

CHAPTER P2
FMS ISOLATOR / RESTRAINTS
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RELEASE DATE: 4/16/04



DUBLIN, OHIO, USA • MISSISSAUGA, ONTARIO, CANADA

Toll Free (USA only): 800-959-1229
 International: 614-889-0480
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P2.0



Kinetics Model FMS

This isolator was developed to handle a variety of seismic zones. The seismic element is placed on the bottom, close to the mounting surface, to minimize the tensile loading generated in the attachment hardware. The isolation element is mounted above the restraint and its size and shape can be varied independently of the restraint's size and shape



Specification

All Direction High Capacity Modular Seismic Isolator

1. Spring Isolators shall be comprised of two interfacing but independent elements, a coil spring element and a seismically rated housing. The spring coil element shall be comprised of one or more coil assemblies having all of the characteristics of free standing coil spring isolators as specified in the vibration isolation portion of the specification. The seismically rated housing shall be sized to match the force requirements applicable to the project and have the capability of accepting coils of various sizes, shapes, capacities and deflections as needed to meet the desired isolation criteria.
2. All spring forces will be contained within the coil/housing assembly and under no external load condition shall spring forces be carried through the restraint anchorage system.
3. The restraint element shall incorporate a steel housing and elastomeric elements at all dynamic contact points. The restraint will allow $\frac{1}{4}$ " motion in any lateral or vertical direction from the neutral position. All elastomeric elements shall be replaceable.
4. To ensure the optimum anchorage capacity, the restraint will have an **overturning factor** (The ratio of the effective lateral snubber height to the short axis anchor spacing) of .33 or less.
5. The leveling nut or screw shall be made accessible for adjustment with the use of a pneumatic or electric impact wrench.
6. The spring element shall be replaceable without having to lift or otherwise remove any supported equipment.
7. Where required, a soft lateral cushioning element shall be fitted that can absorb the minor lateral forces generated by hydraulic or wind loads without contact being made at the main snubbing element.

The isolator shall be Model FMS as manufactured by Kinetics Noise Control or by other manufacturers who can meet the requirements above.

FMS ISOLATOR DESCRIPTION AND SPECIFICATION

PAGE 1 OF 1

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INSTRUCTIONS FOR CONSTRUCTION OF A CAPACITY ENVELOPE:

- 1.) TO GENERATE THE SEISMIC RESTRAINT CAPACITY ENVELOPE, THE HIGHEST ISOLATOR LOAD FOR THE PIECE OF EQUIPMENT UNDER REVIEW IS USED AS A STARTING POINT.
- 2.) DETERMINE WHETHER THE ATTACHMENT IS TO BE TO STEEL, SELECT FIGURE 2, OR CONCRETE, SELECT FIGURE 3.
- 3.) THE VERTICAL RESTRAINT CAPACITY @ THE LOAD DETERMINED IN STEP 1 IS READ FROM CURVE #1 (FIG. 2) OR CURVE #4 (FIG. 3) AND PLOTTED ON THE VERTICAL AXIS OF FIGURE 1.
- 4.) THE HORIZONTAL RESTRAINT CAPACITY @ THE LOAD DETERMINED IN STEP 1 IS READ FROM CURVE #3 (FIG. 2) OR CURVE #6 (FIG. 3) AND PLOTTED ON THE HORIZONTAL AXIS OF FIGURE 1.
- 5.) THE COMBINED RESTRAINT CAPACITY IS THE POINT WHERE VERTICAL & HORIZONTAL CAPACITIES ARE EQUAL. THE COMBINED RESTRAINT CAPACITY @ THE LOAD DETERMINED IN STEP 1 IS READ FROM CURVE #2 (FIG. 2) OR CURVE #5 (FIG. 3). DRAW A HORIZONTAL LINE FROM THIS VALUE ON THE VERTICAL AXIS, AND A VERTICAL LINE FROM THIS VALUE ON THE HORIZONTAL AXIS. THE INTERSECTION POINT IS THE COMBINED CAPACITY POINT FOR THE GIVEN APPLICATION.
- 6.) CONNECT THE VERTICAL RESTRAINT CAPACITY, COMBINED RESTRAINT CAPACITY, AND THE HORIZONTAL RESTRAINT CAPACITY POINTS THAT YOU PLOTTED FOR YOUR APPLICATION. THIS WILL PRODUCE THE RESTRAINT CAPACITY ENVELOPE FOR YOUR APPLICATION.
- 7.) FOR THE RESTRAINT TO BE SUITABLE FOR THE APPLICATION, ALL WORST CASE SEISMIC LOAD COMBINATIONS MUST FALL WITHIN THE RESTRAINT ENVELOPE.

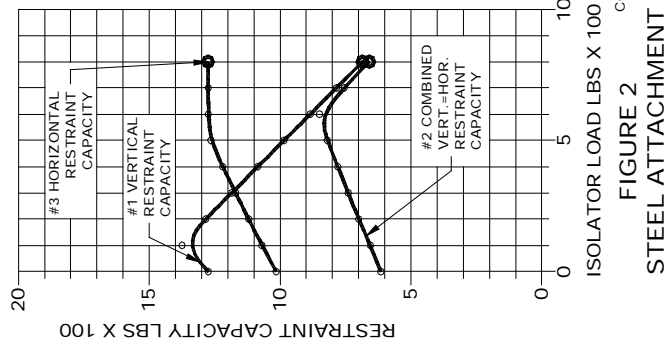


FIGURE 2
STEEL ATTACHMENT

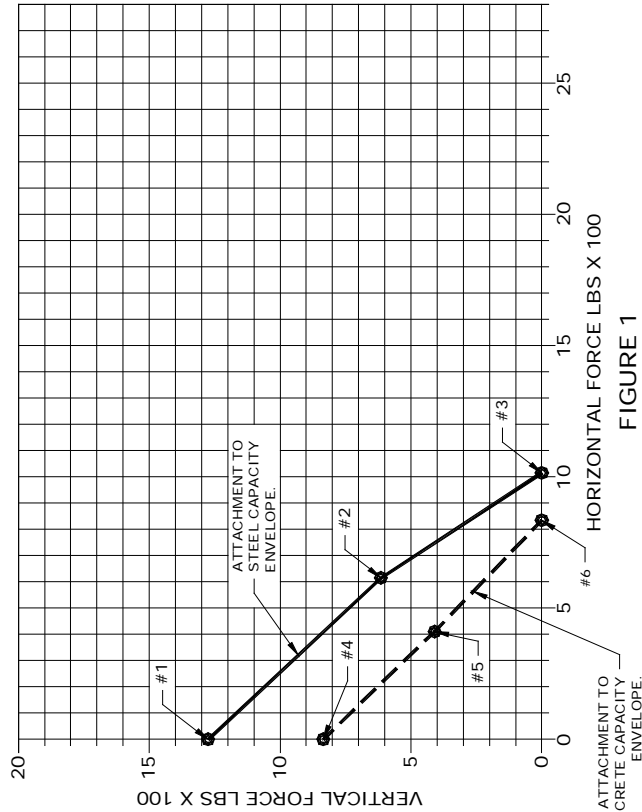


FIGURE 1
RESTRAINT CAPACITY ENVELOPE

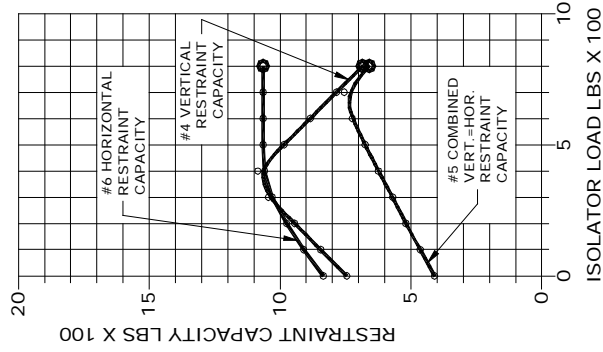


FIGURE 3
CONCRETE ATTACHMENT

FMSAA SUBMITTAL DATA

PAGE 2 OF 2 – DRAWING: S-01-40.100 (2-D DATA)

RELEASE DATE: 4/19/04

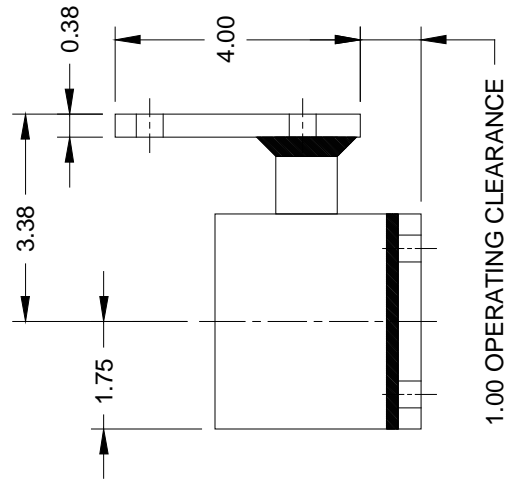
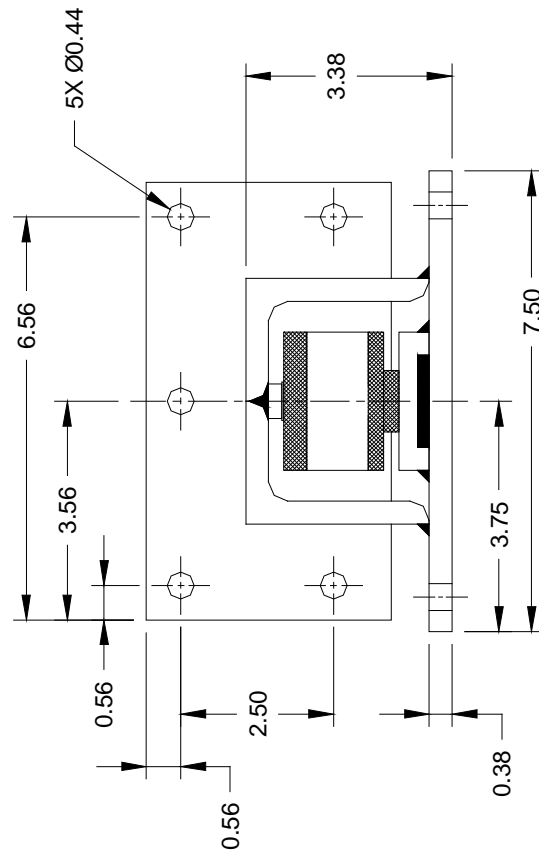
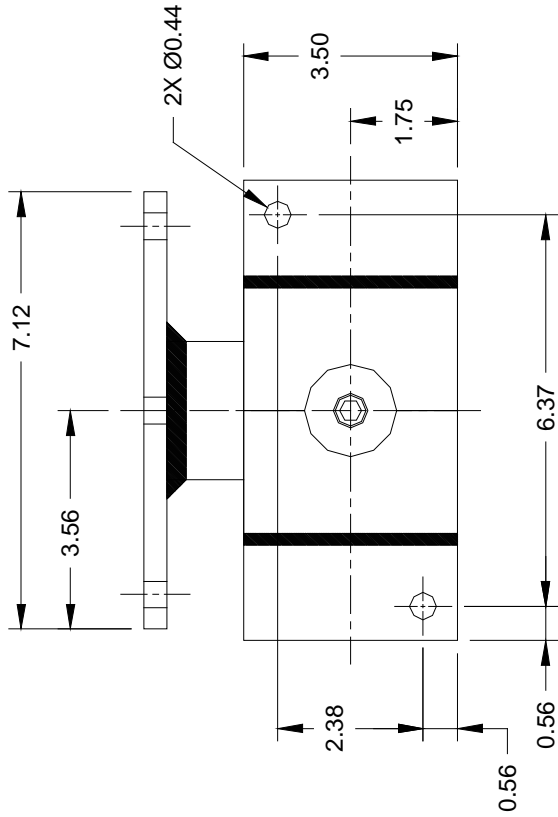


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P2.2.1
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SPECIFICATIONS:

- 1.) 3-AXIS RESTRAINT WITH REPLACEABLE NEOPRENE SNUBBING ELEMENTS.
- 2.) HOT DIPPED GALVANIZED.
- 3.) HOUSINGS MAY BE USED FOR BLOCKING DURING EQUIPMENT ERECTION.
- 4.) CAN BE USED WITH OR WITHOUT SPRING COIL(S).



FMSA SUBMITTAL DATA

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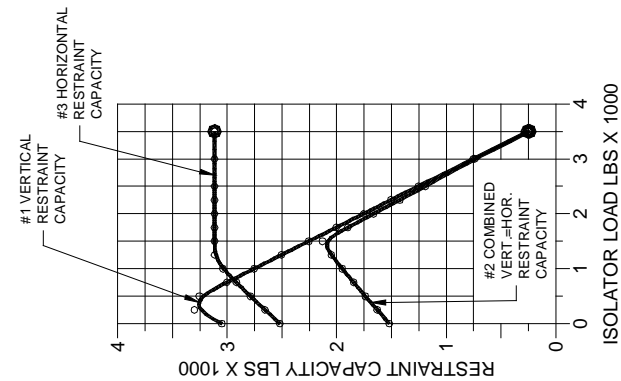


FIGURE 2
STEEL ATTACHMENT

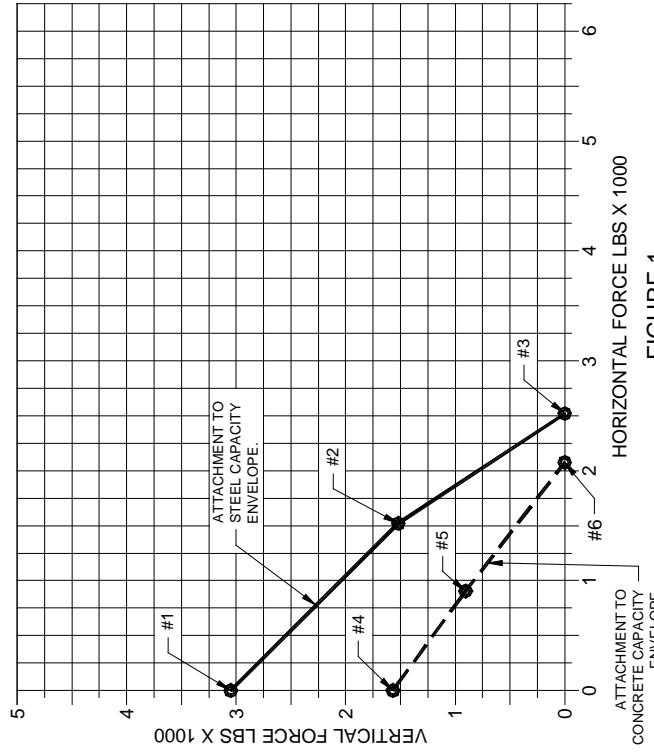


FIGURE 1
RESTRAINT CAPACITY ENVELOPE

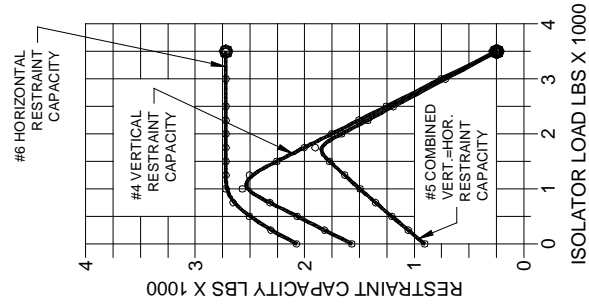


FIGURE 3
CONCRETE ATTACHMENT

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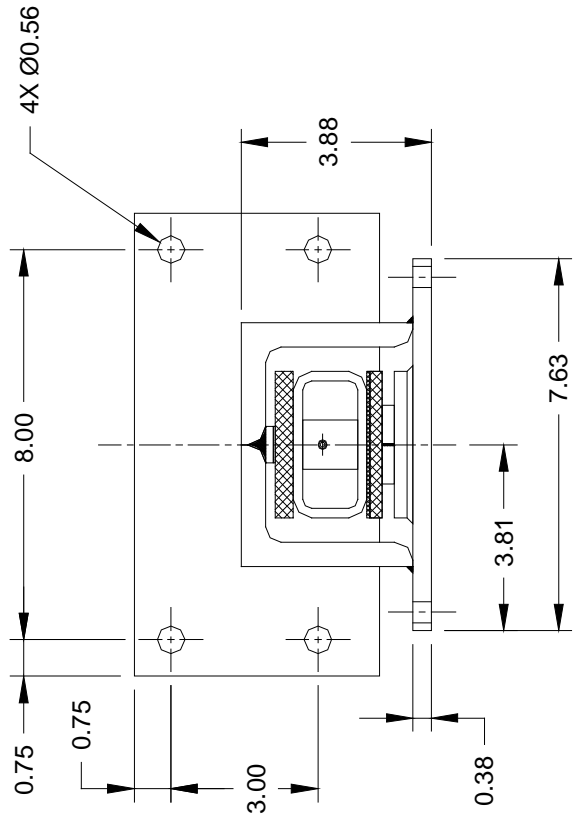
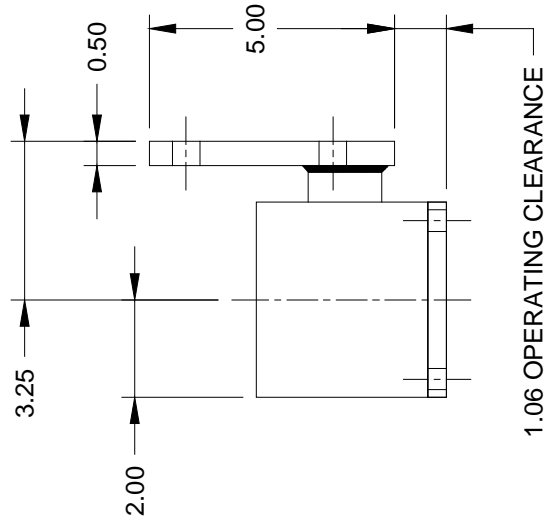
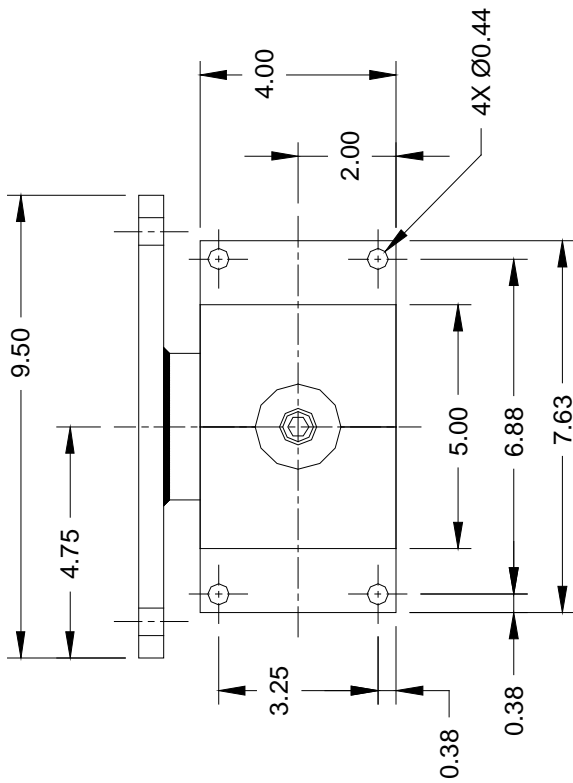
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SPECIFICATIONS:

- 1.) 3-AXIS RESTRAINT WITH REPLACEABLE NEOPRENE SNUBBING ELEMENTS.
- 2.) HOT DIPPED GALVANIZED.
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- 4.) CAN BE USED WITH OR WITHOUT SPRING COIL(S).



