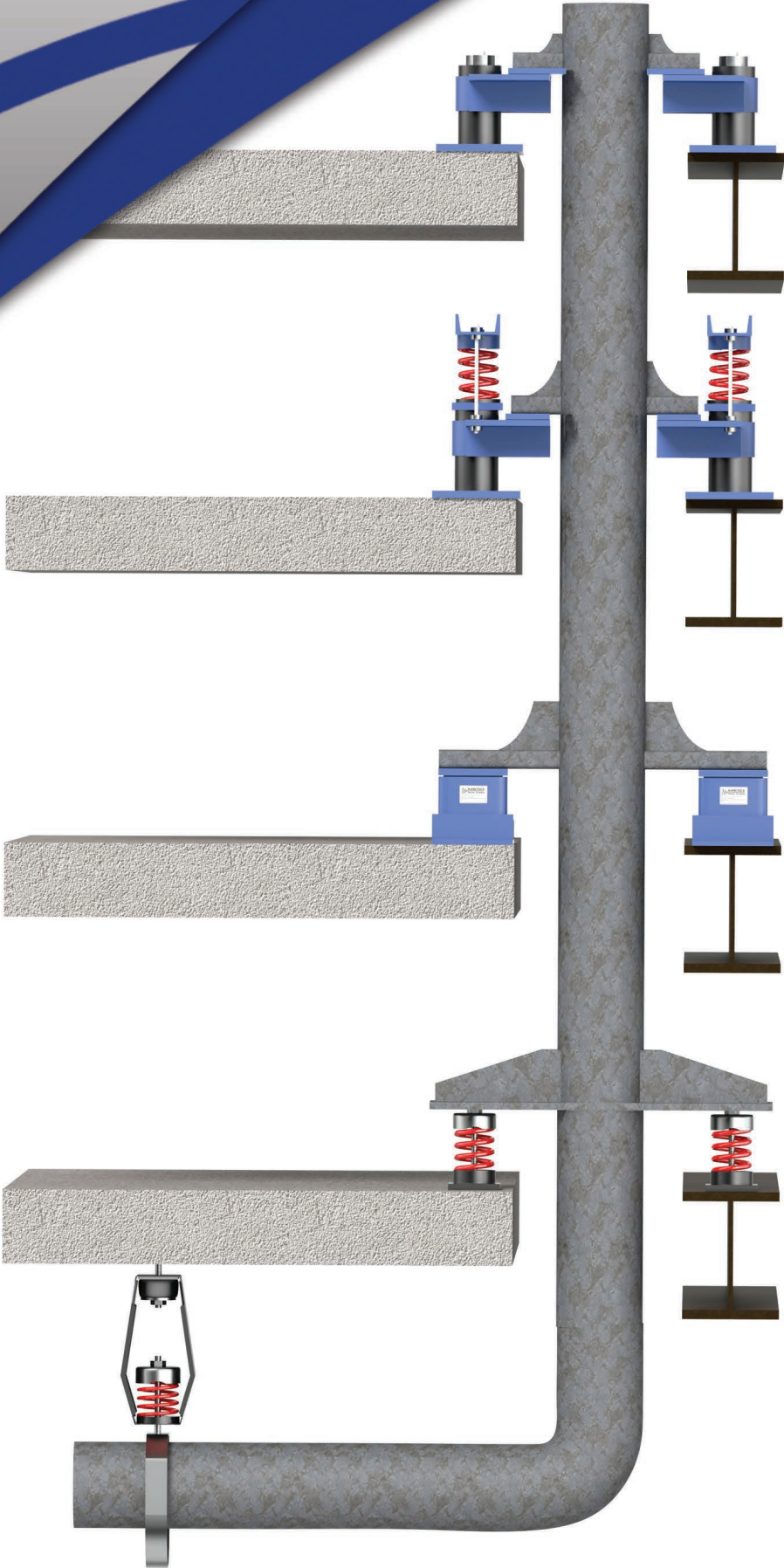


Pipe Riser Isolation

Selection Guide



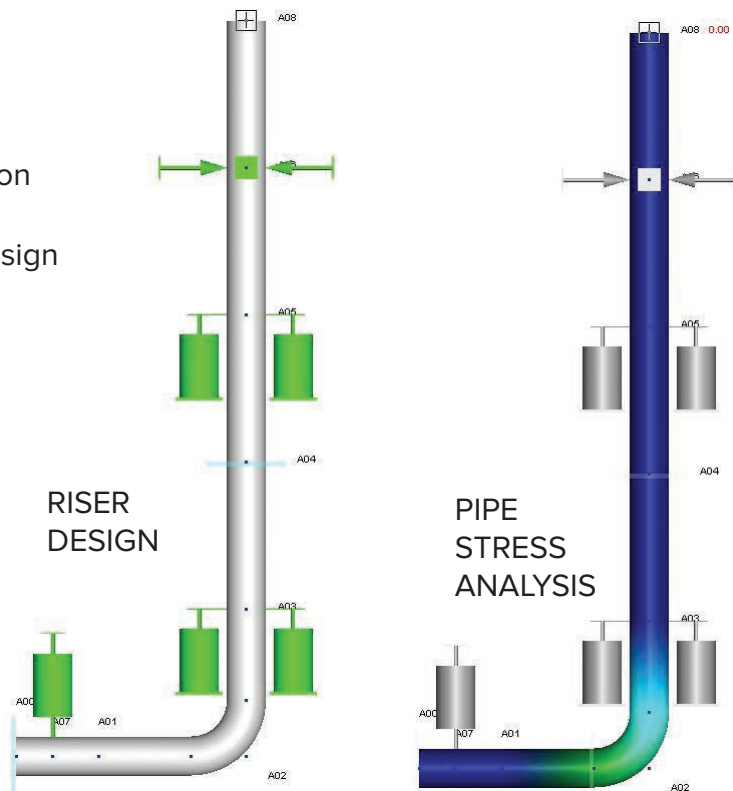
Vibration Isolators as Pipe Riser Supports

Vertical pipe risers can create a unique set of problems when they are installed in multi-story buildings. The introduction of fluids into the pipe can generate significant forces within the building at the riser support locations. Thermal expansion/contraction from steam or hot/cold water systems will cause the overall length of the piping to change. If not designed properly these changes can lead to substantial forces being transferred into the building structure, unacceptably high stress levels within the walls of the pipe, or failure of restraint and system components.

