SECTION 400596 - VIBRATION AND SEISMIC CONTROLS FOR PROCESS EQUIPMENT

Note that this section has only been edited for NYSOGS standardization and has not been technically edited. The designer shall make all technical edits specific to the project for this section.

This Section specifies inertia bases and vibration isolation equipment used for vibration isolation and seismic control, for equipment specified for water and wastewater plants.

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

Inertia bases.

Open-spring isolators.

Restrained-spring isolators.

Closed-spring isolators.

Restrained, closed-spring isolators.

Pad isolators.

Flexible connections.

Seismic snubbers.

* + - * 1. Related Requirements:

List other Sections directly related to or affecting Work of this Section. Include Sections specifying information expected to be found in this Section as well as Sections required to describe complete system or assembly requirements.

Section 033000 - Cast-in-Place Concrete: Execution and product requirements for concrete for placement by this Section.

Section 400507 - Hangers and Supports for Process Piping: Execution and product requirements for pipe hangers and supports.

* + - 1. PREINSTALLATION MEETINGS
         1. Convene minimum [**one week**] <**\_\_\_\_\_\_\_\_**> [**weeks**] prior to commencing Work of this Section.
      2. 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. Product Data:

Submit schedule of vibration isolator type with location and load on each.

Submit catalog information indicating materials and dimensional data.

* + - * 1. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

Include separate Paragraphs for additional certifications.

Include following Paragraph when Contractor is responsible for designing products or assemblies. List affected products when Section specifies more than one product.

* + - * 1. Delegated Design Submittals: Submit signed and sealed Shop Drawings with design calculations and assumptions verifying that maximum sound levels will not be exceeded.
        2. Manufacturer Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures.
        3. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
        4. Qualifications Statements:

Coordinate following Subparagraphs with requirements specified in QUALIFICATIONS Article.

Submit qualifications for manufacturer, installer, and licensed professional.

Submit manufacturer's approval of installer.

* + - 1. CLOSEOUT SUBMITTALS
         1. Project Record Documents: Record actual locations of hangers, including attachment points.
      2. QUALITY ASSURANCE

Include this Article to specify compliance with overall reference standards affecting products and installation included in this Section.

In following Paragraph insert "State of New York Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

* + - * 1. Perform Work according to <**\_\_\_\_\_\_\_\_**> standards.

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

* + - * 1. Maintain <**\_\_\_\_\_\_\_\_**> [**copy**] [**copies**] of each standard affecting Work of this Section on Site.
      1. QUALIFICATIONS

Coordinate following Paragraphs with requirements specified in SUBMITTALS Article.

* + - * 1. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum [**three**] <**\_\_\_\_\_\_\_\_**> years' [**documented**] experience.
        2. Installer: Company specializing in performing Work of this Section with minimum [**three**] <**\_\_\_\_\_\_\_\_**> years' [**documented**] experience [**and approved by manufacturer**].
        3. Licensed Professional: [**Professional engineer**] <**\_\_\_\_\_\_\_\_**> experienced in design of specified Work and licensed In New York State.
      1. DELIVERY, STORAGE, AND HANDLING
         1. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
         2. Store materials according to manufacturer instructions.
         3. Protection:

Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.

Provide additional protection according to manufacturer instructions.

* + - 1. EXISTING CONDITIONS
         1. Field Measurements:

Verify field measurements prior to fabrication.

Indicate field measurements on Shop Drawings.

* + - 1. WARRANTY

This Article extends warranty period beyond one year. Extended warranties may increase construction costs and State enforcement responsibilities. Specify warranties with caution.

* + - * 1. Furnish [**five**] <**\_\_\_\_\_\_\_\_**>-year manufacturer's warranty for inertia bases.

1. PRODUCTS
   * + 1. PERFORMANCE REQUIREMENTS
          1. Provide vibration isolation on motor-driven equipment over 0.5 hp, plus connected piping.
          2. Minimum Static Deflection of Equipment Isolators:

Basement, under 20 hp:

Under 400 rpm: <**\_\_\_\_\_\_\_\_**>.

400 to 600 rpm: 1 inch.

600 to 800 rpm: 0.5 inch.

800 to 900 rpm: 0.2 inch.

1,100 to 1,500 rpm: 0.14 inch.