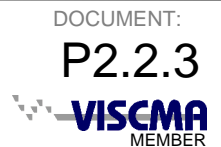
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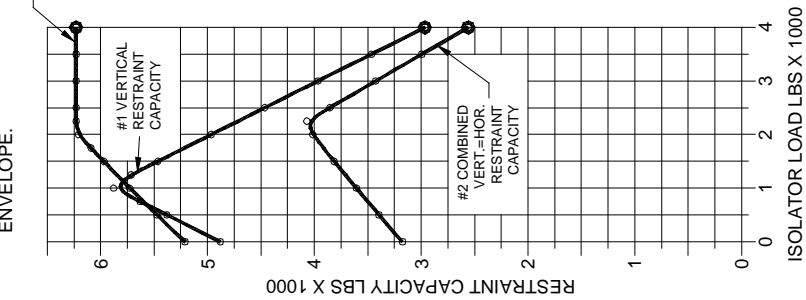


FIGURE 2
RESTRAINT CAPACITY ENVELOPE
STEEL ATTACHMENT

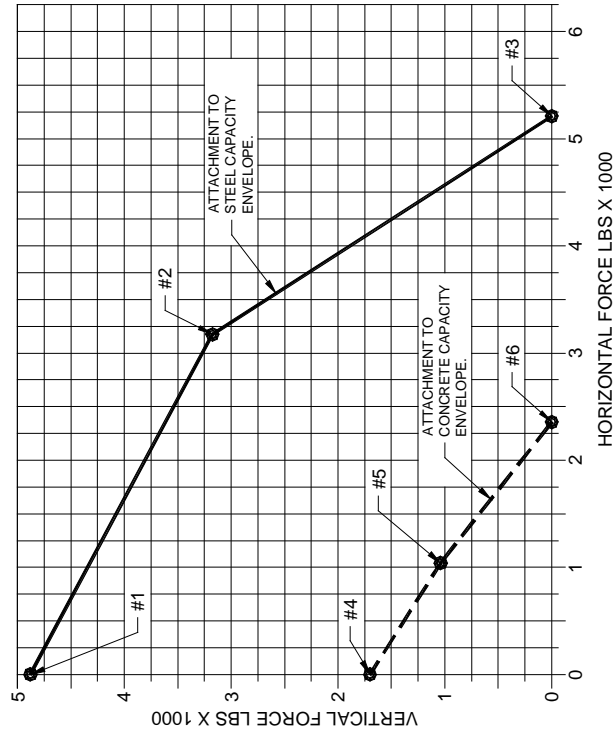


FIGURE 1
RESTRAINT CAPACITY ENVELOPE
CONCRETE ATTACHMENT

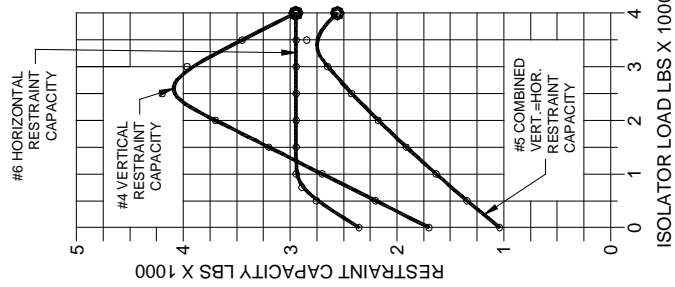


FIGURE 3
RESTRAINT CAPACITY ENVELOPE
CONCRETE ATTACHMENT

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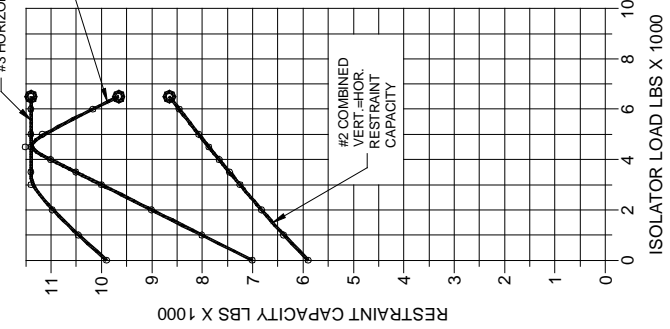


FIGURE 2
STEEL ATTACHMENT

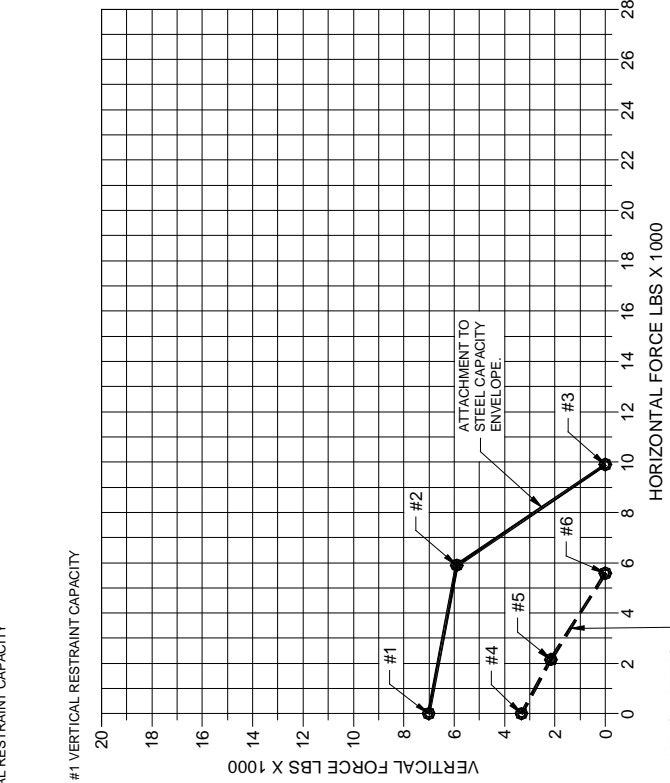


FIGURE 1
RESTRAINT CAPACITY ENVELOPE

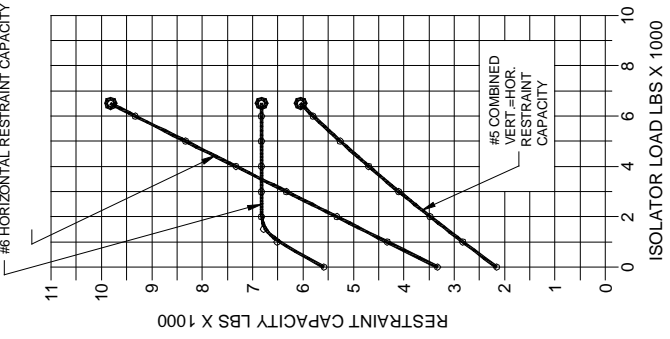


FIGURE 3
CONCRETE ATTACHMENT

FMSC SUBMITTAL DATA

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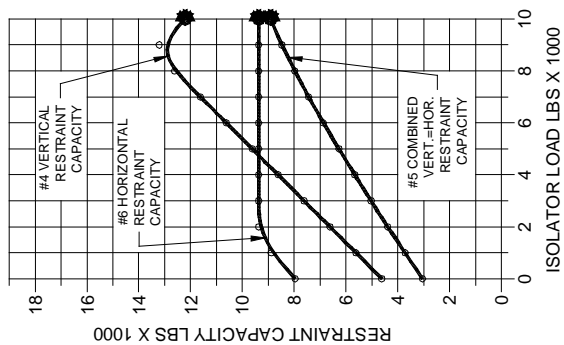


FIGURE 3
CONCRETE ATTACHMENT

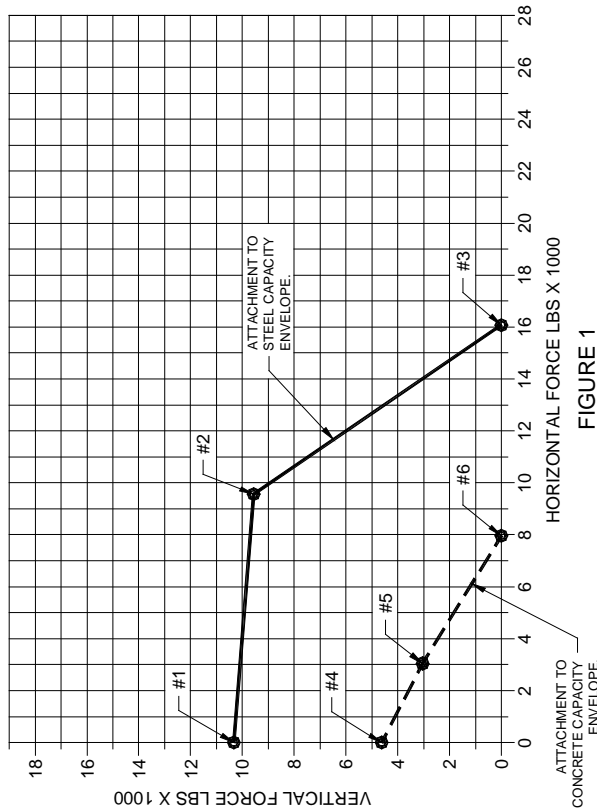


FIGURE 1
RESTRAINT CAPACITY ENVELOPE

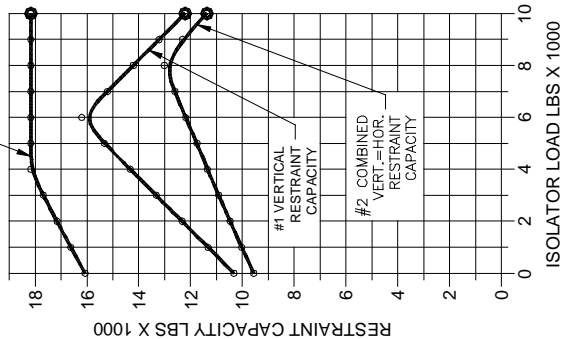


FIGURE 2
STEEL ATTACHMENT

FMSD SUBMITTAL DATA

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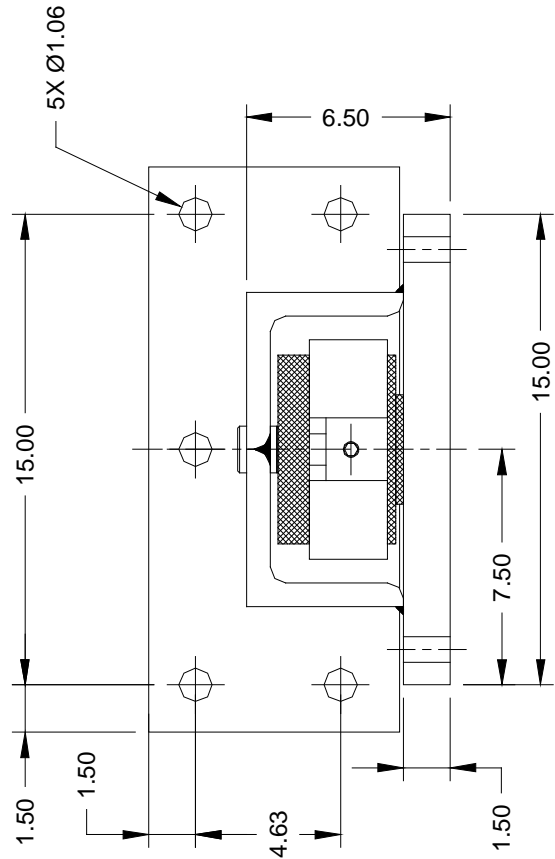
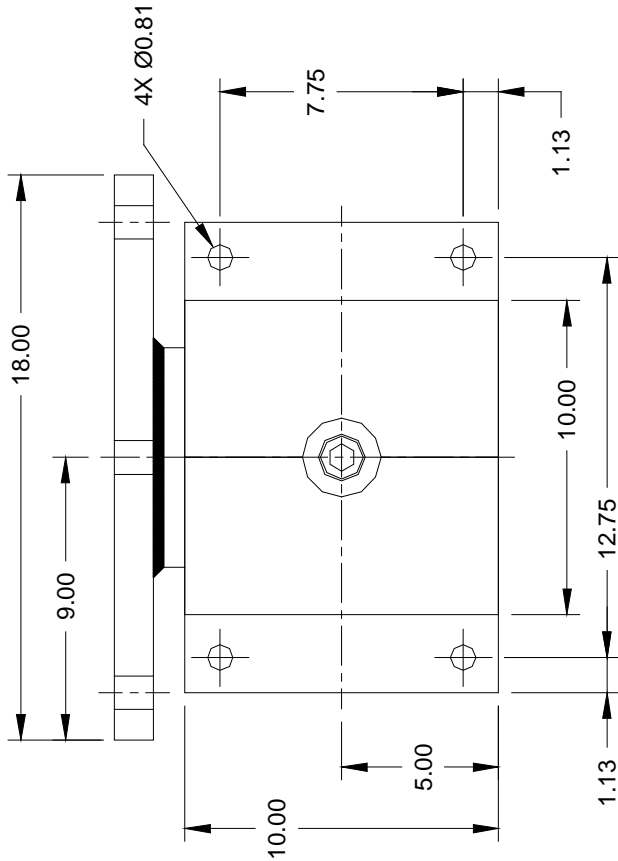


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P2.2.5

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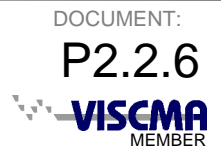
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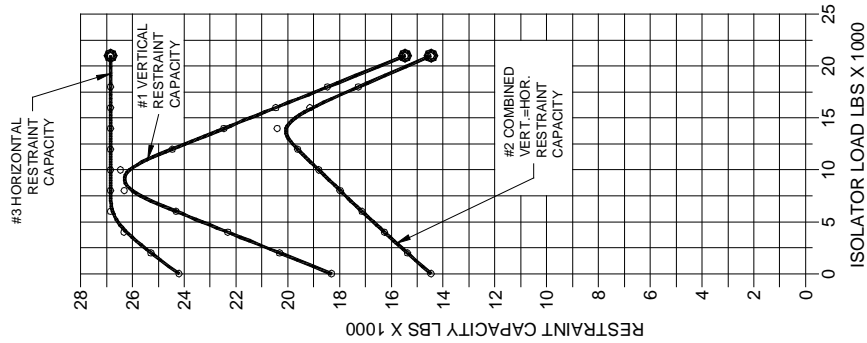


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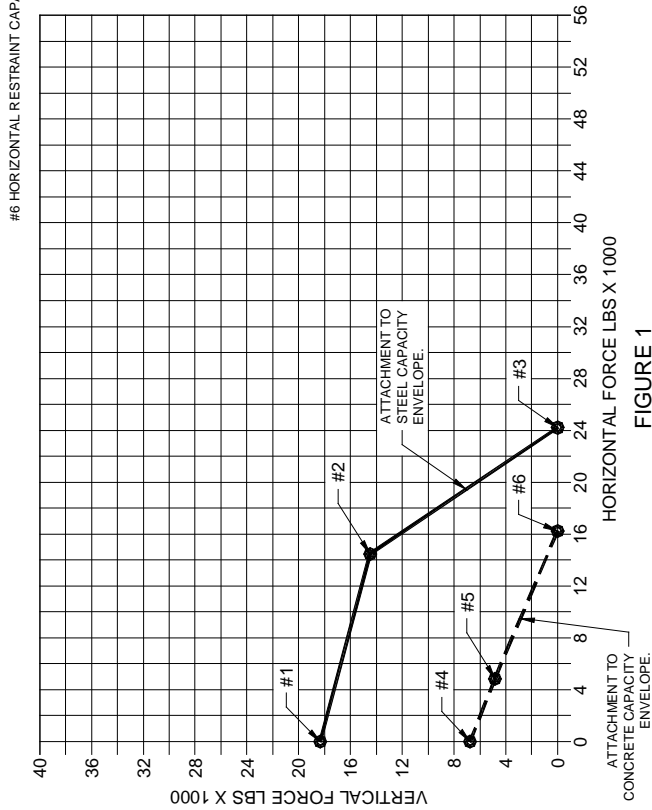


INSTRUCTIONS FOR CONSTRUCTION OF A CAPACITY ENVELOPE:

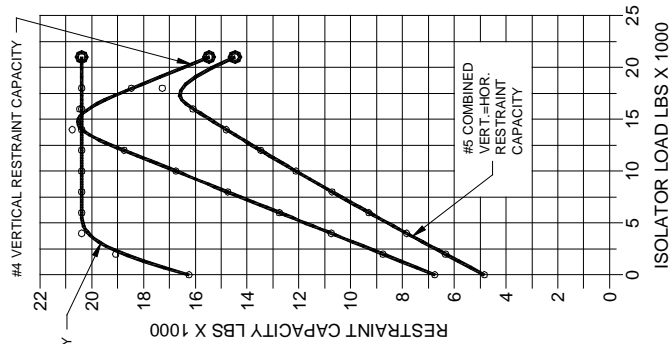
- 1.) TO GENERATE THE SEISMIC RESTRAINT CAPACITY ENVELOPE, THE HIGHEST ISOLATOR LOAD FOR THE PIECE OF EQUIPMENT UNDER REVIEW IS USED AS A STARTING POINT.
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- 3.) THE VERTICAL RESTRAINT CAPACITY @ THE LOAD DETERMINED IN STEP 1 IS READ FROM CURVE #1 (FIG. 2) OR CURVE #4 (FIG. 3) AND PLOTTED ON THE VERTICAL AXIS OF FIGURE 1.
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**FIGURE 2
STEEL ATTACHMENT**



**FIGURE 1
RESTRAINT CAPACITY ENVELOPE**



**FIGURE 3
CONCRETE ATTACHMENT**

FMSE SUBMITTAL DATA

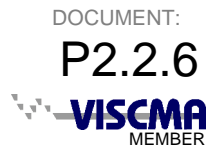
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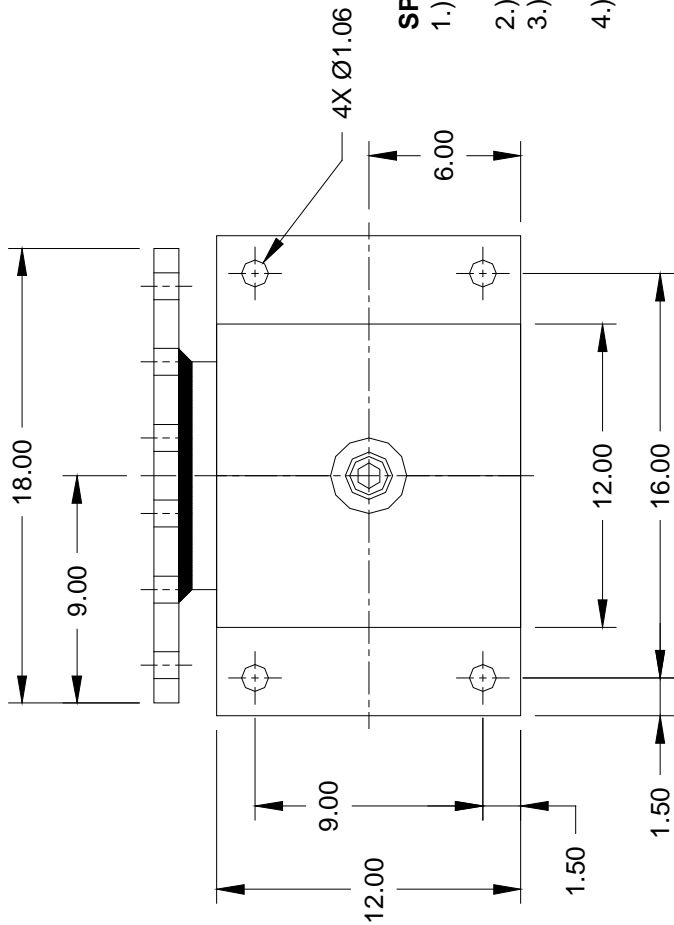
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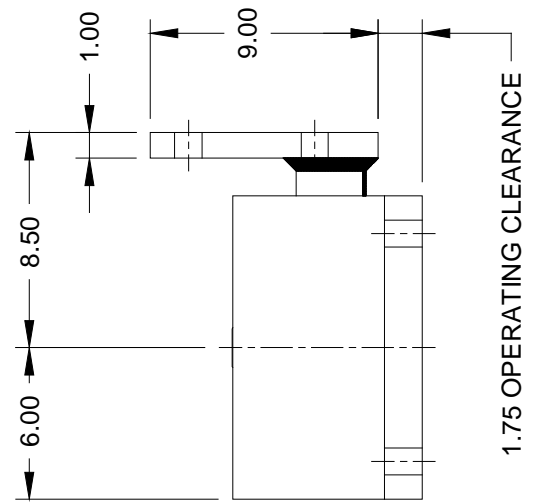
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SPECIFICATIONS:

- 1.) 3-AXIS RESTRAINT WITH REPLACEABLE NEOPRENE SNUBBING ELEMENTS.
- 2.) HOT DIPPED GALVANIZED.
- 3.) HOUSINGS MAY BE USED FOR BLOCKING DURING EQUIPMENT ERECTION.
- 4.) CAN BE USED WITH OR WITHOUT SPRING COIL(S).



FMSF SUBMITTAL DATA

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- INSTRUCTIONS FOR CONSTRUCTION OF A CAPACITY ENVELOPE:
- 1.) TO GENERATE THE SEISMIC RESTRAINT CAPACITY ENVELOPE, THE HIGHEST ISOLATOR LOAD FOR THE PIECE OF EQUIPMENT UNDER REVIEW IS USED AS A STARTING POINT.
 - 2.) DETERMINE WHETHER THE ATTACHMENT IS TO BE TO STEEL, SELECT FIGURE 2, OR CONCRETE, SELECT FIGURE 3.
 - 3.) THE VERTICAL RESTRAINT CAPACITY @ THE LOAD DETERMINED IN STEP 1 IS READ FROM CURVE #1 (FIG. 2) OR CURVE #4 (FIG. 3) AND PLOTTED ON THE VERTICAL AXIS OF FIGURE 1.
 - 4.) THE HORIZONTAL RESTRAINT CAPACITY @ THE LOAD DETERMINED IN STEP 1 IS READ FROM CURVE #3 (FIG. 2) OR CURVE #6 (FIG. 3) AND PLOTTED ON THE HORIZONTAL AXIS OF FIGURE 1.
 - 5.) THE COMBINED RESTRAINT CAPACITY IS THE POINT WHERE VERTICAL & HORIZONTAL CAPACITIES ARE EQUAL. THE COMBINED RESTRAINT CAPACITY @ THE LOAD DETERMINED IN STEP 1 IS READ FROM CURVE #2 (FIG. 2) OR CURVE #5 (FIG. 3). DRAW A HORIZONTAL LINE FROM THIS VALUE ON THE VERTICAL AXIS, AND A VERTICAL LINE FROM THIS VALUE ON THE HORIZONTAL AXIS. THE INTERSECTION POINT IS THE COMBINED CAPACITY POINT FOR THE GIVEN APPLICATION.
 - 6.) CONNECT THE VERTICAL RESTRAINT CAPACITY, COMBINED RESTRAINT CAPACITY, AND THE HORIZONTAL RESTRAINT CAPACITY POINTS THAT YOU PLOTTED FOR YOUR APPLICATION. THIS WILL PRODUCE THE RESTRAINT CAPACITY ENVELOPE FOR YOUR APPLICATION.
 - 7.) FOR THE RESTRAINT TO BE SUITABLE FOR THE APPLICATION, ALL WORST CASE SEISMIC LOAD COMBINATIONS MUST FALL WITHIN THE RESTRAINT ENVELOPE.

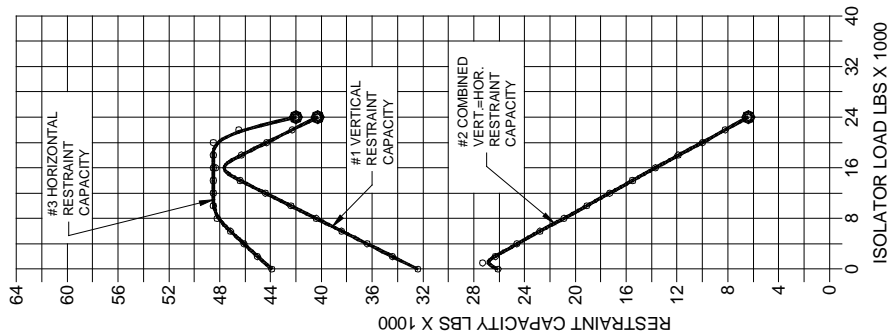


FIGURE 2
STEEL ATTACHMENT

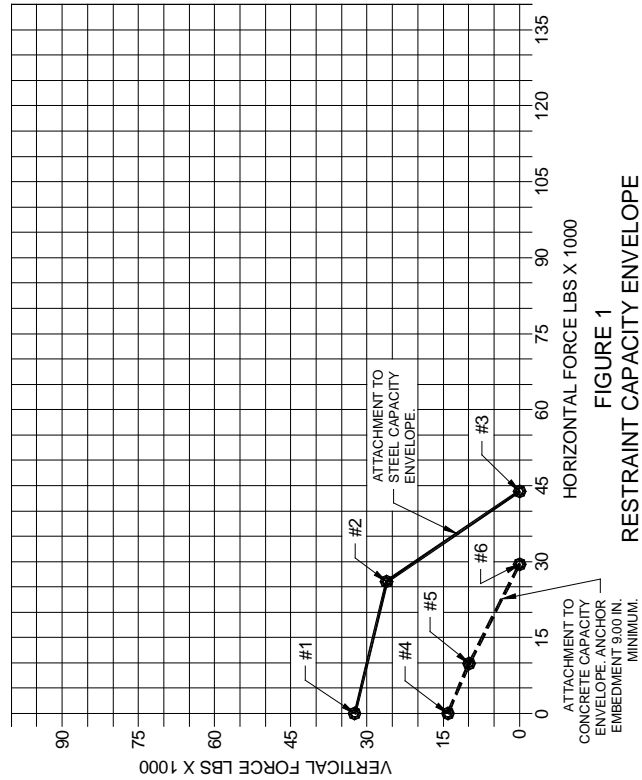


FIGURE 1
RESTRAINT CAPACITY ENVELOPE

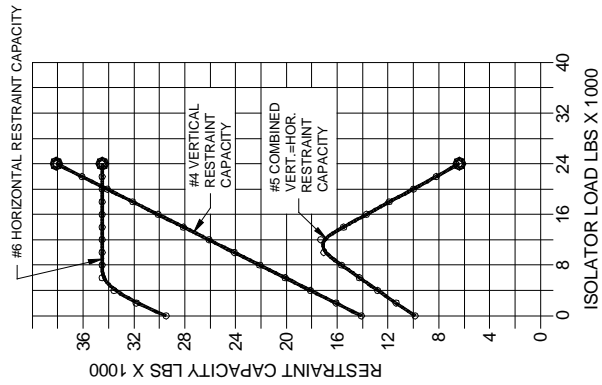


FIGURE 3
CONCRETE ATTACHMENT

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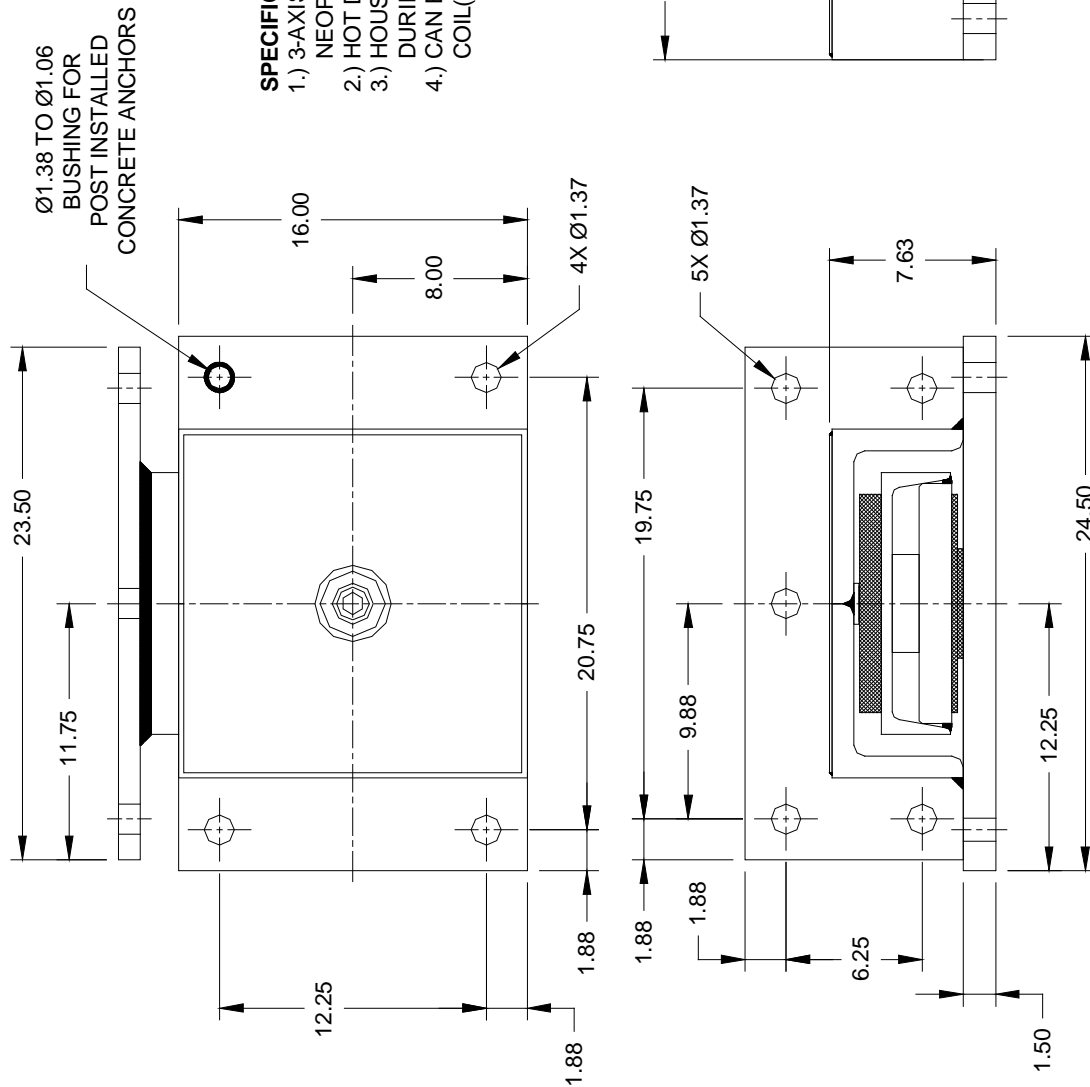
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SPECIFICATIONS:

- 1.) 3-AXIS RESTRAINT WITH REPLACEABLE NEOPRENE SNUBBING ELEMENTS.
- 2.) HOT DIPPED GALVANIZED.
- 3.) HOUSINGS MAY BE USED FOR BLOCKING DURING EQUIPMENT ERECTION.
- 4.) CAN BE USED WITH OR WITHOUT SPRING COIL(S).

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INTRUCTIONS FOR CONSTRUCTION OF A CAPACITY ENVELOPE:
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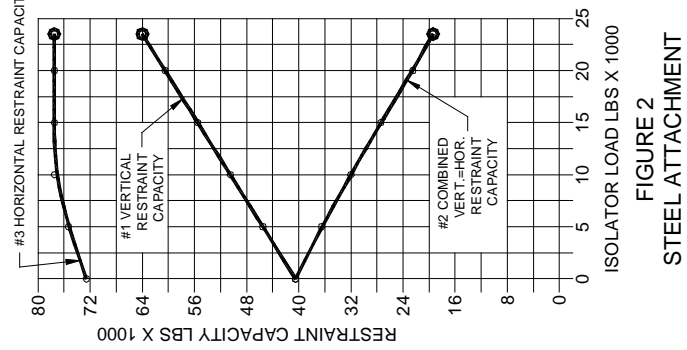


FIGURE 2
STEEL ATTACHMENT

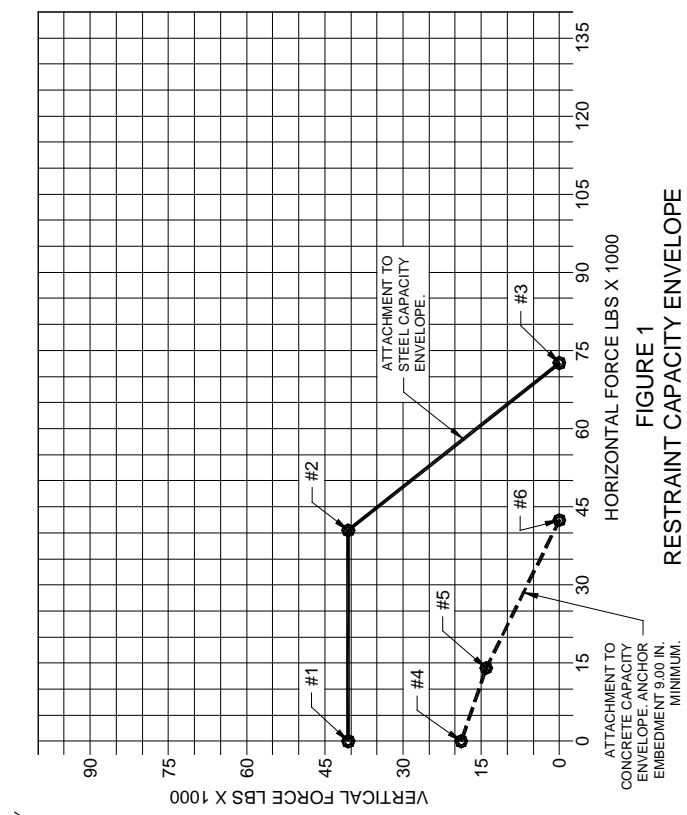


FIGURE 1
RESTRAINT CAPACITY ENVELOPE

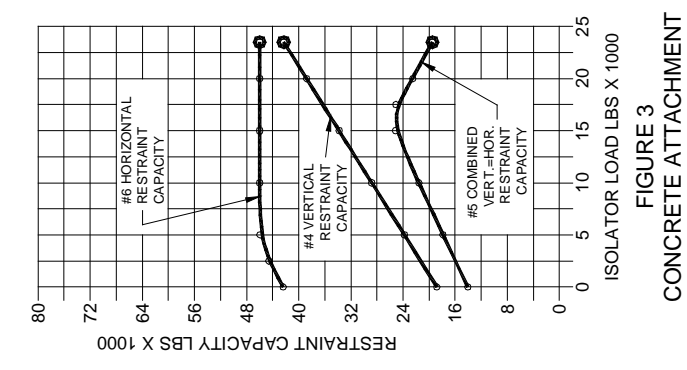


FIGURE 3
CONCRETE ATTACHMENT

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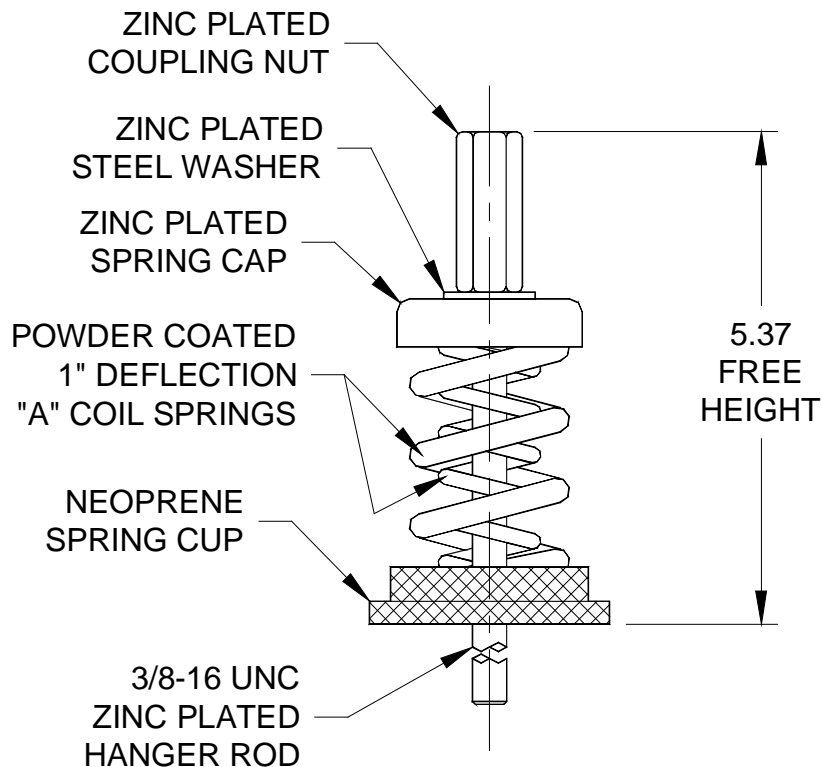