Featured in this brochure are six standard riser support configurations Kinetics Noise Control design to assist building engineers efficiently and cost effectively design riser systems. Kinetics engineers are available to provide piping solutions for residential, commercial, and industrial applications from basic to complex. From pipe rack design to equipment room layouts, to piping system analysis, Kinetics Noise control delivers solutions.

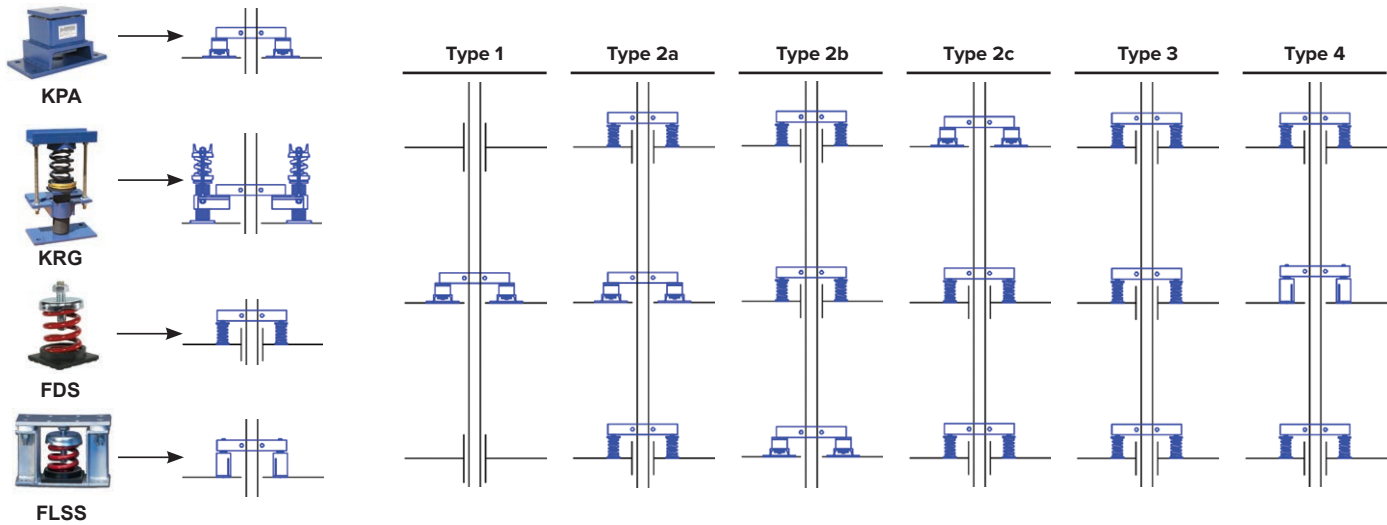
KINETICS® Engineering Solutions

- Pipe Isolation Design
- Pipe Support Design
- Seismic / Wind Restraint Design
- Thermal Stress Analysis
- Expansion Requirements and Design
- ASME B31.3 code design and certification
- ASCE 7 code design and certification
- Commercial / Industrial / Residential Design
- Water, Steam, Medical Gas piping