Over 1,500 rpm: 0.1 inch.

Basement, over 20 hp:

Under 400 rpm: <**\_\_\_\_\_\_\_\_**>.

400 to 600 rpm: 2 inch.

600 to 800 rpm: 1 inch.

800 to 900 rpm: 0.5 inch.

1,100 to 1,500 rpm: 0.2 inch.

Over 1,500 rpm: 0.15 inch.

Upper Floors:

Under 400 rpm: <**\_\_\_\_\_\_\_\_**>.

400 to 600 rpm: <**\_\_\_\_\_\_\_\_**>.

600 to 800 rpm: 3.5 inches.

800 to 900 rpm: 2 inches.

1,100 to 1,500 rpm: 1 inch.

Over 1,500 rpm: 0.5 inch.

* + - * 1. Use concrete inertia bases for motors in excess of 40 hp and on base-mounted pumps, blowers, and compressors over 10 hp.
      1. INERTIA BASES
         1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=12925&mf=04&src=wd):

designer to provide two manufacturers and approved equivalent for all listed products.

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

In following Subparagraph insert "State of New York Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

Furnish materials according to <**\_\_\_\_\_\_\_\_**> standards.

Insert descriptive specifications below to identify Project requirements and to eliminate conflicts with products specified above.

* + - * 1. Structural Bases:

Design: Sufficiently rigid to prevent misalignment or undue stress on machine and to transmit design loads to isolators and snubbers.

Construction: Welded structural steel with gusset brackets, supporting equipment, and motor with slide rails.

* + - * 1. Concrete Inertia Bases:

Mass: Minimum of 1.5 times weight of isolated equipment.

Construction: Structured steel channel perimeter frame, with gusset brackets and anchor bolts, adequately reinforced, and concrete filled.

Connecting Point: Reinforced to connect isolators and snubbers to base.

Concrete: Reinforced 3,000-psi concrete.

* + - 1. OPEN-SPRING ISOLATORS
         1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=12926&mf=04&src=wd):

designer to provide two manufacturers and approved equivalent for all listed products.

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

In following Subparagraph insert "State of New York Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

Furnish materials according to <**\_\_\_\_\_\_\_\_**> standards.

Insert descriptive specifications below to identify Project requirements and to eliminate conflicts with products specified above.

* + - * 1. Description:

Exterior and Humid Areas: Furnish hot-dip galvanized housings and neoprene-coated springs.

Code: Color-code springs based on load-carrying capacity.

* + - * 1. Springs:

Minimum Horizontal Stiffness: 75 percent of vertical stiffness.

Working Deflection: Between 30 and 60 percent of maximum deflection.

* + - * 1. Spring Mounts:

Furnish leveling devices.

Sound Pads:

Material: Neoprene.

Minimum Thickness: 0.25 inch.

Hardware: Zinc-chromate-plated.

* + - * 1. Sound Pads:

Size for minimum deflection of 0.05 inch.

Meet requirements for pad isolators.

* + - 1. RESTRAINED-SPRING ISOLATORS
         1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=12927&mf=04&src=wd):

designer to provide two manufacturers and approved equivalent for all listed products.

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

In following Subparagraph insert "State of New York Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

Furnish materials according to <**\_\_\_\_\_\_\_\_**> standards.

Insert descriptive specifications below to identify Project requirements and to eliminate conflicts with products specified above.

* + - * 1. Description:

Exterior and Humid Areas: Furnish hot-dip galvanized housings and neoprene-coated springs.

Code: Color-code springs based on load-carrying capacity.

* + - * 1. Springs:

Minimum Horizontal Stiffness: 75 percent of vertical stiffness.

Working Deflection: Between 30 and 60 percent of maximum deflection.

* + - * 1. Spring Mounts:

Furnish leveling devices.

Sound Pads:

Material: Neoprene.

Minimum Thickness: 0.25 inch.

Hardware: Zinc-chromate-plated.

* + - * 1. Sound Pads:

Size for minimum deflection of 0.05 inch.

Meet requirements for pad isolators.

* + - * 1. Restraint: Furnish mounting frame and limit stops.
      1. CLOSED-SPRING ISOLATORS
         1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=12928&mf=04&src=wd):

designer to provide two manufacturers and approved equivalent for all listed products.