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1 Deflection – Single “A” Coil Set – 35 lbs to 800 lbs

ISOLATOR MODEL	USED WITH FMS MODELS	RATED LOAD (LBS)	DEFLECTION @ RATED LOAD (IN)	SPRING RATE (LBS/IN)	SPRING COLOR OUTER/INNER	LOAD @ 1 IN. DEFLECTION (LBS)
1-35	AA/A/B	35	1.52	23.0	Blue/-----	23
1-70	AA/A/B	70	1.36	51.5	Green/-----	51
1-120	AA/A/B	120	1.18	101.7	Gray/-----	102
1-220	AA/A/B	220	1.07	205.6	Brown/-----	206
1-370	AA/A/B	370	0.96	385.4	Orange/-----	385
1-500	AA/A/B	500	1.00	500.0	Beige/-----	500
1-600	AA/A/B	600	1.00	600.0	Chrome/-----	600
1-700	AA/A/B	700	1.00	700.0	Beige/White	700
1-805	AA/A/B	800	1.00	800.0	Chrome/White	800



1 DEFLECTION – SINGLE “A” COIL ISOLATION SUBMITTAL DATA

PAGE 1 OF 2

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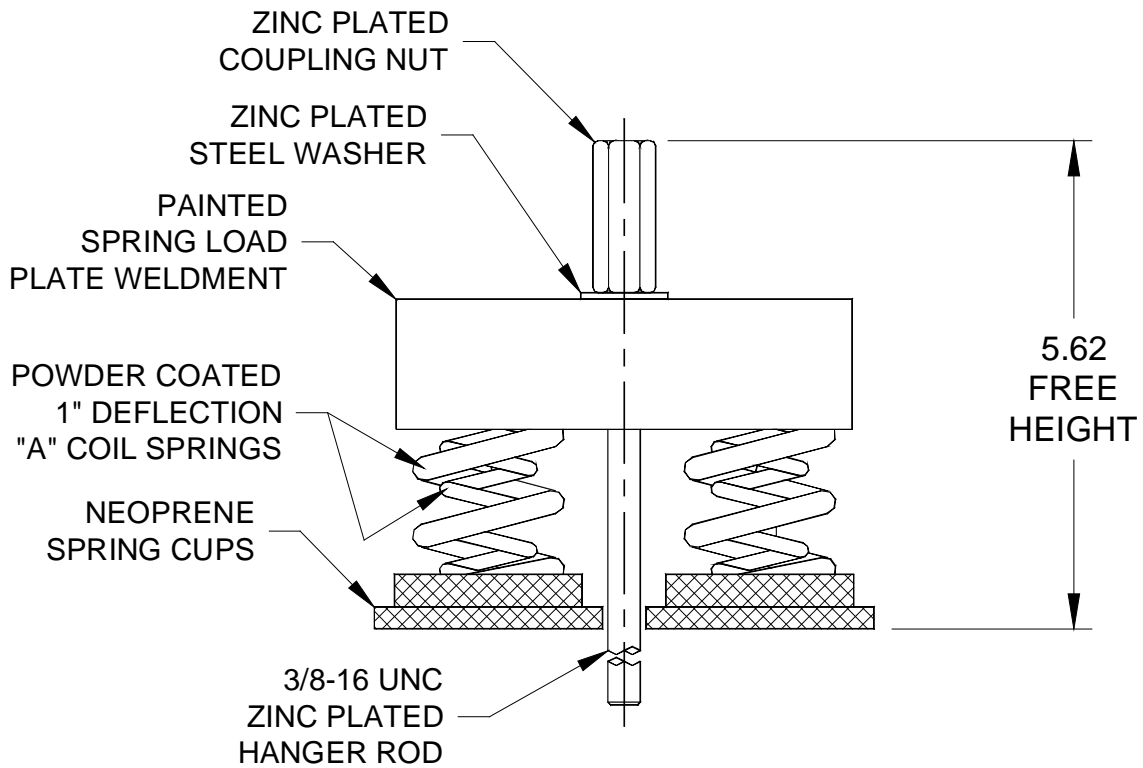


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1 Deflection – Double “A” Coil Sets – 740 lbs to 1,600 lbs

ISOLATOR MODEL	USED WITH FMS MODELS	RATED LOAD (LBS)	DEFLECTION @ RATED LOAD (IN)	SPRING RATE (LBS/IN)	SPRING COLOR OUTER/INNER	LOAD @ 1 IN. DEFLECTION (LBS)
1-740	AA/A/B	740	0.96	770.8	Orange/-----	771
1-840	AA/A/B	840	1.07	811.2	Brown/White	811
1-1000	AA/A/B	1,000	1.00	1,000.0	Beige/-----	1,000
1-1200	AA/A/B	1,200	1.00	1,200.0	Chrome/-----	1,200
1-1400	AA/A/B	1,400	1.00	1,400.0	Beige/White	1,400
1-1600	----/A/B	1,600	1.00	1,600.0	Chrome/White	1,600



1 DEFLECTION – DOUBLE “A” COIL ISOLATION SUBMITTAL DATA



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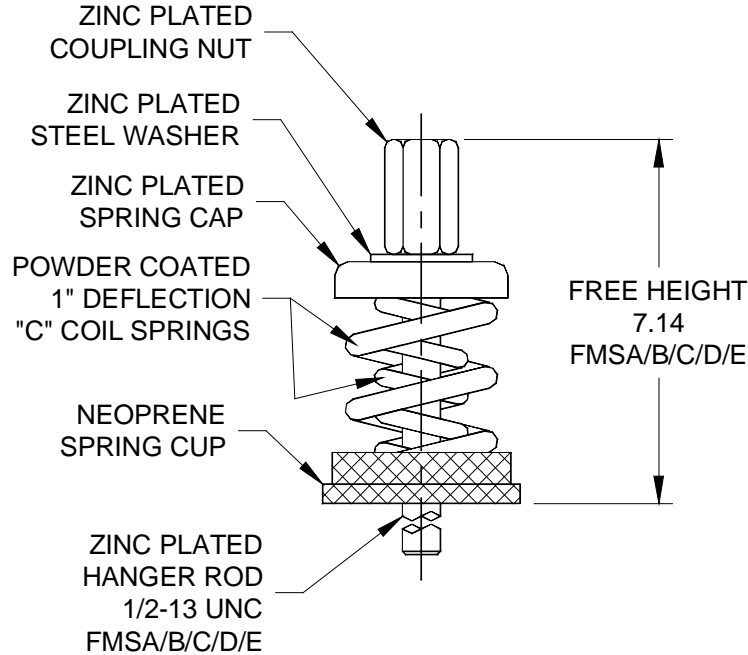
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1 Deflection – Single “C” Coil Set – 250 lbs to 3,500 lbs

ISOLATOR MODEL	USED WITH FMS MODELS	RATED LOAD (LBS)	DEFLECTION @ RATED LOAD (IN)	SPRING RATE (LBS/IN)	SPRING COLOR OUTER/INNER	LOAD @ 1 IN. DEFLECTION (LBS)
1-250	A/B/C/D/E	250	1.79	139.7	Blue/-----	140
1-450	A/B/C/D/E	450	1.54	292.2	Green/-----	292
1-625	A/B/C/D/E	625	1.44	434.0	Black/-----	434
1-800	A/B/C/D/E	800	1.31	610.7	Gray/-----	611
1-1000	A/B/C/D/E	1,000	1.15	869.6	Red/-----	870
1-1250	A/B/C/D/E	1,250	1.09	1,146.8	Brown/-----	1,147
1-1700	A/B/C/D/E	1,700	0.95	1,789.5	Orange/-----	1,790
1-2100	A/B/C/D/E	2,080	0.95	2,189.5	Orange/Gray	2,190
1-2465	A/B/C/D/E	2,465	1.00	2,465.0	Blue/-----	2,465
1-2865	A/B/C/D/E	2,865	1.00	2,865.0	Blue/Gray	2,865
1-3500	A/B/C/D/E	3,500	1.00	3,500.0	Blue/Brown	3,500



1 DEFLECTION – SINGLE “C” COIL ISOLATION SUBMITTAL DATA

PAGE 1 OF 4

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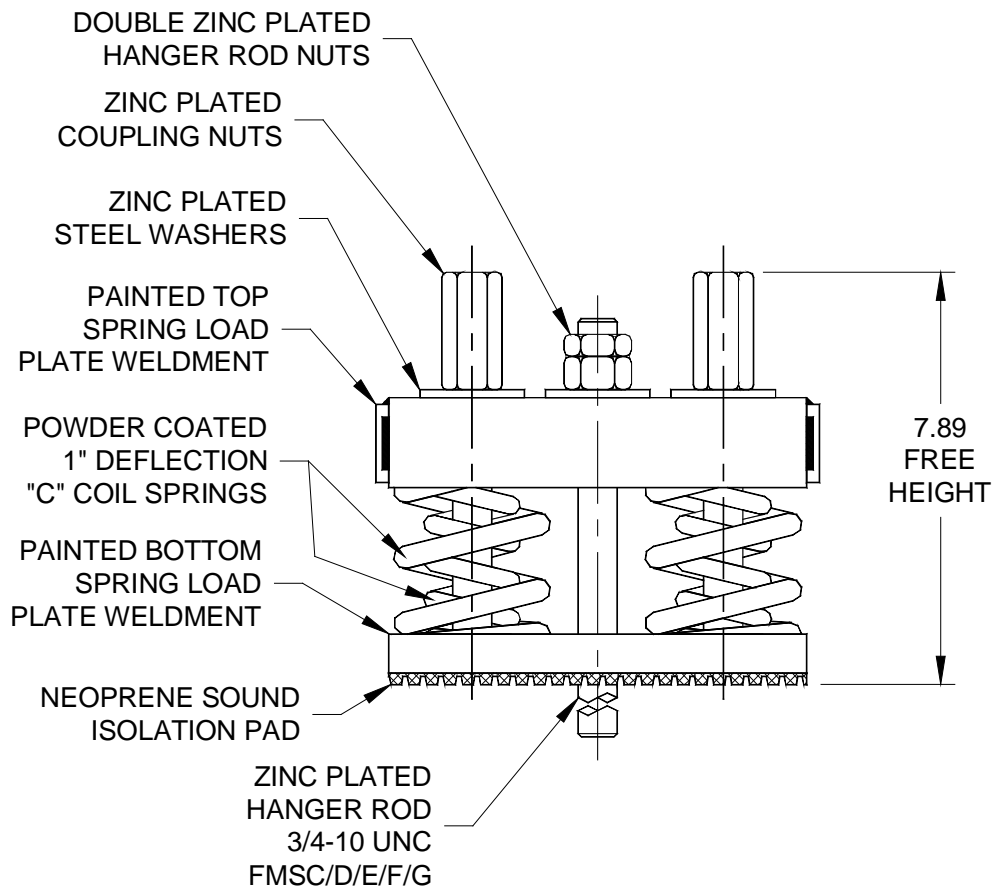


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1 Deflection – Double “C” Coil Sets – 3,400 lbs to 7,000 lbs

ISOLATOR MODEL	USED WITH FMS MODELS	RATED LOAD (LBS)	DEFLECTION @ RATED LOAD (IN)	SPRING RATE (LBS/IN)	SPRING COLOR OUTER/INNER	LOAD @ 1 IN. DEFLECTION (LBS)
1-3400	C/D/E/F/G	3,400	0.95	3,579.0	Orange/-----	3,579
1-4200	C/D/E/F/G	4,160	0.95	4,379.0	Orange/Gray	4,379
1-4930	C/D/E/F/G	4,930	1.00	4,930.0	Blue/-----	4,930
1-5730	C/D/E/F/G	5,730	1.00	5,370.0	Blue/Gray	5,730
1-7000	--/D/E/F/G	7,000	1.00	7,000.0	Blue/Brown	7,000



1" DEFLECTION – DOUBLE “C” COIL ISOLATION SUBMITTAL DATA

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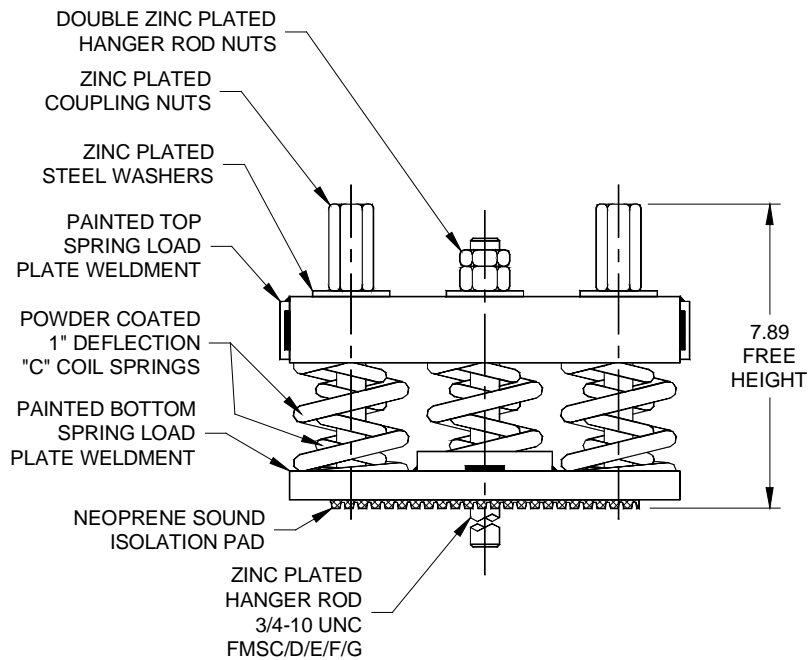
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1 Deflection – Triple “C” Coil Sets – 3,750 lbs to 10,500 lbs

ISOLATOR MODEL	USED WITH FMS MODELS	RATED LOAD (LBS)	DEFLECTION @ RATED LOAD (IN)	SPRING RATE (LBS/IN)	SPRING COLOR OUTER/INNER	LOAD @ 1 IN. DEFLECTION (LBS)
1-3750	C/D/E/F/G	3,750	1.09	3,440.4	Brown/-----	3,440
1-5100	C/D/E/F/G	5,100	0.95	5,368.5	Orange/-----	5,369
†1-5900	C/D/E/F/G	5,860	0.95	6,168.5	Orange/Gray	6,169
‡1-6300	C/D/E/F/G	6,240	0.95	6,568.5	Orange/Gray	6,569
1-7395	--/D/E/F/G	7,395	1.00	7,395.0	Blue/-----	7,395
†1-8195	--/D/E/F/G	8,195	1.00	8,195.0	Blue/Gray	8,195
‡1-8595	--/D/E/F/G	8,595	1.00	8,595.0	Blue/Gray	8,595
†1-9500	--/D/E/F/G	9,465	1.00	9,465.0	Blue/Brown	9,465
‡1-10500	--/--/E/F/G	10,500	1.00	10,500.0	Blue/Brown	10,500

†Center coil set does not contain an inner coil.

‡Center coil set contains an inner coil and requires a special load washer.