Standard Riser Types

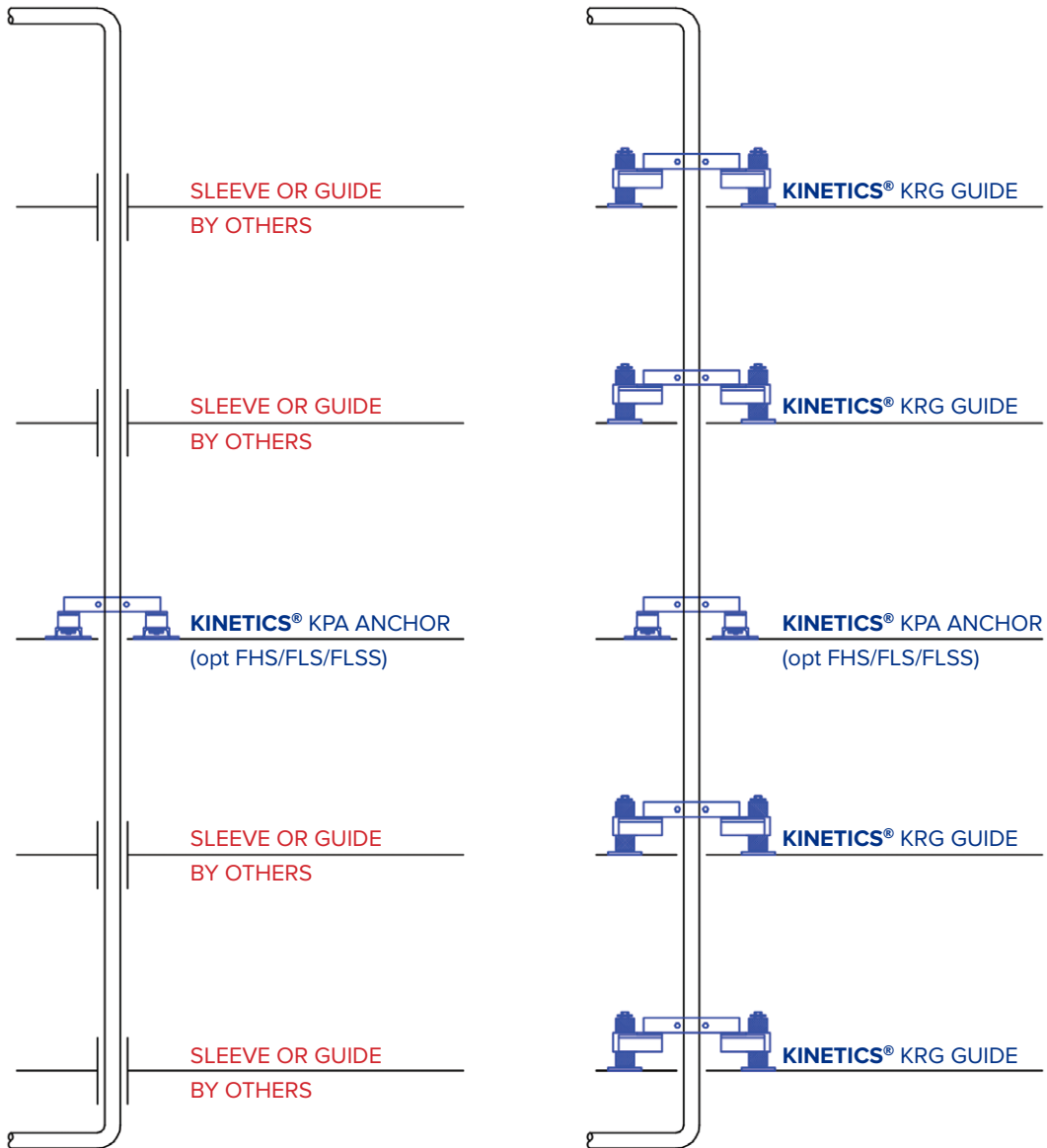
Kinetics Noise Control’s engineering team has developed standard riser support configurations to help building engineers efficiently and cost effectively design riser systems. Details on pages 4-9.



RISER TYPES	1	2a	2b	2c	3	4
Cost	\$	\$\$\$\$	\$\$\$\$	\$\$\$\$	\$\$\$	\$\$
Installation Difficulty	🔧	🔧🔧	🔧🔧	🔧🔧	🔧🔧🔧	🔧🔧
Cold Water	✓	✓	✓	✗*	✓	✓
Hot Water	✓	✓	✗	✓	✓	✓
Steam	✓	✓	✗	✓	✗	✗
Multi-Floor Weight Distribution	✗	✓	✓	✓	✓	✓
Flexible Couplings	✓	✓*	✓*	✓*	✗	✗

*Some Exceptions

Riser Type 1 (Anchored/Guided)

