 2. Locate isolators for equipment with bases on sides of bases which are parallel to equipment shaft unless this is not possible due to physical constraints.
 3. Locate isolators to provide stable support for equipment, without excess rocking. Consider location of center of gravity of system and location and spacing of isolators. If necessary, provide a base with suitable footprint to maintain stability of supported equipment, whether or not such a base is specifically called for herein.
 4. Where a housekeeping pad is provided, isolators shall bear on housekeeping pad and isolator base plates shall rest entirely on housekeeping pad.
 5. Connect hanger rods for vibration-isolated support to structural beams or joists, not the floor slab between beams and joists. Provide suitable intermediate support members as necessary.

6. Position vibration isolation hanger elements as high as possible in hanger rod assembly, but not in contact with building structure, and allowing hanger housing to rotate a full 360 degrees about rod axis without contacting any object.
7. Parallel running pipes may be hung together on a trapeze isolated from building. Isolator deflections must be the greatest required by provisions for pipe isolation for any single pipe on trapeze. Do not mix isolated and unisolated pipes on same trapeze.
8. Pipes, ducts and equipment shall not be supported from other pipes, ducts and equipment.
9. Resiliently isolated pipes, ducts and equipment shall not come in rigid contact with the building construction or rigidly supported equipment.
10. Adjust all leveling bolts and hanger rod bolts so that isolated equipment is level and in proper alignment with connecting ducts or pipes.

I. Bases:

1. No equipment shall bear directly on vibration isolators unless its own frame is suitably rigid to span between isolators and such direct support is approved by equipment manufacturer. This provision shall apply whether or not a base frame is called for on the schedule. In the case that a base frame is required for the unit because of the equipment manufacturer's requirements and is not specifically called for on the equipment schedule, provide a base frame as recommended by the equipment manufacturer at no additional expense.

3.03 PIPING AND DUCTWORK ISOLATION

- A. Isolate piping from building structure by means of vibration isolators, resilient lateral supports, and resilient penetration sleeve/seals, in accordance with this Article 3.03.
- B. Isolate the following piping and ductwork:
 1. Piping within mechanical rooms.
 2. Piping within 50 feet total pipe length of connected vibration-isolated equipment (pumps, air handling units, etc.).
 3. HVAC piping that is larger than 4-inches.
- C. Isolators for the first three support points adjacent to connected equipment to achieve one half the specified static deflection of the isolators supporting the connected equipment. When required static deflection of equipment isolators is greater than 1/2-inch, provide Type FSN or HSN isolators. When required static deflection of equipment isolators is less than or equal to 1/2-inch, provide Type FN or HN isolators. All other pipe support isolators within the specified limits to be either Type FN or HN achieving at least 1/4-inch static deflection.
- D. Where lateral support of pipes is required, provide resilient lateral supports.
- E. Install isolators with hanger box attached to, or hung as close as possible to structure. Hanger rods shall not short circuit hanger box.

- F. Suspend isolators from substantial structural member sized for 0.08 inch deflection at center of span, not from slab diaphragm, unless specifically permitted.

3.04 SEISMIC RESTRAINTS

A. Installation:

1. Bolt or weld floor mounted equipment, whether isolated or not, to structure to allow for required acceleration. Follow bolt points, diameter of inserts, imbedment depth and weld length as shown on approved submittal drawings in all respects.
2. Provide suspended equipment with four point independently braced Type III restraints, installed taut for non-isolated equipment, piping, or ductwork, and slack with 1/2-inch cable deflection for isolated equipment.
 - a. Brace piping, Schedule 10, 20, 40 or 80, welded or Victaulic, at a maximum of 40 foot intervals and at turns of more than 4 feet. Provide lateral bracing at 80 foot intervals.
 - b. Brace ductwork a maximum of every 30 feet and at every turn and run end. Provide lateral bracing every 60 feet.
3. Provide Type II restraints at each corner or side of equipment base.
4. Seismic restraints are not required on the following:
 - a. Piping in Mechanical Equipment Room less than 1-1/4-inch inside diameter.
 - b. Piping in other areas less than 2-1/2-inch inside diameter.
 - c. Ducts less than 6 square feet in cross sectional area.
 - d. Piping suspended by individual hangers 12-inches or less in length from top of pipe support to supporting structure.
 - e. Ducts suspended by individual hangers 12-inches or less in length from top of duct to supporting structure.
5. Where base anchoring of equipment is insufficient to resist seismic forces, locate restraints such as Type III above center of gravity of equipment to suitably resist "G" forces.
6. For overhead support equipment, overstress of building structure must not occur. Brace from flanges of structural beams.
7. Pipe risers through cored shafts require no additional seismic bracing. (Core diameters to be a maximum of 2-inches larger than pipe outside diameter.)

B. Non-isolated Equipment Installation:

1. Restraint Type III or IV.
 - a. Suspended pipe and duct not excluded by diameter or distance from structure allowances. Where VAV boxes are rigidly attached to duct (no flex) they shall be considered ductwork.
 - b. Suspended equipment, including, but not limited to, fans, VAV boxes and unit heaters.
 - c. Floor mounted equipment.

2. Restraint Type III: Diffusers in acoustical tile ceilings to be four point independently cable braced.

3.05 FIELD QUALITY CONTROL

- A. Should any rotating equipment cause excessive noise or vibration when properly installed on specified isolators, rebalance, realign, or perform other remedial work required to reduce noise and vibration levels. Excessive is defined as exceeding manufacturer's specifications for equipment in question.
- B. Upon completion of installation of all vibration isolation and seismic restraint devices, provide the services of a factory trained manufacturer's representative to inspect completed project and certify in writing to Contractor that all systems are installed properly, or require correction. Contractor shall submit a report to the Architect, including manufacturer's representative's report. Certify correctness of installation or detail corrective work to be done.
- C. Make adjustments as directed by the Architect at time of inspection prior to Substantial Completion.

3.06 VIBRATION ISOLATION SCHEDULE

Equipment	Isolator		Base Type	Remarks
	Type	Min. Defl.*		
Base Mounted Pumps	FSN	2.5	BIB	
Chillers	FN	0.4	--	
Suspended Air Handling Units	HSN	1.5		
Suspended Air Conditioning Units	HSN	0.75		
Suspended Fan Coil Units	HN	0.35		
Roof Mounted Exhaust Fans	BC-2	0.75	--	
Fans within Air Handling Units	FSN	1.5	BSF	Internal by Unit Manufacturer
Air Cooled Condensers	FSNTL	0.75	--	
Domestic Water booster Pumps	FN	0.25	--	
Inline Centrifugal Fan	HSN	0.5	--	

* Minimum Static Deflection (inches)

END OF SECTION 15070