1" DEFLECTION – TRIPLE “C” COIL ISOLATION SUBMITTAL DATA

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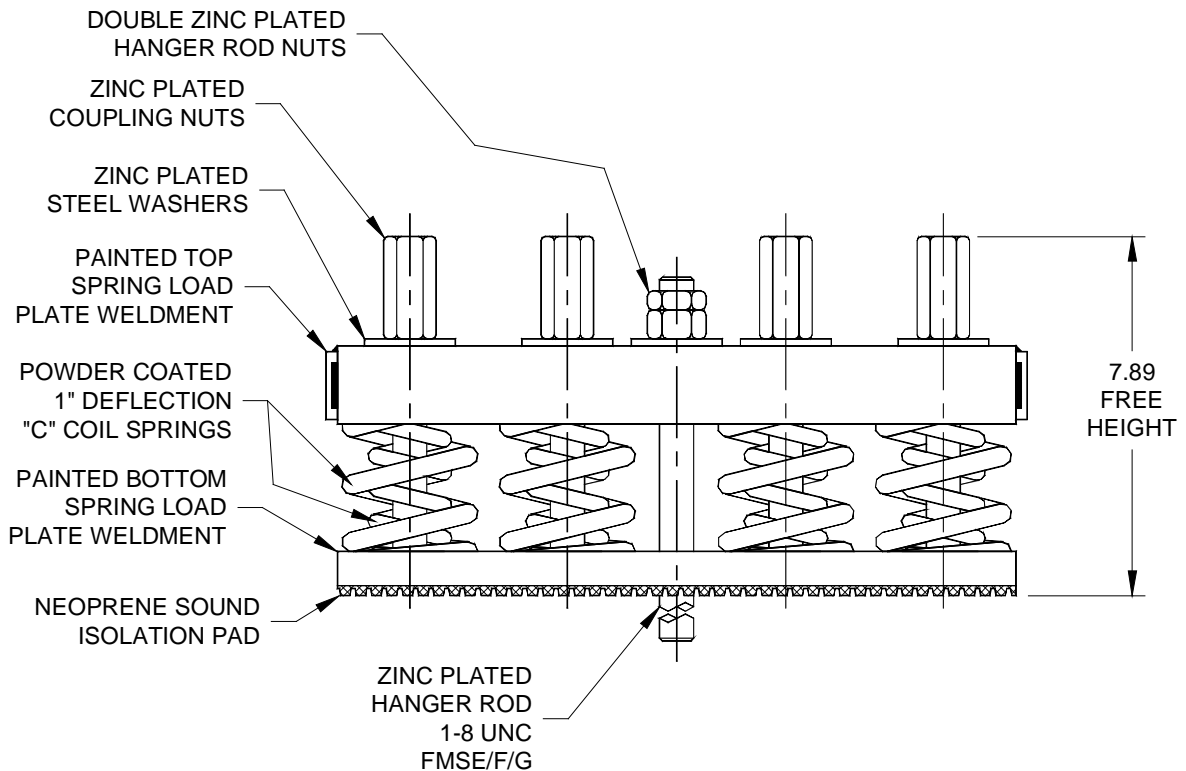
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1 Deflection – Quad “C” Coil Sets – 9,860 lbs to 14,000 lbs

ISOLATOR MODEL	USED WITH FMS MODELS	RATED LOAD (LBS)	DEFLECTION @ RATED LOAD (IN)	SPRING RATE (LBS/IN)	SPRING COLOR OUTER/INNER	LOAD @ 1 IN. DEFLECTION (LBS)
1-9860	E/F/G	9,860	1.00	9,860.0	Blue/-----	9,860
1-11460	E/F/G	11,460	1.00	11,460.0	Blue/Gray	11,460
1-14000	E/F/G	14,000	1.00	14,000.0	Blue/Brown	14,000



1" DEFLECTION – QUAD “C” COIL ISOLATION SUBMITTAL DATA

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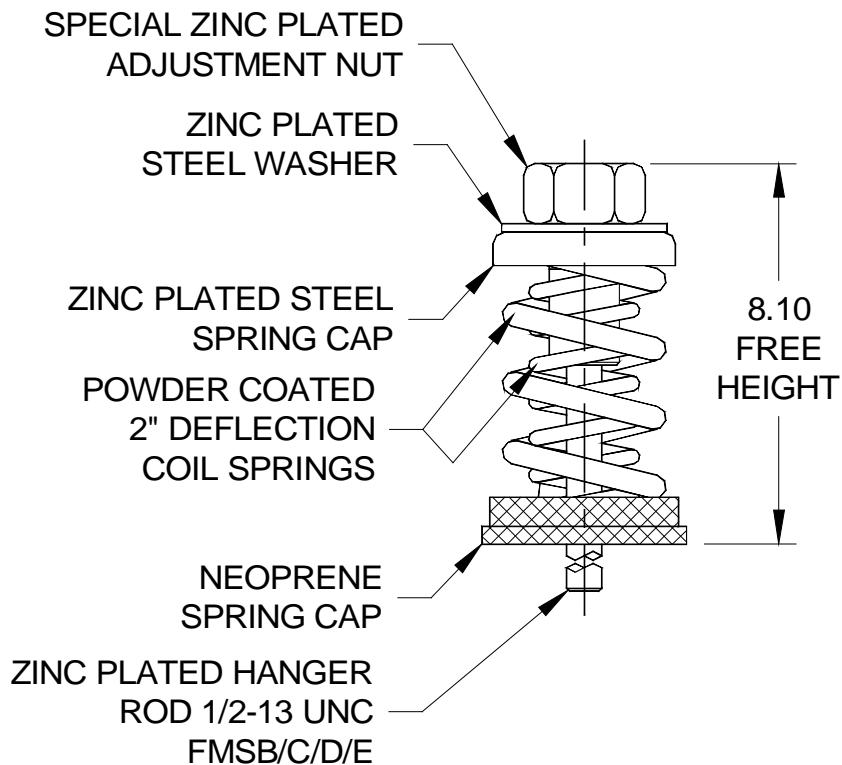


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2 Deflection – Single Coil Set – 100 lbs to 2,000 lbs

ISOLATOR MODEL	USED WITH FMS MODELS	RATED LOAD (LBS)	DEFLECTION @ RATED LOAD (IN)	SPRING RATE (LBS/IN)	SPRING COLOR OUTER/INNER
2-100	B/C/D/E	100	2.00	50.0	Gray/-----
2-250	B/C/D/E	250	2.00	125.0	Blue/-----
2-500	B/C/D/E	500	2.00	250.0	Green/-----
2-750	B/C/D/E	750	2.00	375.0	Black/-----
2-995	B/C/D/E	995	2.00	497.5	Orange/-----
2-1395	B/C/D/E	1,395	2.00	697.5	Orange/Green
2-1600	B/C/D/E	1,600	2.00	800.0	Red/-----
2-1975	B/C/D/E	2,000	2.00	1,000.0	Red/Green



2 DEFL. – 100 to 2,000 SINGLE COIL ISOLATION SUBMITTAL DATA

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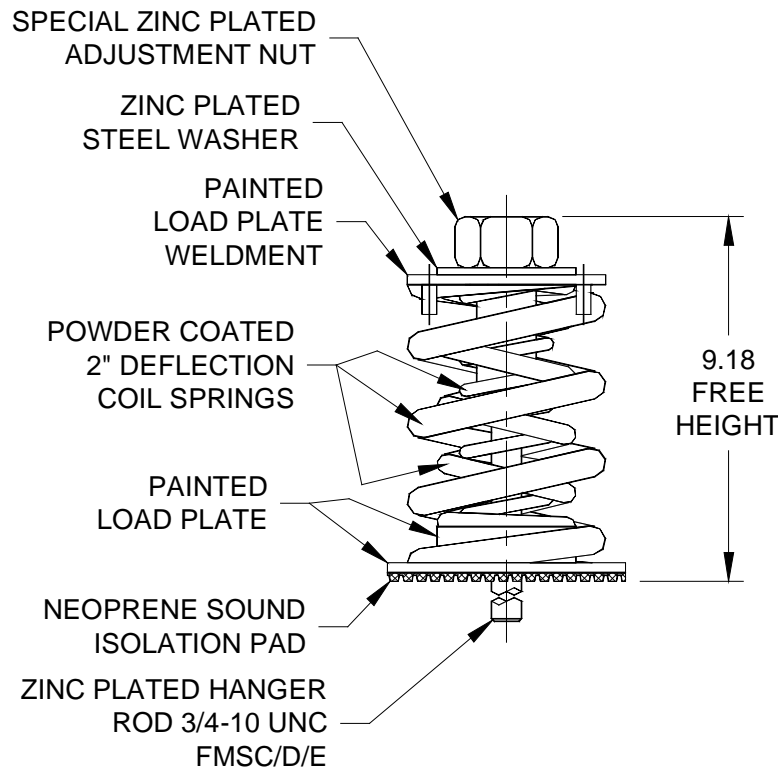
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2 Deflection – Single Coil Set – 2,000 lbs to 4,500 lbs

ISOLATOR MODEL	USED WITH FMS MODELS	RATED LOAD (LBS)	DEFLECTION @ RATED LOAD (IN)	SPRING RATE (LBS/IN)	SPRING COLOR OUTER/MIDDLE/INNER
2-2000	C/D/E	2,000	2.00	1,000.0	Orange/----/----
2-2250	C/D/E	2,250	2.00	1,125.0	Orange/Blue/----
2-2500	C/D/E	2,500	2.00	1,250.0	Blue/----/----
2-2750	C/D/E	2,750	2.00	1,375.0	Orange/Black/----
2-3000	C/D/E	3,000	2.00	1,500.0	Blue/Green/----
2-3600	C/D/E	3,600	2.00	1,800.0	Orange/Red/----
2-4500	C/D/E	4,500	2.00	2,250.0	Blue/Red/Green



2 DEFL. – 2,000 to 4,500 SINGLE COIL ISOLATION SUBMITTAL DATA

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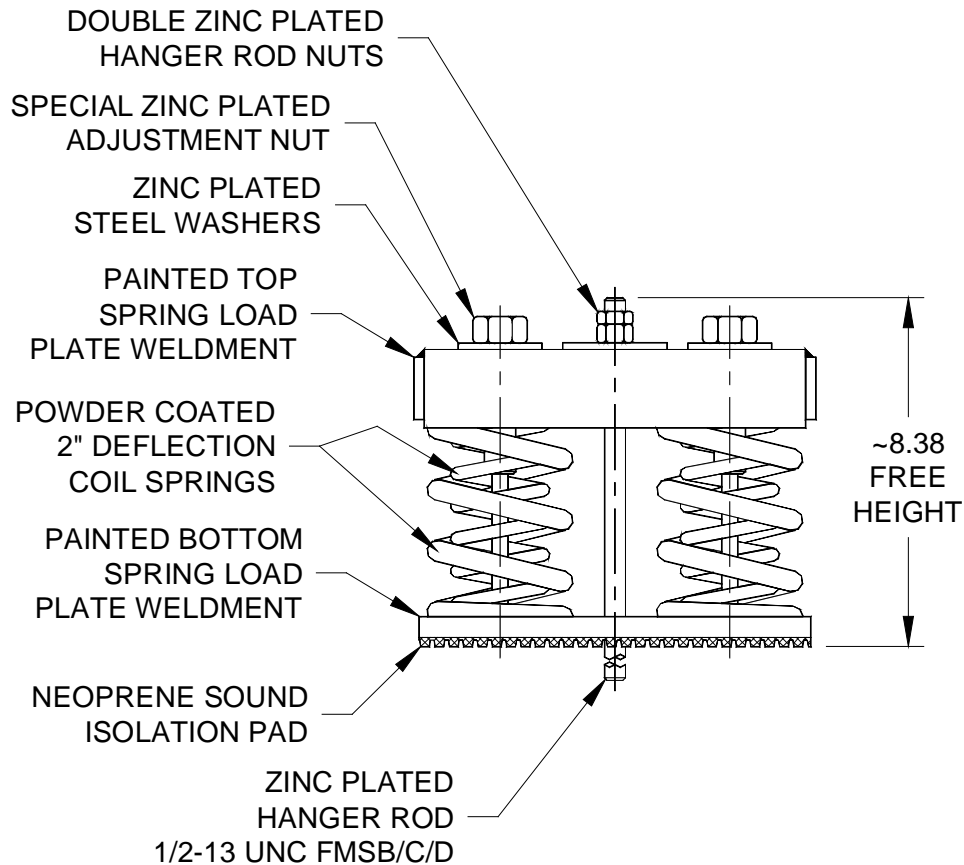
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2 Deflection – Double Coil Set – 1,990 lbs to 4,000 lbs

ISOLATOR MODEL	USED WITH FMS MODELS	RATED LOAD (LBS)	DEFLECTION @ RATED LOAD (IN)	SPRING RATE (LBS/IN)	SPRING COLOR OUTER/INNER
2-1990	B/C/D/E	1,990	2.00	995.0	Orange/-----
2-2300	B/C/D/E	2,300	2.00	1,150.0	Black/Green
2-2790	B/C/D/E	2,790	2.00	1,395.0	Orange/Green
2-3200	B/C/D/E	3,200	2.00	1,600.0	Red/-----
2-4000	B/C/D/E	4,000	2.00	2,000.0	Red/Green



2 DEFL. – 1,990 to 4,000 DOUBLE COIL ISOLATION SUBMITTAL DATA

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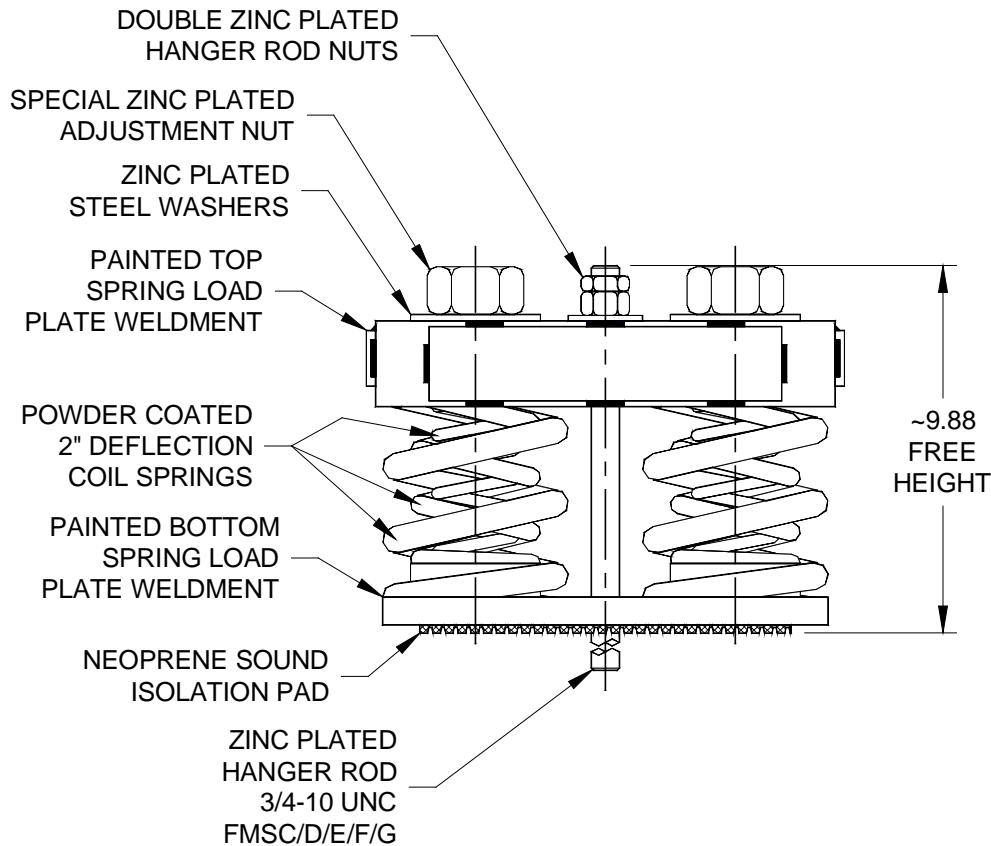
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2 Deflection – Double Coil Set – 5,000 lbs to 9,000 lbs

ISOLATOR MODEL	USED WITH FMS MODELS	RATED LOAD (LBS)	DEFLECTION @ RATED LOAD (IN)	SPRING RATE (LBS/IN)	SPRING COLOR OUTER/MIDDLE/INNER
2-5000	C/D/E/F/G	5,000	2.00	2,500.0	Blue/-----/-----
2-5500	C/D/E/F/G	5,550	2.00	2,750.0	Orange/Black/-----
2-6000	C/D/E/F/G	6,000	2.00	3,000.0	Blue/Green/-----
2-7200	--/D/E/F/G	7,200	2.00	3,600.0	Orange/Red/-----
2-9000	--/D/E/F/G	9,000	2.00	4,500.0	Blue/Red/Green



2" DEFL. – 5,000 to 9,000 DOUBLE COIL ISOLATION SUBMITTAL DATA

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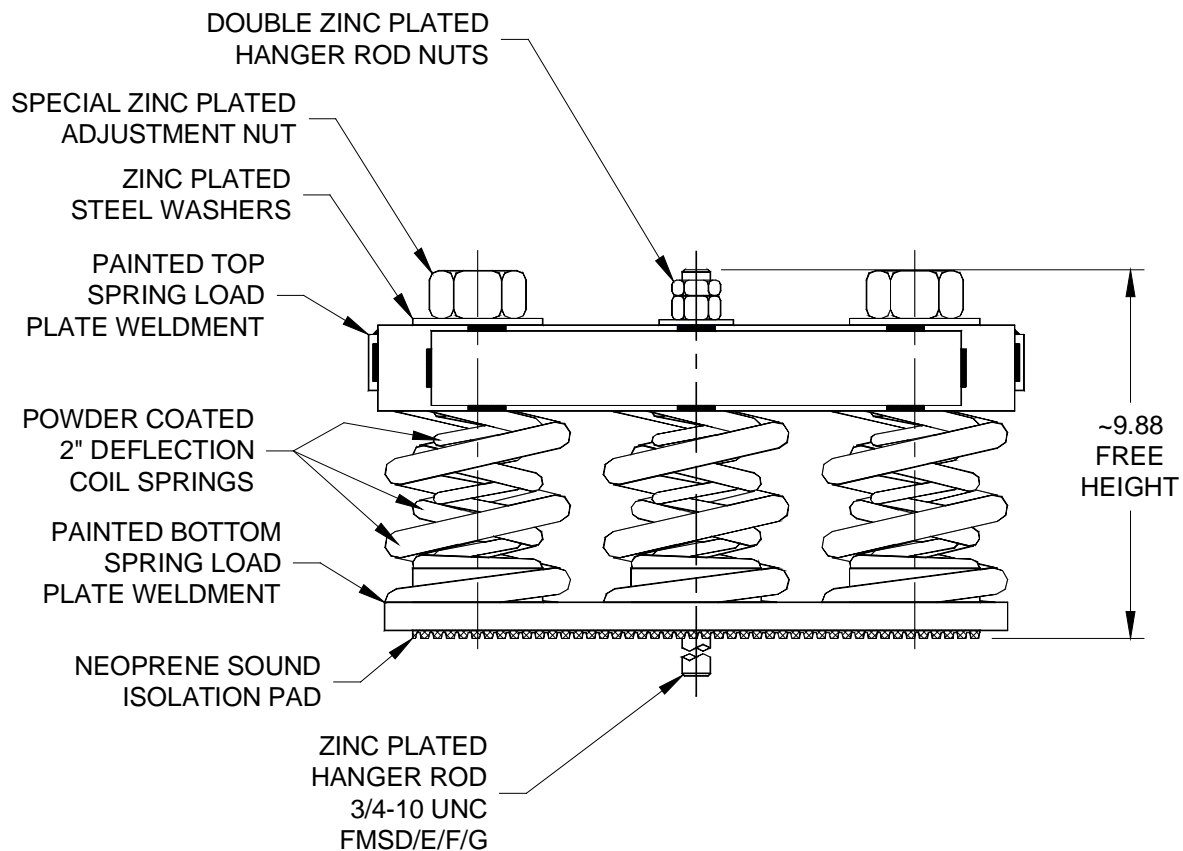