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

In following Subparagraph insert "State of New York Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

Furnish materials according to <**\_\_\_\_\_\_\_\_**> standards.

Insert descriptive specifications below to identify Project requirements and to eliminate conflicts with products specified above.

* + - * 1. Description:

Type: Closed-spring mount with top and bottom housing separated by neoprene rubber stabilizers.

Exterior and Humid Areas: Furnish hot-dip galvanized housings and neoprene-coated springs.

Code: Color-code springs based on load-carrying capacity.

* + - * 1. Springs:

Minimum Horizontal Stiffness: 75 percent of vertical stiffness.

Working Deflection: Between 30 and 60 percent of maximum deflection.

* + - * 1. Housings: Incorporate neoprene isolation pad meeting requirements for neoprene pad isolators, and neoprene side stabilizers with minimum 0.25-inch clearance.
      1. RESTRAINED, CLOSED-SPRING ISOLATORS
         1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=12929&mf=04&src=wd):

designer to provide two manufacturers and approved equivalent for all listed products.

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

In following Subparagraph insert "State of New York Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

Furnish materials according to <**\_\_\_\_\_\_\_\_**> standards.

Insert descriptive specifications below to identify Project requirements and to eliminate conflicts with products specified above.

* + - * 1. Description:

Exterior and Humid Areas: Furnish hot-dip galvanized housings and neoprene-coated springs.

Code: Color-code springs based on load-carrying capacity.

Type: Closed-spring mount with top and bottom housing separated with neoprene rubber stabilizers.

* + - * 1. Springs:

Minimum Horizontal Stiffness: 75 percent of vertical stiffness.

Working Deflection: Between 30 and 60 percent of maximum deflection.

* + - * 1. Housings:

Neoprene Isolation Pad:

Configuration: [**Single layer**] [**1/2-inch-thick waffle pads bonded to each side of 1/4-inch -thick steel plate**].

Material: [**Rubber**] [**Neoprene**].

Hardness: 30 durometer.

Minimum Thickness: 1/2 inch.

Maximum Loading: 40 psi.

Height of Ribs: Not to exceed 70 percent of width.

Neoprene Side Stabilizers: Minimum 0.25-inch clearance, with limit stops.

* + - 1. PAD ISOLATORS
         1. Description:

Configuration: [**Single layer**] [**1/2-inch thick waffle pads bonded to each side of 1/4-inch thick steel plate**].

Material: [**Rubber**] [**Neoprene**].

Hardness: 30 durometer.

Minimum Thickness: 1/2 inch

Maximum Loading: 40 psi

Height of Ribs: Not to exceed 70 percent of width.

* + - * 1. Mount:

Material: Molded rubber.

Design Deflection: 0.5 inch

Insert: Threaded.

* + - * 1. Glass-Fiber Pads: Neoprene-jacketed, precompressed molded glass fiber.
      1. FLEXIBLE CONNECTIONS
         1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=12683&mf=04&src=wd):

designer to provide two manufacturers and approved equivalent for all listed products.

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

In following Subparagraph insert "State of New York Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

Furnish materials according to <**\_\_\_\_\_\_\_\_**> standards.

Insert descriptive specifications below to identify Project requirements and to eliminate conflicts with products specified above.

* + - * 1. Steel Piping:

Inner Hose: [**Carbon steel**] [**Stainless steel**] [**Bronze**] <**\_\_\_\_\_\_\_\_**>.

Exterior Sleeve: [**None**] [**Single-braided**] [**Double-braided**] [**stainless steel**] [**bronze**] <**\_\_\_\_\_\_\_\_**>.

Pressure Rating: [**125-psig WSP and 450 deg. F]** [**200-psig WOG and 250 deg. F]** [**<\_\_\_\_\_\_\_\_> psig at 70 deg. F]**.

Joints: [**Flanged**] [**Threaded**] [**Threaded with union**] [**Welded**] [**As specified for pipe joints**] [**As specified in Section**] <**\_\_\_\_\_\_\_\_\_\_\_\_**>.

Size: [**Use pipe-sized units**] <**\_\_\_\_\_\_\_\_**>.

Maximum Offset: [**3/4**] [**1**] <**\_\_\_\_\_\_\_\_**> inch on each side of installed center line.