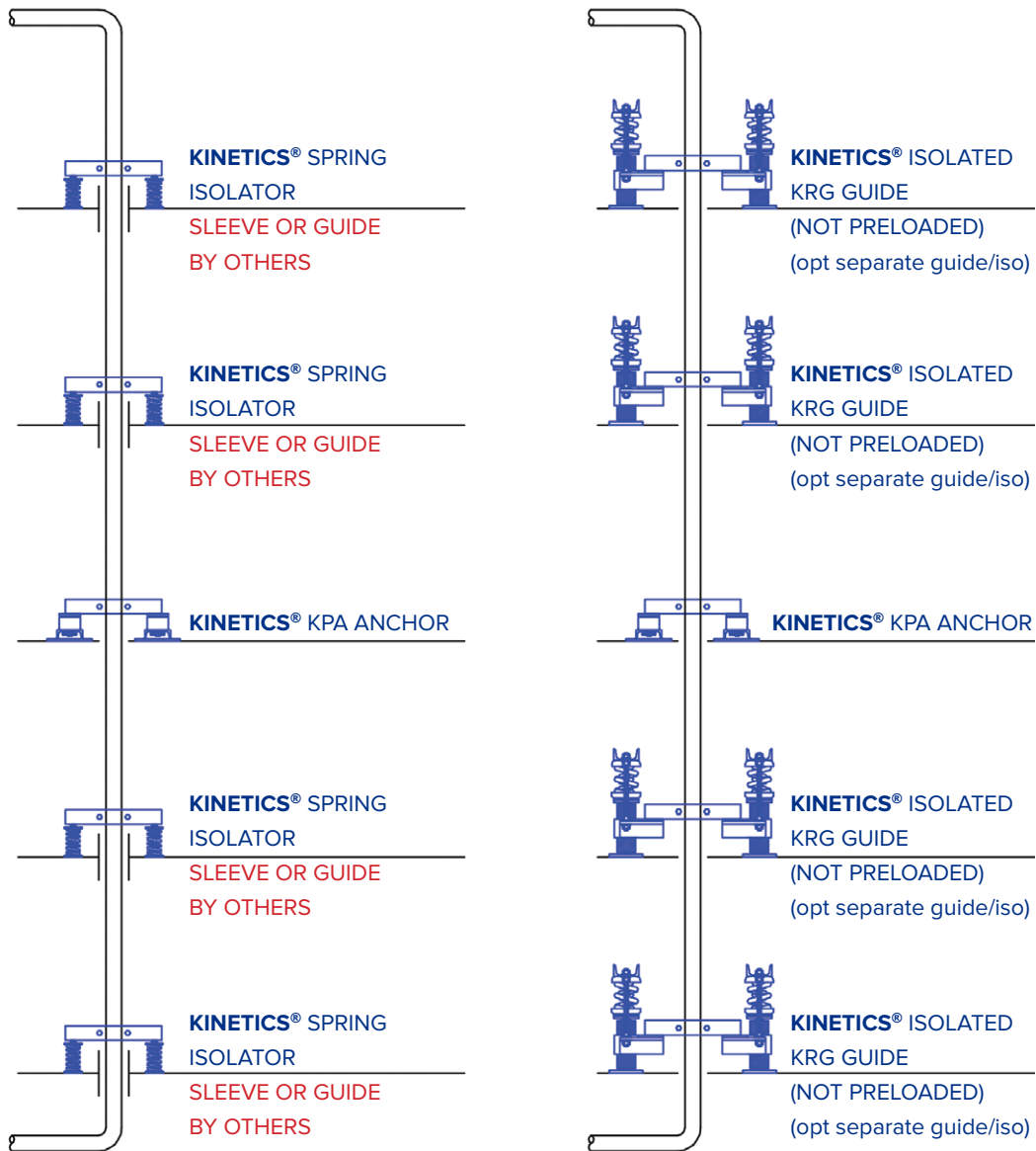


Cost	Installation Difficulty	Cold Water	Hot Water	Steam	Multi-Floor Weight Distribution	Flexible Couplings
\$						

NOTES:

- Potential high floor loading - All of the weight is carried by the anchor all of the time.
- Anchor can be anywhere in the system: top, bottom, mid-story.
- Anchor “fixes” pipe at it’s location making variations in height due to thermal growth/shrinkage highly predictable.
- Simple to install.
- Least expensive support system.
- Commonly used on risers up to 6 stories.
- Works with Hot and/or Cold systems.

Riser Type 2A (Anchored/Guided with Springs)



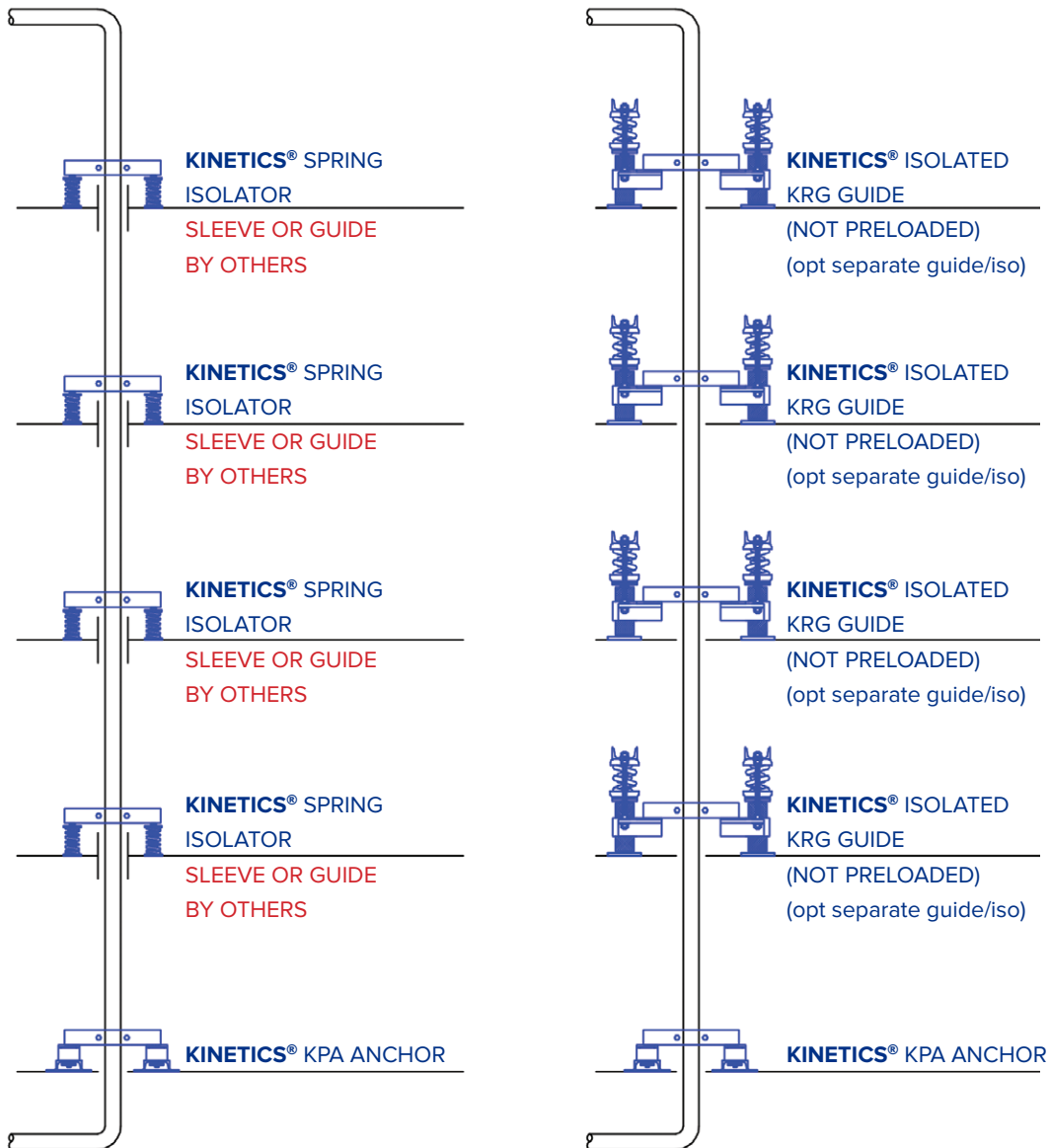
Cost	Installation Difficulty	Cold Water	Hot Water	Steam	Multi-Floor Weight Distribution	Flexible Couplings
\$\$\$\$						

NOTES:

- Balanced floor loading.
- Anchor located at mid-story.
- Reduces stress on piping.
- Anchor “fixes” pipe at its location making variations in height due to thermal growth/shrinkage highly predictable.
- Simple to install.
- Most expensive support system.
- Works with Hot and/or Cold systems.