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2 Deflection – Triple Coil Set – 9,100 lbs to 13,500 lbs

ISOLATOR MODEL	USED WITH FMS MODELS	RATED LOAD (LBS)	DEFLECTION @ RATED LOAD (IN)	SPRING RATE (LBS/IN)	SPRING COLOR OUTER/MIDDLE/INNER
2-9100	D/E/F/G	9,000	2.00	4,500.0	Blue/Green/-----
2-9750	D/E/F/G	9,750	2.00	4,875.0	Blue/Black/-----
2-10800	--/E/F/G	10,800	2.00	5,400.0	Orange/Red/-----
2-12000	--/E/F/G	12,000	2.00	6,000.0	Orange/Red/Green
2-13500	--/E/F/G	13,500	2.00	6,750.0	Blue/Red/Green



2" DEFL. – 9,100 to 13,500 TRIPLE COIL ISOLATION SUBMITTAL DATA

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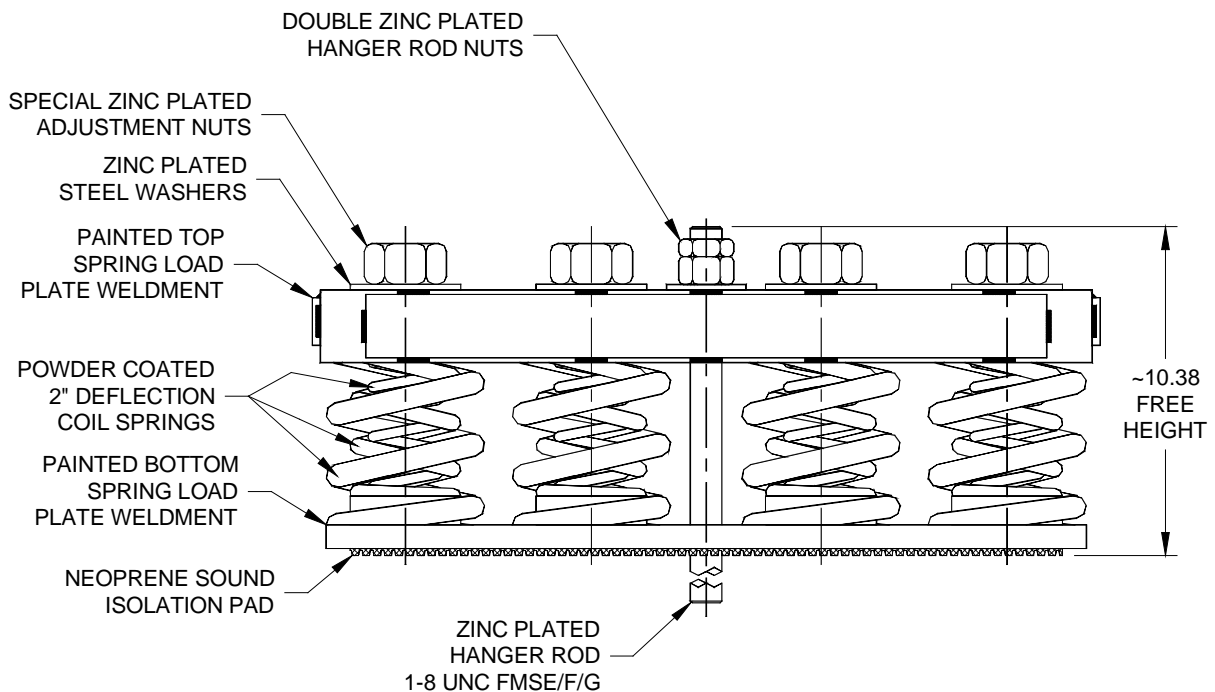
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P2.3.3



2 Deflection – QUAD Coil Set – 14,000 lbs to 18,000 lbs

ISOLATOR MODEL	USED WITH FMS MODELS	RATED LOAD (LBS)	DEFLECTION @ RATED LOAD (IN)	SPRING RATE (LBS/IN)	SPRING COLOR OUTER/MIDDLE/INNER
2-14000	E/F/G	13,980	2.00	6,990.0	Blue/Orange/-----
2-16000	E/F/G	16,000	2.00	8,000.0	Orange/Red/Green
2-18000	E/F/G	18,000	2.00	4,500.0	Blue/Red/Green



2" DEFL. – 14,000 to 18,000 QUAD COIL ISOLATION SUBMITTAL DATA

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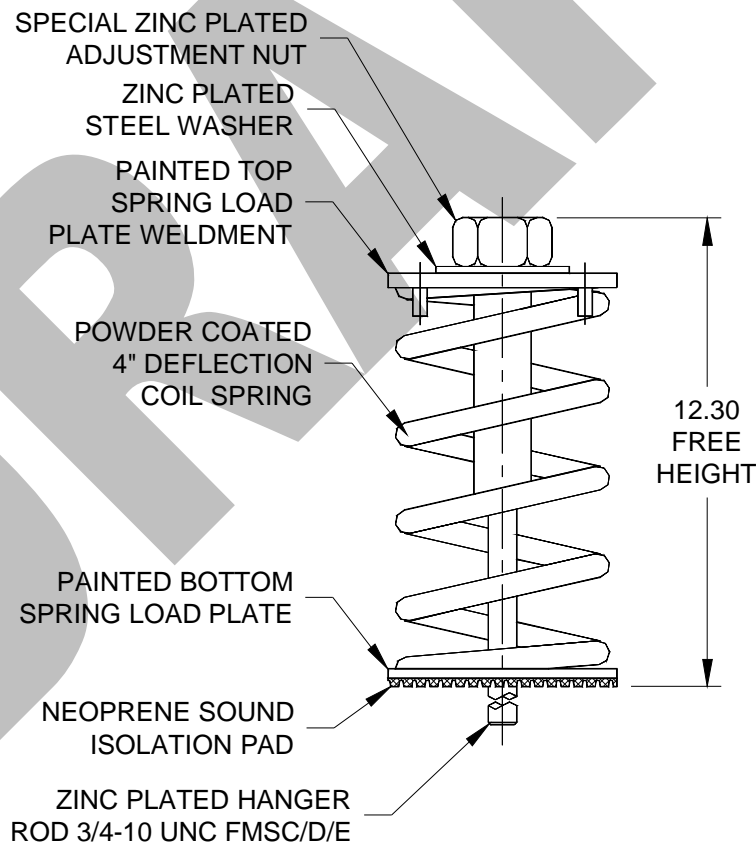
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4" Deflection – Single Coil Set – 100 lbs to 1,600 lbs

Isolator Model	Used With FMS Models	Rated Load (lbs)	Deflection @ Rated Load (in)	Spring Rate (lbs/in)	Spring Color
4-100	C/D/E	100	4.00	25.0	Gray
4-250	C/D/E	250	4.00	62.5	Blue
4-500	C/D/E	500	4.00	125.0	Green
4-750	C/D/E	750	4.00	187.5	Black
4-1000	C/D/E	1,000	4.00	250.0	Red
4-1250	C/D/E	1,250	4.00	312.5	Brown
4-1600	C/D/E	1,600	4.00	400.0	Orange



4" DEFL. – 100 to 1,600 SINGLE COIL ISOLATION SUBMITTAL DATA

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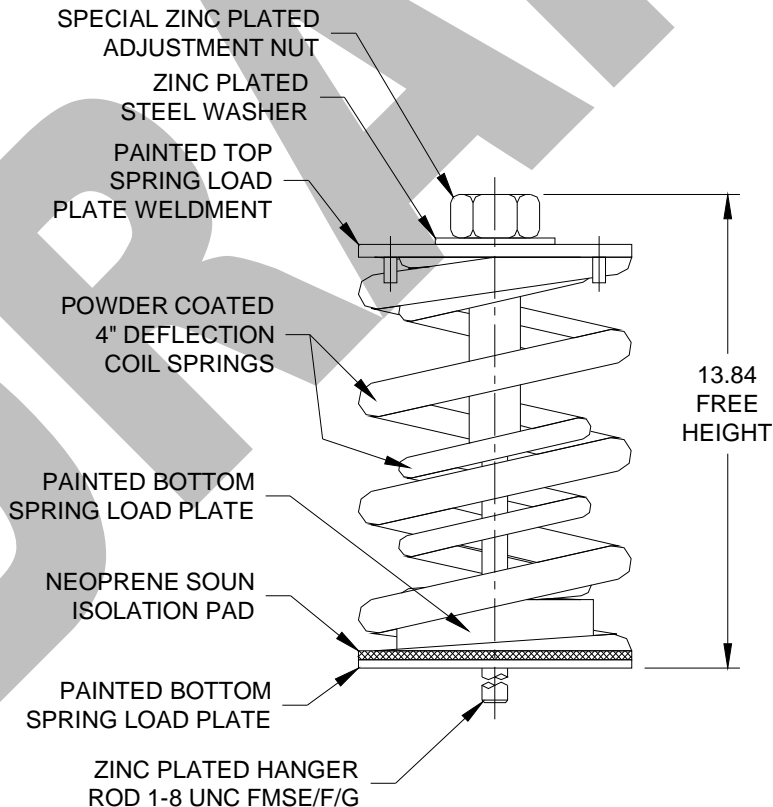
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4" Deflection – Single Coil Set – 2,250 lbs to 5,800 lbs

Isolator Model	Used With FMS Models	Rated Load (lbs)	Deflection @ Rated Load (in)	Spring Rate (lbs/in)	Spring Color Outer/Inner
4-2250	E/F/G	2,250	4.00	562.5	Beige/-----
4-2750	E/F/G	2,750	4.00	687.5	Beige/Green
4-3250	E/F/G	3,250	4.00	812.5	Beige/Red
4-3900	E/F/G	3,850	4.00	962.5	Beige/Orange
4-4200	E/F/G	4,200	4.00	1,050.0	Chrome/-----
4-4700	E/F/G	4,700	4.00	1,175.0	Chrome/Green
4-5200	E/F/G	5,200	4.00	1,300.0	Chrome/Red
4-5800	E/F/G	5,800	4.00	1,450.0	Chrome/Orange



4" DEFL. – 2,250 to 5,800 SINGLE COIL ISOLATION SUBMITTAL DATA

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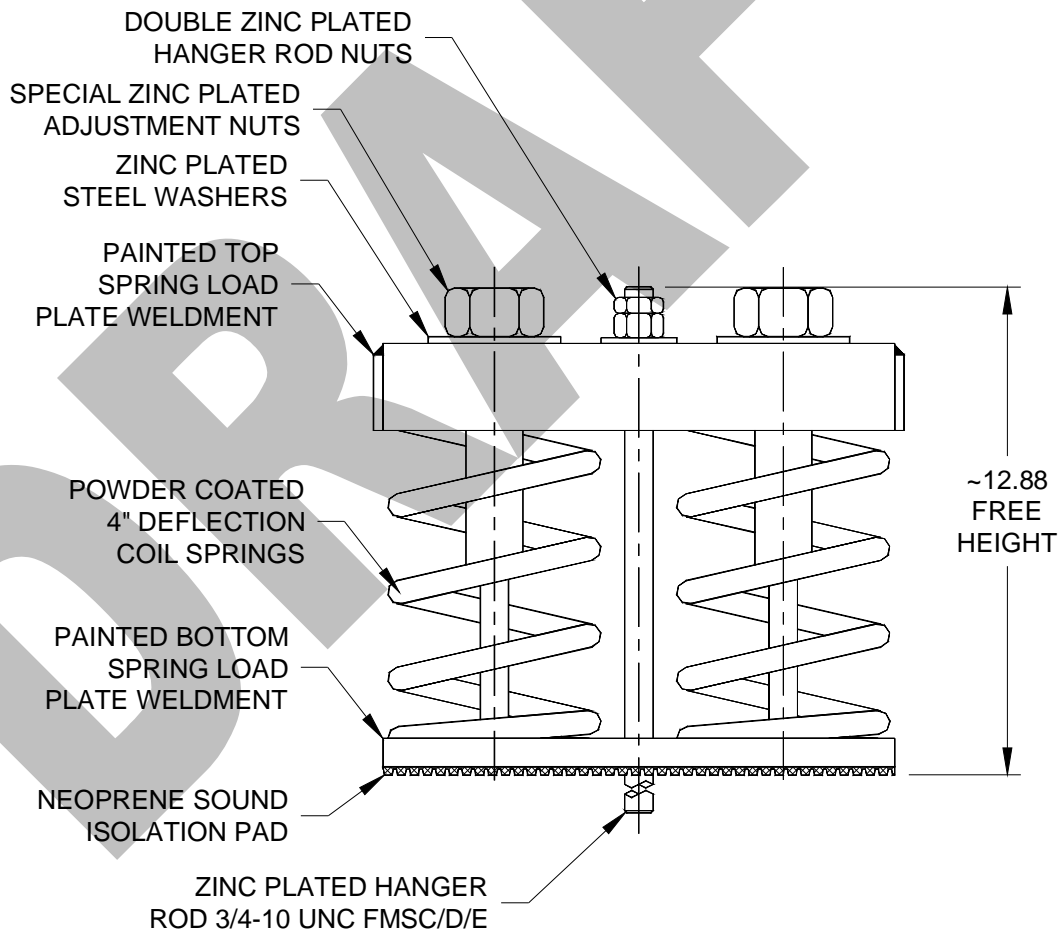
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4" Deflection – Double Coil Set – 1,500 lbs to 3,200 lbs

Isolator Model	Used With FMS Models	Rated Load (lbs)	Deflection @ Rated Load (in)	Spring Rate (lbs/in)	Spring Color
4-1500	C/D/E	1,500	4.00	375.0	Black
4-2000	C/D/E	2,000	4.00	500.0	Red
4-2500	C/D/E	2,500	4.00	625.0	Brown
4-3200	C/D/E	3,200	4.00	800.0	Orange



4" DEFL. – 1,500 to 3,200 DOUBLE COIL ISOLATION SUBMITTAL DATA

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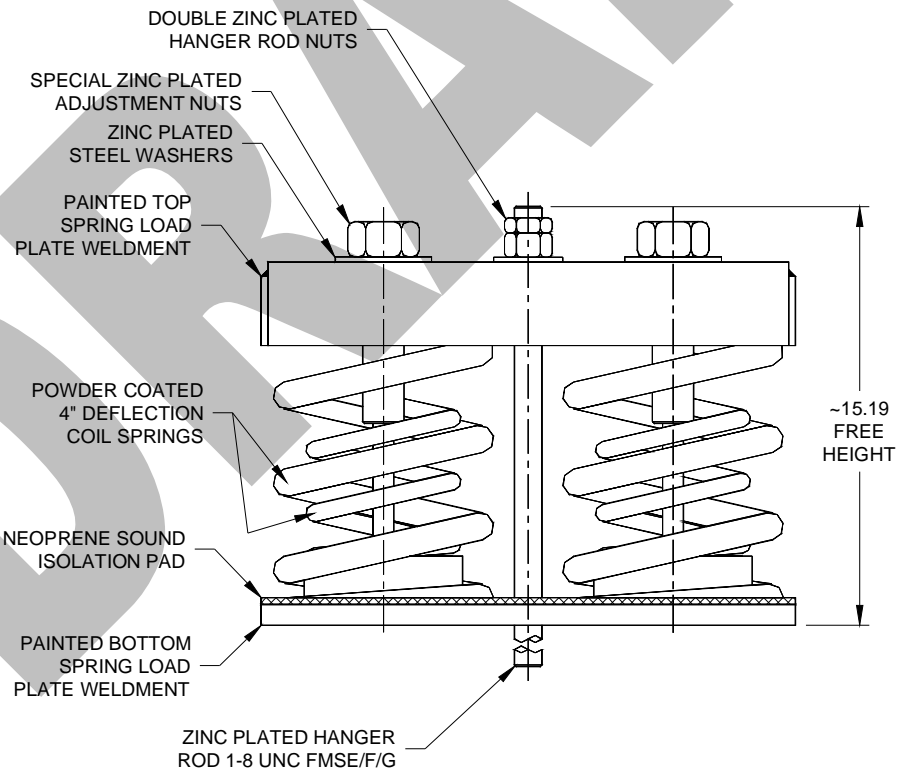


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4" Deflection – Double Coil Set – 5,500 lbs to 11,600 lbs

Isolator Model	Used With FMS Models	Rated Load (lbs)	Deflection @ Rated Load (in)	Spring Rate (lbs/in)	Spring Color Outer/Inner
4-5500	E/F/G	5,500	4.00	1,375.0	Beige/Green
4-6500	E/F/G	6,500	4.00	1,625.0	Beige/Red
4-7700	E/F/G	7,700	4.00	1,925.0	Beige/Orange
4-8400	E/F/G	8,400	4.00	2,100.0	Chrome/-----
4-9400	E/F/G	9,400	4.00	2,350.0	Chrome/Green
4-10400	E/F/G	10,400	4.00	2,600.0	Chrome/Red
4-11600	E/F/G	11,600	4.00	2,900.0	Chrome/Orange