* + - * 1. Copper Piping:

Inner Hose: Bronze.

Exterior Sleeve: Braided bronze.

Pressure Rating: [**125-psig WSP and 450 deg. F]** [**200-psig) WOG and 250 deg. F**] [**<\_\_\_\_\_\_\_\_> psig at 70 deg. F**].

Joints: [**Flanged**] [**Threaded**] [**Threaded with union**] [**Soldered**] [**As specified for pipe joints**] [**As specified in Section**] <**\_\_\_\_\_\_\_\_\_\_\_\_**>.

Size: [**Use pipe-sized units**] <**\_\_\_\_\_\_\_\_**>.

Maximum Offset: [**3/4**] [**1**] <**\_\_\_\_\_\_\_\_**> inch on each side of installed center line.

* + - 1. SEISMIC SNUBBERS
         1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=12931&mf=04&src=wd):

designer to provide two manufacturers and approved equivalent for all listed products.

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

In following Subparagraph insert "State of New York Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

Furnish materials according to <**\_\_\_\_\_\_\_\_**> standards.

Insert descriptive specifications below to identify Project requirements and to eliminate conflicts with products specified above.

* + - * 1. Description:

Nondirectional and double-acting unit, consisting of interlocking steel members restrained by neoprene elements.

Neoprene Elements:

Type: Replaceable.

Minimum Thickness: 0.75 inch

Capacity: Four times load assigned to mount groupings at 0.4-inch deflection.

Attachment Points and Fasteners: Capable of withstanding three times rated load capacity of seismic snubber.

1. EXECUTION
   * + 1. EXAMINATION
          1. Verify that equipment and piping is installed before Work of this Section is started.
       2. INSTALLATION
          1. Adjust equipment to proper level.
          2. Install isolation for motor-driven equipment.
          3. Clearance between Housekeeping Pad and Base:

Steel Bases: 1 inch

Concrete Inertia Bases: 2 inches

* + - * 1. Piping Connections:

Prior to making piping connections to equipment with operating weights substantially different from installed weights, block up equipment with temporary shims to final height.

When full load is applied, adjust isolators to load in order to allow shim removal.

* + - * 1. Provide pairs of horizontal limit springs on fans with more than [**6**] <**\_\_\_\_\_\_\_\_**> inches of static pressure and on hanger-supported, horizontally mounted axial fans.

Consider providing seismic snubbers in earthquake areas.

* + - * 1. Snubbers:

Provide resiliently mounted equipment and piping with seismic snubbers.

Provide each inertia base with minimum four seismic snubbers located close to isolators.

Snub equipment designated for post-disaster use to 0.05-inch maximum clearance.

Provide other snubbers with clearance between 0.15 inch and 0.25 inch.

* + - 1. FIELD QUALITY CONTROL
         1. Inspect isolated equipment after installation and submit report, including static deflections.
         2. Ensure that equipment operates under loaded conditions without objectionable sound or vibration.
         3. Equipment Acceptance: Adjust, repair, modify, or replace components failing to perform as specified and rerun tests.
      2. ADJUSTING
         1. Closed-Spring Isolators: Adjust such that side stabilizers are clear under normal operating conditions.
      3. CLEANING
         1. Remove foreign objects that might bridge vibration isolators.
      4. ATTACHMENTS

When relying on separate schedules, tables, illustrations, or forms to specify product requirements, include list of each attachment. Include identical list of attachments in Project Manual table of contents.

Insert attachments following END OF SECTION. Consider following examples when developing Project schedule.

* + - * 1. Equipment Isolation Schedule:

Rotary Drum Screen:

Base:

Type: <**\_\_\_\_\_\_\_\_**>.

Thickness: <**\_\_\_\_\_\_\_\_**>.

Isolator:

Type: <**\_\_\_\_\_\_\_\_**>.

Deflection: <**\_\_\_\_\_\_\_\_**>.

Grit Removal Equipment:

Base:

Type: <**\_\_\_\_\_\_\_\_**>.

Thickness: <**\_\_\_\_\_\_\_\_**>.

Isolator:

Type: <**\_\_\_\_\_\_\_\_**>.

Deflection: <**\_\_\_\_\_\_\_\_**>.

END OF SECTION 400596