*Some Exceptions

Riser Type 2B (Bottom Anchored/Guided with Springs)



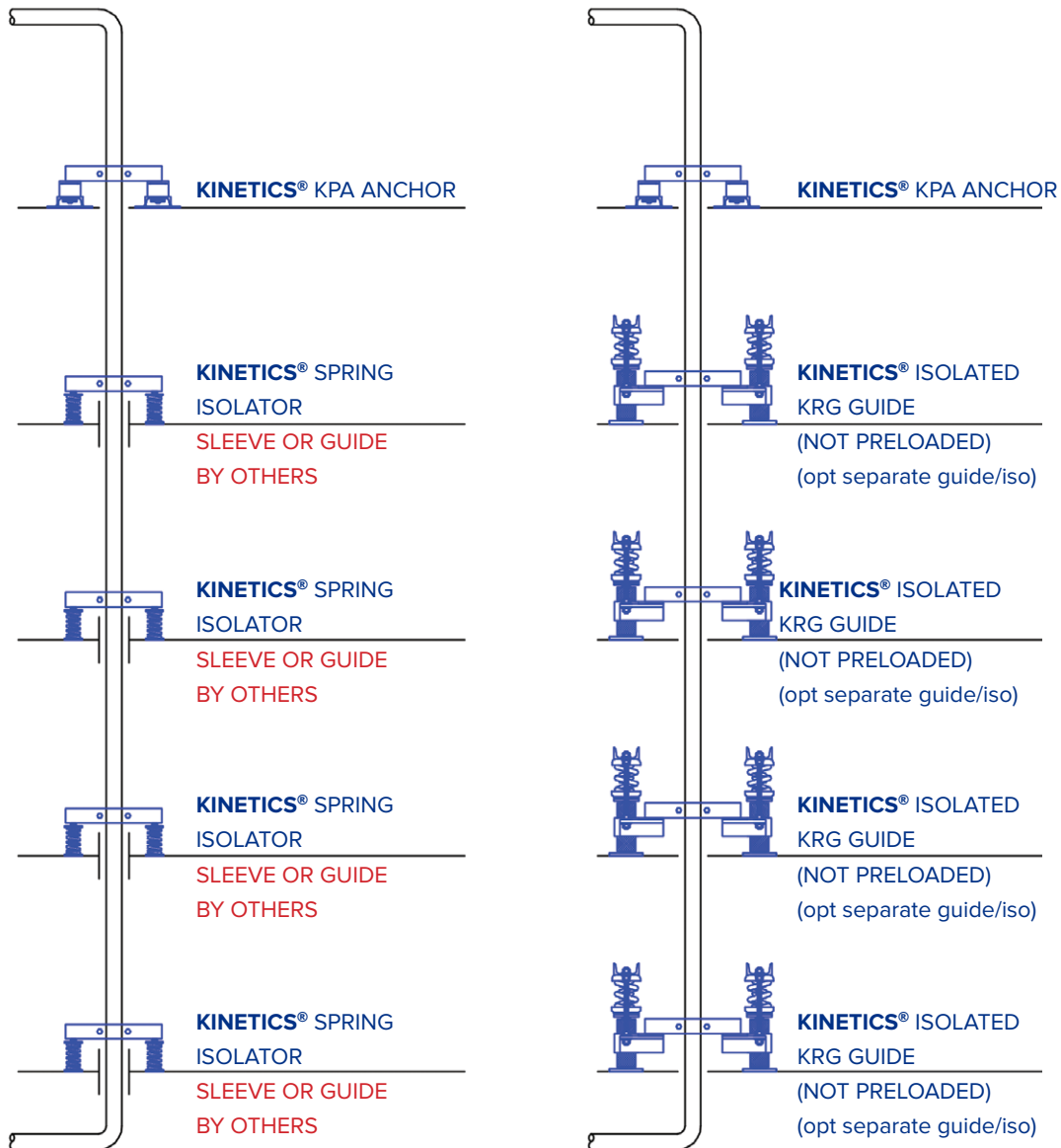
Cost	Installation Difficulty	Cold Water	Hot Water	Steam	Multi-Floor Weight Distribution	Flexible Couplings
\$\$\$\$						

NOTES:

- Balanced floor loading.
- Anchor at bottom.
- Reduces stress on piping & structure.
- Anchor “fixes” pipe at it’s location making variations in height due to thermal growth/shrinkage highly predictable.
- Slightly less cost to install than type 2a.
- Works with Cold systems only.