4" DEFL. – 5,500 to 11,600 DOUBLE COIL ISOLATION SUBMITTAL DATA

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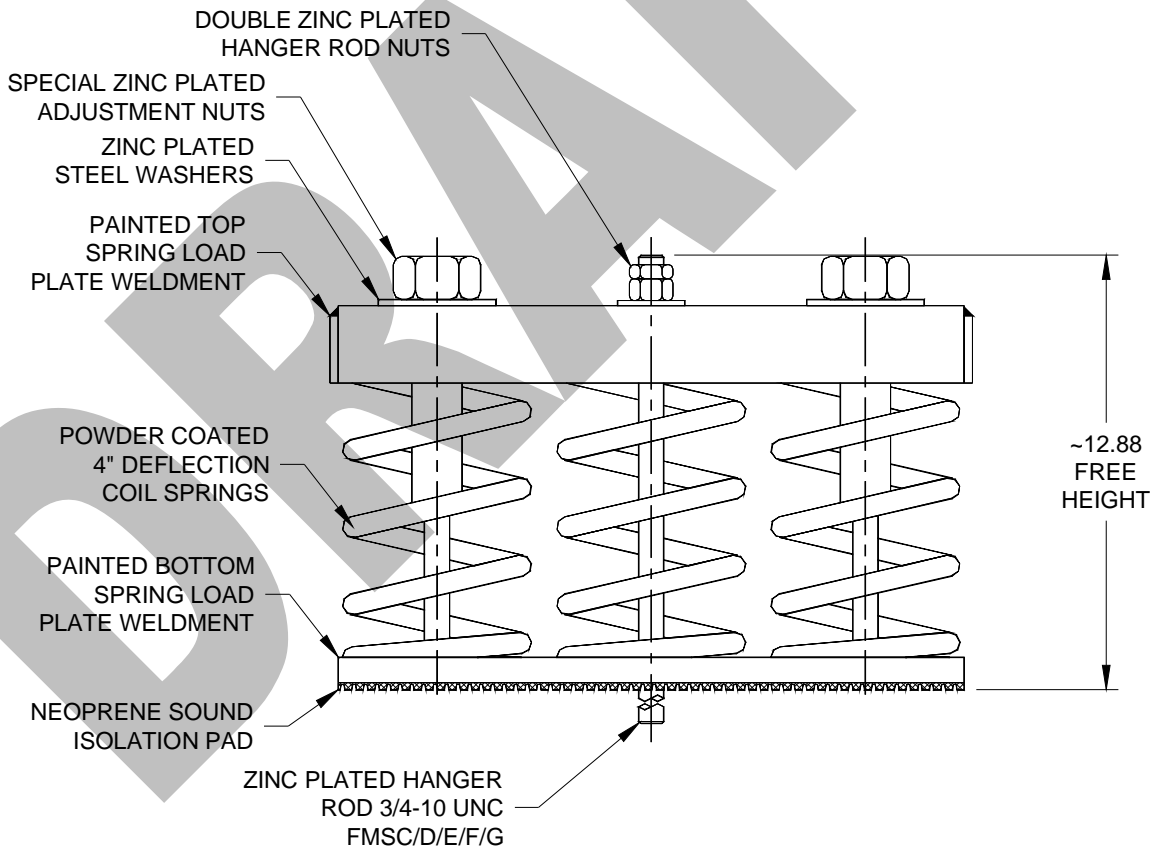
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4" Deflection – Triple Coil Set – 3,000 lbs to 4,800 lbs

Isolator Model	Used With FMS Models	Rated Load (lbs)	Deflection @ Rated Load (in)	Spring Rate (lbs/in)	Spring Color
4-3000	C/D/E/F/G	3,000	4.00	750.0	Red
4-3750	C/D/E/F/G	3,750	4.00	937.5	Brown
4-4800	C/D/E/F/G	4,800	4.00	1,200.0	Orange



4" DEFL. – 3,000 to 4,800 TRIPLE COIL ISOLATION SUBMITTAL DATA

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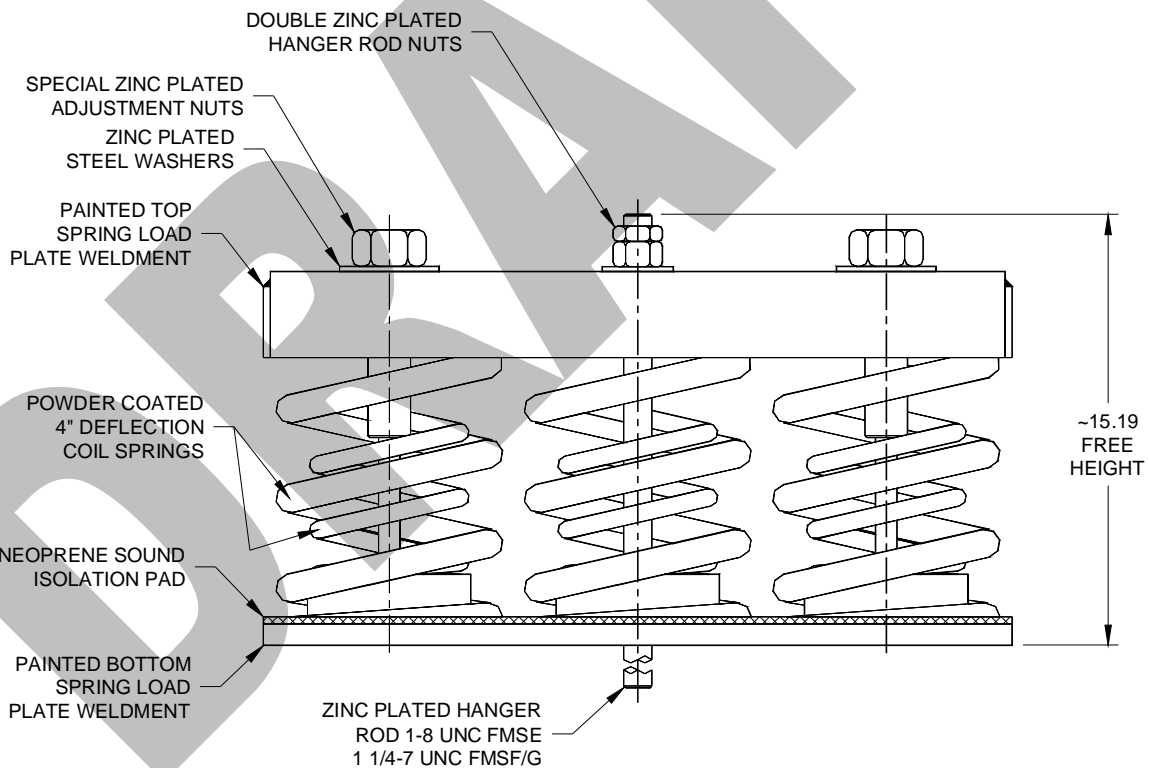
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4" Deflection – Triple Coil Set – 11,700 lbs to 17,400 lbs

Isolator Model	Used With FMS Models	Rated Load (lbs)	Deflection @ Rated Load (in)	Spring Rate (lbs/in)	Spring Color Outer/Inner
4-11700	E/F/G	11,550	4.00	2,887.5	Beige/Orange
4-14100	E/F/G	14,100	4.00	3,525.0	Chrome/Green
4-17400	E/F/G	17,400	4.00	5,350.0	Chrome/Orange



4" DEFL. – 11,700 to 17,400 TRIPLE COIL ISOLATION SUBMITTAL DATA

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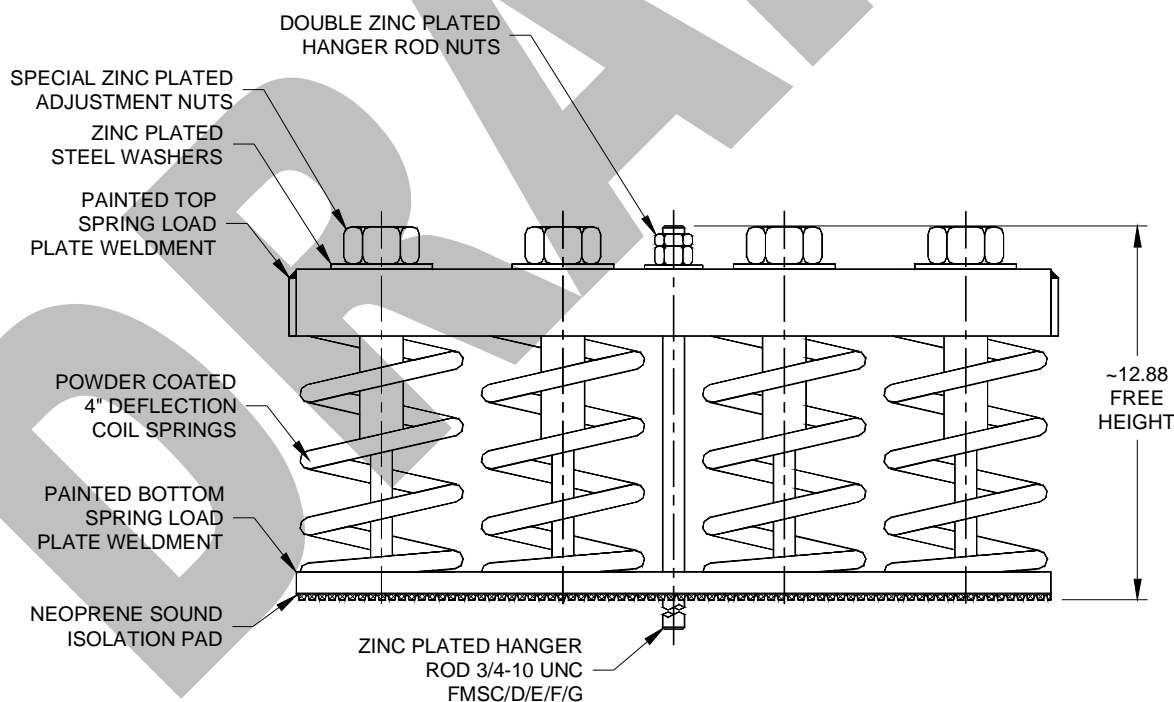
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4" Deflection – Quad Coil Set – 5,000 lbs to 6,400 lbs

Isolator Model	Used With FMS Models	Rated Load (lbs)	Deflection @ Rated Load (in)	Spring Rate (lbs/in)	Spring Color
4-5000	C/D/E/F/G	5,000	4.00	1,250.0	Brown
4-6400	--/D/E/F/G	6,400	4.00	1,600.0	Orange



4" DEFL. – 5,000 to 6,400 QUAD COIL ISOLATION SUBMITTAL DATA

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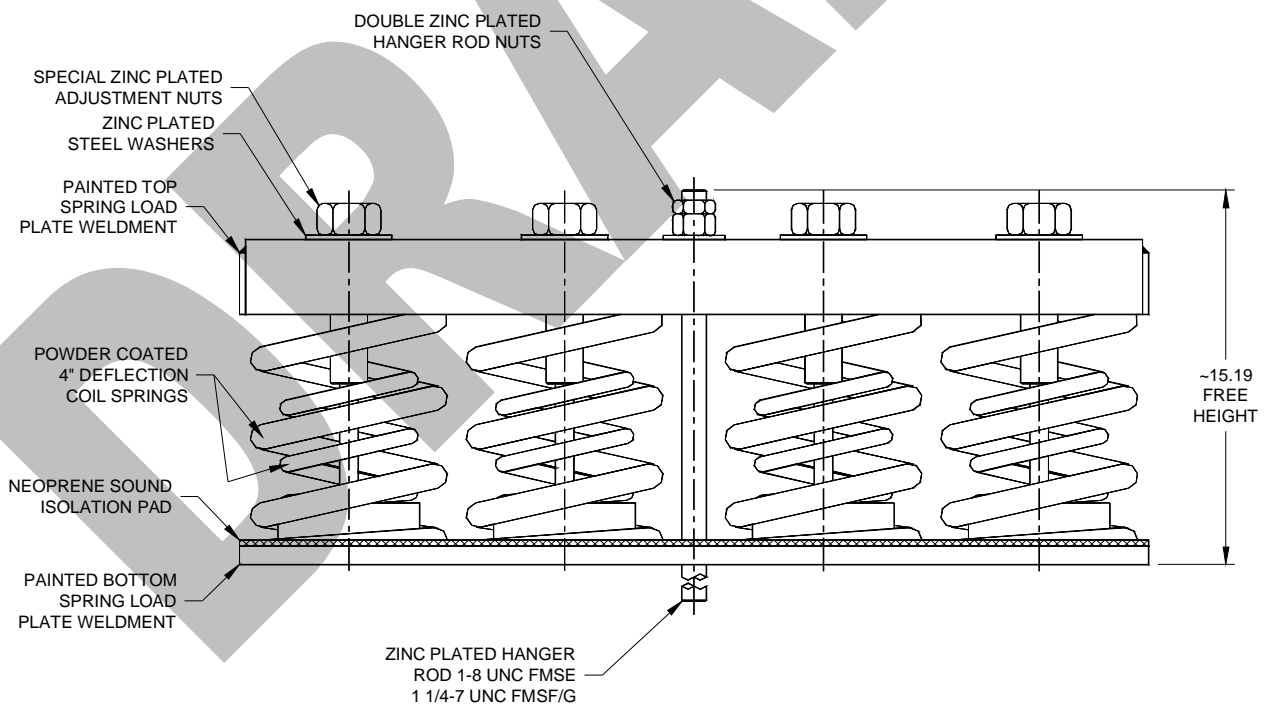
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4" Deflection – Quad Coil Set – 17,800 lbs to 23,200 lbs

Isolator Model	Used With FMS Models	Rated Load (lbs)	Deflection @ Rated Load (in)	Spring Rate (lbs/in)	Spring Color Outer/Inner
4-17800	E/F/G	17,800	4.00	4,450.0	Chrome/Blue
4-20800	E/F/G	20,800	4.00	5,200.0	Chrome/Red
4-23200	--/F/G	23,200	4.00	5,800.0	Chrome/Orange



4" DEFL. – 17,800 to 23,200 QUAD COIL ISOLATION SUBMITTAL DATA

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FMS Isolator/Restraint Selection Information

The purpose of this section is to provide enough data to allow the reader to make a preliminary FMS Isolator/Restraint selection for your application. The final selection should be made with the help of Kinetics Noise Control Engineering. Since the FMS is a seismic device, a detailed analysis must be performed to ensure that the proper restraint and/or isolator model has been chosen for your application based on your building code, specification, geographical location, and geotechnical data.

Table P2.4-1 lists the various FMS models, and some of the basic application data.

Table P2.4-1; General Comparison of FMS Isolator/Restraint Models

FMS RESTRAINT MODEL	SUBMITTAL DRAWING NUMBER	MAXIMUM ¹ COMBINED RESTRAINT CAPACITY (² STEEL) (LB)	MAXIMUM ¹ COMBINED RESTRAINT CAPACITY (³ CONCRETE) (LB)	MAXIMUM ISOLATION RATING (LB)	APPROXIMATE RESTRAINT WEIGHT (LB)
FMSAA	S-10-40.100	615	410	805	9.0
FMSA	S-10-40.800	1,520	905	2,500	11.6
FMSB	S-10-40.200	3,175	1,040	3,000	18.4
FMSC	S-10-40.300	5,900	2,160	6,500	49.3
FMSD	S-10-40.400	9,565	3,045	10,000	86.7
FMSE	S-10-40.500	14,470	4,840	21,000	189.7
FMSF	S-10-40.600	26,100	9,875	24,000	268.0
FMSG	S-10-40.700	40,500	23,500	24,000	437.0

¹ Maximum restraint values for a load having equal horizontal and vertical components without isolation.

² Bolted or welded to structural steel.

³ Anchored to 3,000 psi minimum compressive strength steel reinforced concrete using post installed wedge type anchors.

FMS ISOLATOR/RESTRANIT SELECTION INFORMATION

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Figure P2.4-1 shows the restraint capacity envelopes for the entire FMS family if the restraint is attached to structural steel. These curves are for non-isolated restraints. The FMS family is unique in that isolation will change the restraint capacities of the unit, and quite often for the better. However, these curves will allow the reader to select one or two FMS models that may fit their application. Figure P2.4-2 presents the restraint capacity envelopes for the entire FMS family if the restraint is to be attached to 3,000 psi minimum compressive strength steel reinforced concrete. Again, these curves are for non-isolated restraints. The restraint capacities are affected, normally in a positive manner, by the addition of isolation to the system.

Tables P2.4-2 through P2.4-9 give the restraint capacities for the FMS family with various isolation loads applied to the restraints. These values will allow the reader to make a reasonable estimate as to whether a given isolator/restraint combination will work for the application under consideration. When a tentative selection has been made a plot of the appropriate capacity envelope should be constructed for the isolator/restraint combination being used, see the appropriate submittal sheets for the selected FMS, and the actual load points plotted on the capacity envelope chart. If the actual load points fall inside the capacity envelope, the selected FMS is adequate. If they do not fall inside the capacity envelope, select the next largest FMS.