*Some Exceptions

Riser Type 2C (Top Anchored/Guided with Springs)



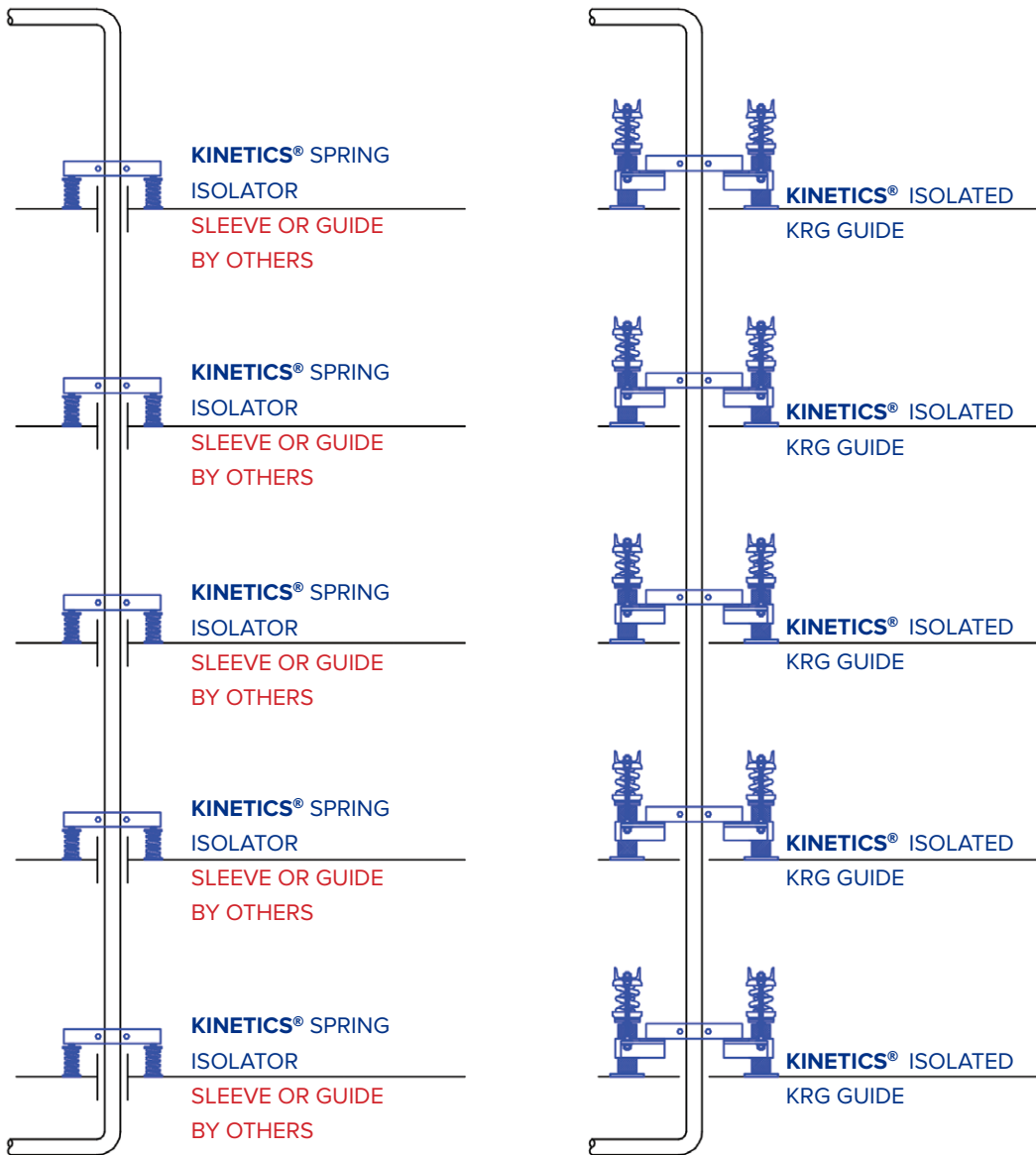
Cost	Installation Difficulty	Cold Water	Hot Water	Steam	Multi-Floor Weight Distribution	Flexible Couplings
\$\$\$\$						

NOTES:

- Balanced floor loading.
- Anchor at top
- Moderate stress on piping & structure.
- Anchor “fixes” pipe at it’s location making variations in height due to thermal growth/shrinkage highly predictable.
- Slightly less cost to install than type 2a.
- Works with Hot systems only.

*Some Exceptions

Riser Type 3 (Fully Floating)

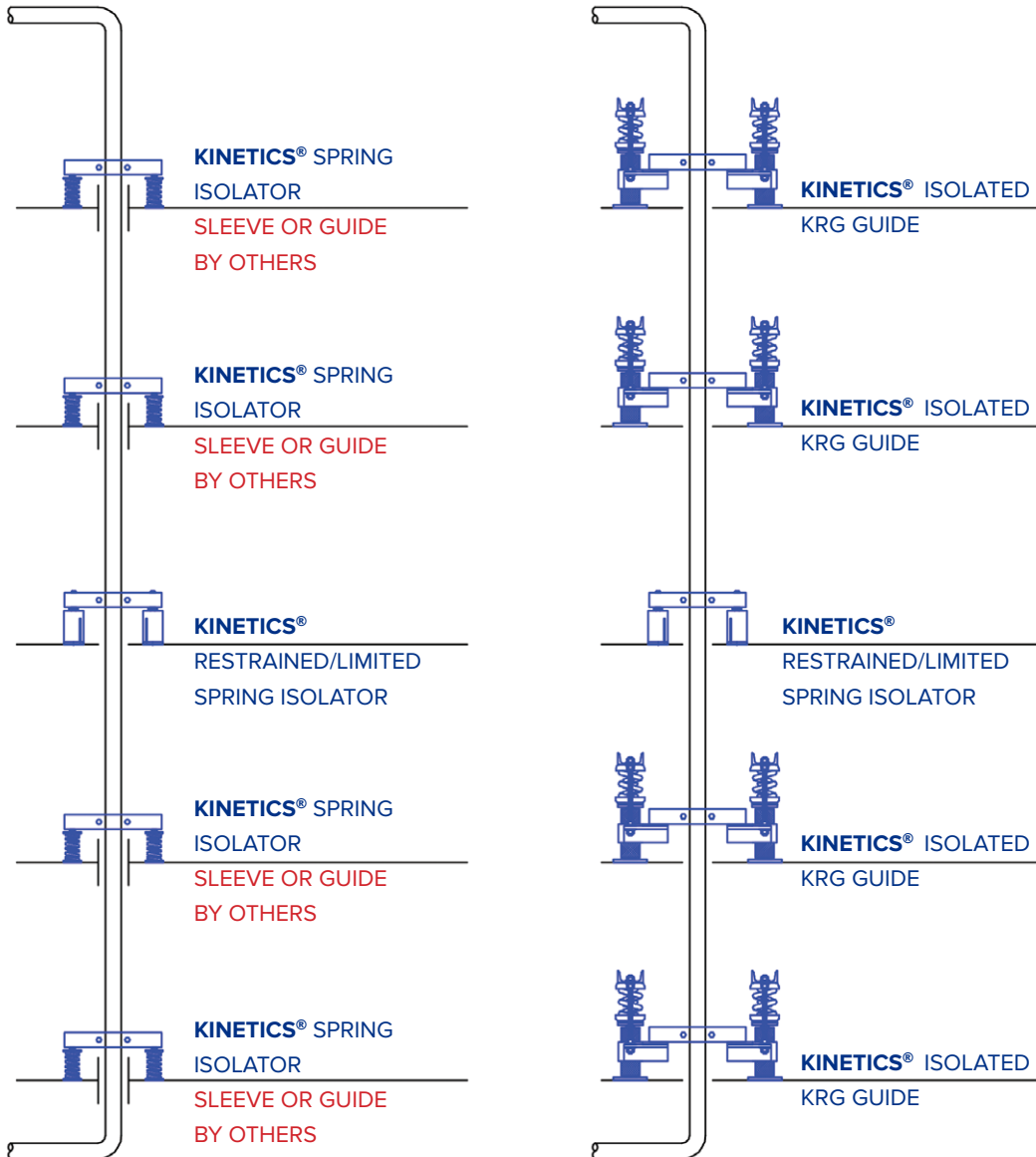


Cost	Installation Difficulty	Cold Water	Hot Water	Steam	Multi-Floor Weight Distribution	Flexible Couplings
\$\$\$		✓	✓	✗	✓	✗

NOTES:

- Balanced floor loading.
- Reduces stress on piping.
- Most expensive support system.
- Works with Hot and/or Cold systems.

Riser Type 4 (Semi-Floating)



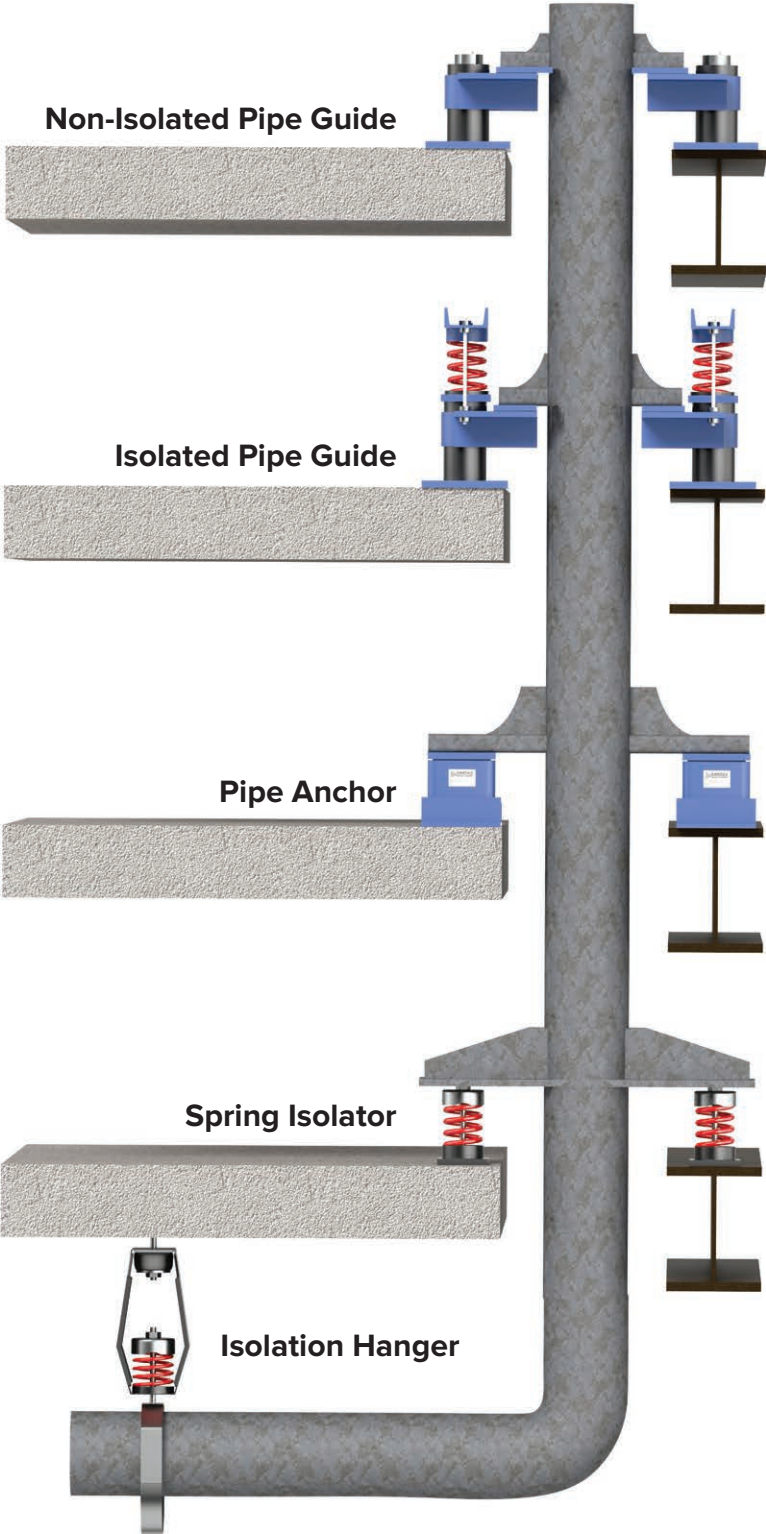
Cost	Installation Difficulty	Cold Water	Hot Water	Steam	Multi-Floor Weight Distribution	Flexible Couplings
\$\$						