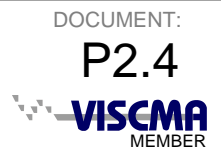
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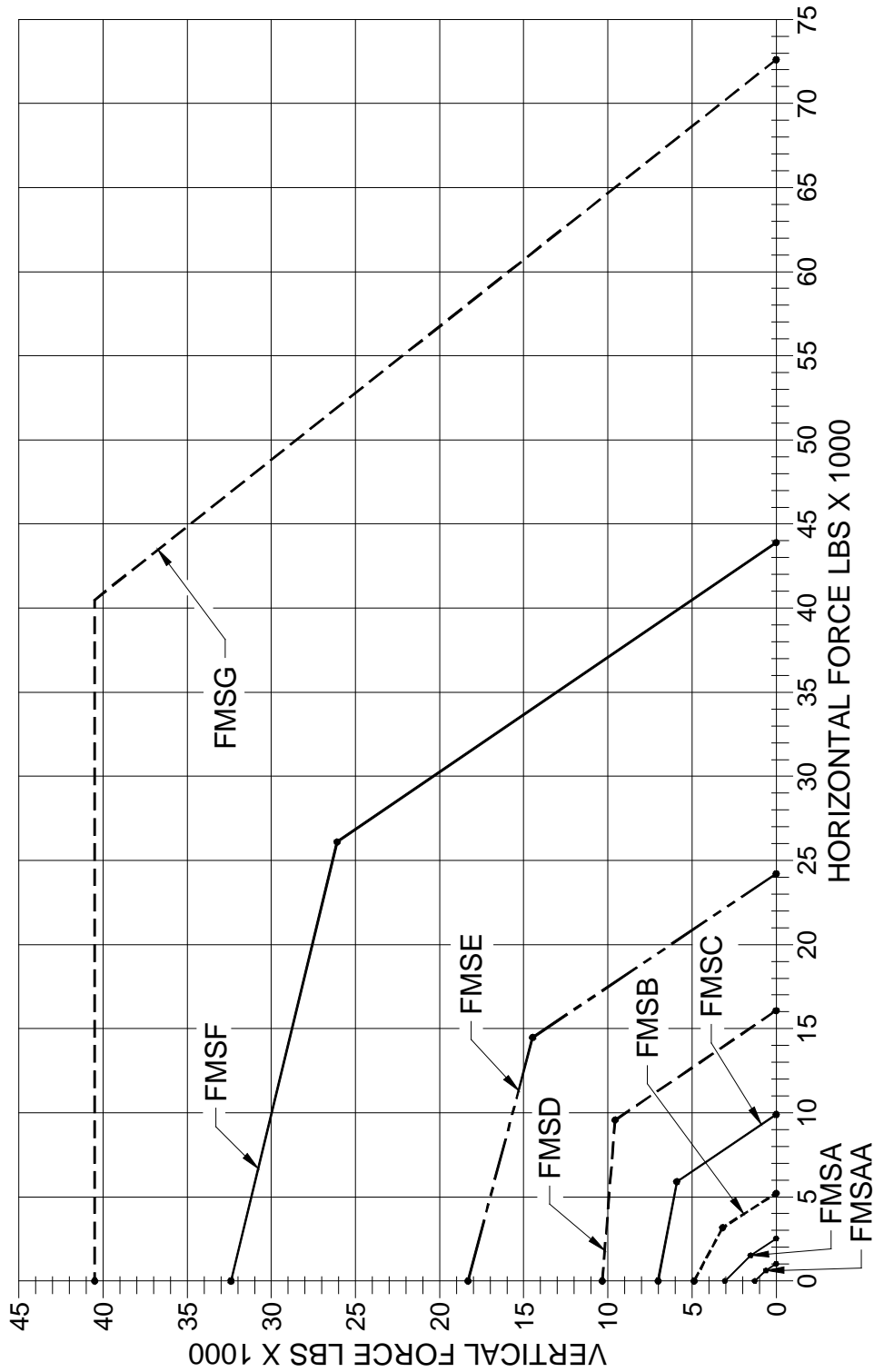
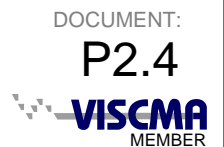


Figure P2.4-2; FMS Restraint Capacity Envelopes for Steel Attachment.

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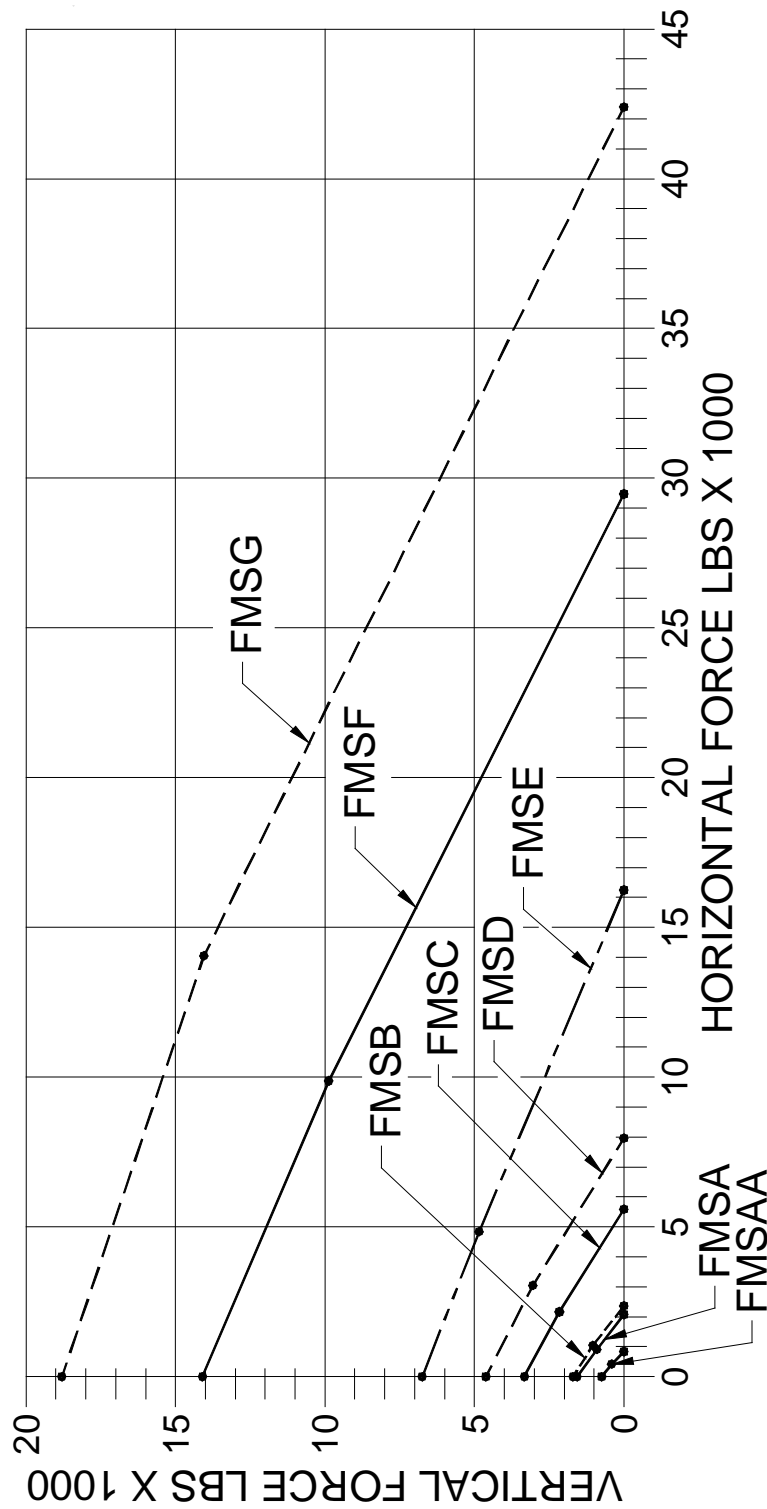


Figure P2.4-1; FMS Restraint Capacity Envelopes for Concrete Attachment.

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Table P2.4-2; FMSAA Restraint Capacities at Various Isolator Loads.

ISOLATOR LOAD (LB)	HORIZ. CAPACITY (²STEEL) (LB)	VERT. CAPACITY (²STEEL) (LB)	¹COMB. CAPACITY (²STEEL) (LB)	HORIZ. CAPACITY (³CONCRETE) (LB)	VERT. CAPACITY (³CONCRETE) (LB)	¹COMB. CAPACITY (³CONCRETE) (LB)
0	1,015	1,275	615	835	745	410
100	1,070	1,375	655	910	845	465
200	1,120	1,285	700	975	945	520
300	1,170	1,185	740	1,030	1,045	570
400	1,220	1,085	780	1,060	1,085	625
500	1,265	985	820	1,065	985	675
600	1,275	885	850	1,065	885	725
700	1,275	885	755	1,065	785	755
805	1,275	685	660	1,065	685	660

¹ Maximum restraint values for a load having equal horizontal and vertical components without isolation.

² Bolted or welded to structural steel.

³ Anchored to 3,000 psi minimum compressive strength steel reinforced concrete using post installed wedge type anchors.

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Table P2.4-3; FMSA Restraint Capacities at Various Isolator Loads.

ISOLATOR LOAD (LB)	HORIZ. CAPACITY (² STEEL) (LB)	VERT. CAPACITY (² STEEL) (LB)	¹ COMB. CAPACITY (² STEEL) (LB)	HORIZ. CAPACITY (³ CONCRETE) (LB)	VERT. CAPACITY (³ CONCRETE) (LB)	¹ COMB. CAPACITY (³ CONCRETE) (LB)
0	2,520	3,050	1,520	2,075	1,570	905
250	2,655	3,300	1,630	2,310	1,820	1,055
500	2,790	3,255	1,740	2,505	2,070	1,205
750	2,915	3,005	1,845	2,655	2,320	1,355
1,000	3,040	2,755	1,950	2,720	2,570	1,495
1,250	3,115	2,505	2,050	2,720	2,505	1,635
1,500	3,115	2,255	2,130	2,720	2,255	1,775
1,750	3,115	2,005	1,900	2,720	2,005	1,905
2,000	3,115	1,755	1,665	2,720	1,755	1,665
2,250	3,115	1,505	1,425	2,720	1,505	1,425
2,500	3,115	1,255	1,190	2,720	1,255	1,190
3,000	3,115	755	740	2,720	755	715
3,500	3,035	255	240	2,720	255	240

¹ Maximum restraint values for a load having equal horizontal and vertical components without isolation.

² Bolted or welded to structural steel.

³ Anchored to 3,000 psi minimum compressive strength steel reinforced concrete using post installed wedge type anchors.

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Table P2.4-4; FMSB Restraint Capacities at Various Isolator Loads.

ISOLATOR LOAD (LB)	HORIZ. CAPACITY (²STEEL) (LB)	VERT. CAPACITY (²STEEL) (LB)	¹COMB. CAPACITY (²STEEL) (LB)	HORIZ. CAPACITY (³CONCRETE) (LB)	VERT. CAPACITY (³CONCRETE) (LB)	¹COMB. CAPACITY (³CONCRETE) (LB)
0	5,210	4,880	3,175	2,355	1,700	1,040
250	5,345	5,130	3,285	2,575	1,950	1,195
500	5,475	5,380	3,395	2,755	2,200	1,345
750	5,605	5,630	3,500	2,890	2,450	1,490
1,000	5,730	5,880	3,605	2,945	2,700	1,635
1,250	5,850	5,715	3,710	2,945	2,950	1,775
1,500	5,970	5,465	3,815	2,945	3,200	1,915
1,750	6,090	5,215	3,915	2,945	3,450	2,045
2,000	6,210	4,965	4,015	2,945	3,700	2,175
2,250	6,230	4,715	4,070	2,945	3,950	2,300
2,500	6,230	4,465	3,855	2,945	4,200	2,425
3,000	6,230	3,965	3,425	2,945	3,965	2,650
3,500	6,230	3,465	2,995	2,945	3,450	2,845
4,000	6,230	2,965	2,560	2,945	2,950	2,560

¹ Maximum restraint values for a load having equal horizontal and vertical components without isolation.

² Bolted or welded to structural steel.

³ Anchored to 3,000 psi minimum compressive strength steel reinforced concrete using post installed wedge type anchors.

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Table P2.4-5; FMSC Restraint Capacities at Various Isolator Loads.

ISOLATOR LOAD (LB)	HORIZ. CAPACITY (²STEEL) (LB)	VERT. CAPACITY (²STEEL) (LB)	¹COMB. CAPACITY (²STEEL) (LB)	HORIZ. CAPACITY (³CONCRETE) (LB)	VERT. CAPACITY (³CONCRETE) (LB)	¹COMB. CAPACITY (³CONCRETE) (LB)
0	9,900	7,010	5,900	5,585	3,330	2,160
1,000	10,460	8,010	6,390	6,515	4,330	2,830
2,000	10,980	9,010	6,825	6,825	5,330	3,480
3,000	11,400	10,000	7,250	6,825	6,330	4,100
4,000	11,400	11,010	7,665	6,825	7,330	4,700
5,000	11,400	11,175	8,070	6,825	8,330	5,265
6,000	11,400	10,175	8,460	6,825	9,330	5,800
6,500	11,400	9,660	8,655	6,825	9,815	6,050

¹ Maximum restraint values for a load having equal horizontal and vertical components without isolation.

² Bolted or welded to structural steel.

³ Anchored to 3,000 psi minimum compressive strength steel reinforced concrete using post installed wedge type anchors.

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Table P2.4-6; FMSD Restraint Capacities at Various Isolator Loads.

ISOLATOR LOAD (LB)	HORIZ. CAPACITY (² STEEL) (LB)	VERT. CAPACITY (² STEEL) (LB)	¹ COMB. CAPACITY (² STEEL) (LB)	HORIZ. CAPACITY (³ CONCRETE) (LB)	VERT. CAPACITY (³ CONCRETE) (LB)	¹ COMB. CAPACITY (³ CONCRETE) (LB)
0	16,075	10,330	9,565	7,960	4,620	3,045
1,000	16,625	11,330	10,025	8,885	5,620	3,715
2,000	17,160	12,330	10,475	9,370	6,620	4,395
3,000	17,685	13,330	10,915	9,370	7,620	5,030
4,000	18,170	14,330	11,350	9,370	8,620	5,660
5,000	18,170	15,330	11,750	9,370	9,620	6,275
6,000	18,170	16,210	12,195	9,370	10,620	6,875
7,000	18,170	15,210	12,605	9,370	11,620	7,445
8,000	18,170	14,210	13,010	9,370	12,620	7,980
9,000	18,170	13,210	12,310	9,370	13,210	8,480
10,000	18,170	12,210	11,375	9,370	12,210	8,910

¹ Maximum restraint values for a load having equal horizontal and vertical components without isolation.

² Bolted or welded to structural steel.

³ Anchored to 3,000 psi minimum compressive strength steel reinforced concrete using post installed wedge type anchors.

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Table P2.4-7; FMSE Restraint Capacities at Various Isolator Loads.

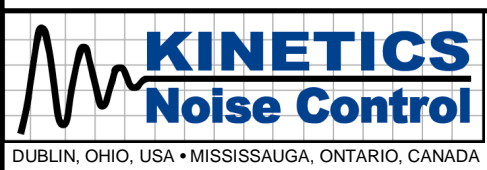
ISOLATOR LOAD (LB)	HORIZ. CAPACITY (² STEEL) (LB)	VERT. CAPACITY (² STEEL) (LB)	¹ COMB. CAPACITY (² STEEL) (LB)	HORIZ. CAPACITY (³ CONCRETE) (LB)	VERT. CAPACITY (³ CONCRETE) (LB)	¹ COMB. CAPACITY (³ CONCRETE) (LB)
0	24,205	18,315	14,470	16,245	6,750	4,840
2,000	25,285	20,315	15,380	19,075	8,750	6,335
4,000	26,325	22,315	16,270	20,390	10,750	7,840
6,000	26,850	24,315	17,135	20,390	12,750	9,295
8,000	26,850	26,315	17,980	20,390	14,750	10,720
10,000	26,850	26,465	18,805	20,390	16,750	12,115
12,000	26,850	24,465	19,615	20,390	18,750	13,480
14,000	26,850	22,465	20,405	20,390	20,750	14,805
16,000	26,850	20,465	19,145	20,390	20,470	16,090
18,000	26,850	18,465	17,275	20,390	18,465	17,275
21,000	26,850	15,465	14,470	20,390	15,465	14,470

¹ Maximum restraint values for a load having equal horizontal and vertical components without isolation.

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Table P2.4-8; FMSF Restraint Capacities at Various Isolator Loads.

ISOLATOR LOAD (LB)	HORIZ. CAPACITY (² STEEL) (LB)	VERT. CAPACITY (² STEEL) (LB)	¹ COMB. CAPACITY (² STEEL) (LB)	HORIZ. CAPACITY (³ CONCRETE) (LB)	VERT. CAPACITY (³ CONCRETE) (LB)	¹ COMB. CAPACITY (³ CONCRETE) (LB)
0	43,900	32,400	26,100	29,475	14,100	9,875
2,000	45,025	34,400	26,300	31,825	16,100	11,350
4,000	46,100	36,400	24,600	33,575	18,100	12,810
6,000	47,150	38,400	22,800	34,500	20,100	14,245
8,000	48,200	40,400	20,900	34,500	22,100	15,660
10,000	48,200	42,400	19,100	34,500	24,100	17,060
12,000	48,200	44,400	17,300	34,500	26,100	17,300
14,000	48,200	46,400	15,500	34,500	28,100	15,500
16,000	48,200	48,300	13,700	34,500	30,100	13,700
18,000	48,200	46,300	11,900	34,500	32,100	11,900
20,000	48,200	44,300	10,000	34,500	34,100	10,000
22,000	48,200	42,300	8,200	34,500	36,100	8,200
24,000	48,200	40,300	6,400	34,500	38,100	6,400

¹ Maximum restraint values for a load having equal horizontal and vertical components without isolation.

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Table P2.4-9; FMSG Restraint Capacities at Various Isolator Loads.

ISOLATOR LOAD (LB)	HORIZ. CAPACITY (²STEEL) (LB)	VERT. CAPACITY (²STEEL) (LB)	¹COMB. CAPACITY (²STEEL) (LB)	HORIZ. CAPACITY (³CONCRETE) (LB)	VERT. CAPACITY (³CONCRETE) (LB)	¹COMB. CAPACITY (³CONCRETE) (LB)
0	72,600	40,500	40,500	42,400	18,800	14,050
5,000	75,350	45,500	36,500	45,950	23,800	17,880
10,000	77,500	50,500	32,000	46,000	28,800	21,570
15,000	77,500	55,500	27,400	46,000	33,800	25,150
20,000	77,500	60,500	22,500	46,000	38,800	22,500
24,000	77,500	64,000	19,400	46,000	42,300	19,500

¹ Maximum restraint values for a load having equal horizontal and vertical components without isolation.

² Bolted or welded to structural steel.

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