NOTES:

- Balanced floor loading.
- Anchor can be anywhere in the system: top, bottom, mid-story.
- Reduces stress on piping.
- Anchor “fixes” pipe at its location making variations in height due to thermal growth/shrinkage highly predictable.
- Simple to install.
- Most expensive support system.
- Works with Hot and/or Cold systems.

Riser Supports, Anchors, and Guides

KINETICS® riser supports, anchors, and guides isolate the pipe from the structure to minimize noise and vibration transmission, while also allowing the pipe to expand and contract with minimal change in the support forces.



KINETICS® Riser Support Components



KRG Pipe Guide

Isolated or non-isolated. Required in shaft mounted risers. Typically excluded on core drilled risers. Isolated version recommended for use guide is required at same location as an isolated support, unless isolation can be overhead.



KPA Pipe Anchor

Recommended to anchor pipe to structure to set thermal origin.



FLS/FLSS Restrained Spring Isolators

Recommended as an anchor in fully spring supported systems with seismic considerations.



FDS Non-Restrained Spring Isolators

Recommended to support loads back to structure while allowing pipe thermal growth/shrinkage, as dictated by project documents and/or structural limits.



SRH Isolation Hangers

Recommended to support branch lines or in place of FDS when overhead support is preferred.

Piping/Hanger Selection Data (U.S.)

Piping Weight and Spacing - Water

Pipe Size (in.)	1	1.25	1.5	2	2.5	3	4	5	6	8	10	12	14	16	18	20	24
Pipe Schedule	40	40	40	40	40	40	40	40	40	40	40	40	30	30	30	20	20
Max. Spacing (ft.)	7	7	9	10	11	12	14	16	17	19	20	23	25	27	28	30	32
Insulation (in.)*	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Wt. per Lin. Ft. (lb.)																	
Pipe	1.7	2.3	2.7	3.7	5.8	7.6	10.8	14.7	19.0	28.6	40.6	53.7	54.7	62.7	82.2	78.8	94.9
Water	0.4	0.6	0.9	1.5	2.1	3.2	5.5	8.7	12.5	21.7	34.2	48.5	59.8	79.2	99.8	126.1	184.0
Insulation	0.6	0.7	0.8	0.9	1.1	1.3	1.5	3.0	3.4	4.2	5.1	6.0	6.5	7.3	8.2	9.0	10.7
Total	2.7	3.6	4.4	6.1	9.0	12.1	17.8	26.4	34.9	54.5	79.9	108.2	121.0	149.2	190.2	213.9	289.6
Wt. @ 10 ft. Spacing (lb.)	-	-	-	61	90	121	178	264	349	545	799	1082	1210	1492	1902	2139	2896
KNC Hanger Model No.																	
SH/SRH/SFH -1	-	-	-	70	125	125	245	370	370	600	800	1250	1250	1700	2200	2200	3500
SH/SRH/SFH -2	-	-	-	70	120	120	220	465	465	720	850	1025	1200	2000	2000	2500	-
SH/SRH/SFH -4	-	-	-	100	100	100	250	250	500	500	750	1000	1250	1600	2250	2250	3000
Recommended Rod Size (in.)**	-	-	-	0.38	0.38	0.38	0.50	0.50	0.50	0.50	0.62	0.62	0.75	0.75	0.88	0.88	1.00
Wt. @ 20 ft. Spacing (lb.)	-	-	-	-	-	-	-	-	-	-	1598	2163	2419	2984	-	-	-
KNC Hanger Model No.																	
SH/SRH/SFH -1	-	-	-	-	-	-	-	-	-	-	1700	2200	2465	3500	-	-	-
SH/SRH/SFH -2	-	-	-	-	-	-	-	-	-	-	2000	2500	2500	-	-	-	-
SH/SRH/SFH -4	-	-	-	-	-	-	-	-	-	-	1600	2250	2500	3000	-	-	-
Recommended Rod Size (in.)**	-	-	-	-	-	-	-	-	-	-	0.75	0.88	0.88	1.00	-	-	-
Max. Spacing (ft.)	7	7	9	10	11	12	14	16	17	19	20	23	25	27	28	30	32
Wt. @ Max. Spacing (lb.)	19	26	40	61	99	145	250	421	594	1036	1598	2487	3024	-	-	-	-
KNC Hanger Model No.																	
SH/SRH/SFH -1	35	35	70	70	125	245	370	500	600	1000	1700	2865	3500	-	-	-	-
SH/SRH/SFH -2	35	35	70	70	120	220	465	465	720	1200	2000	2500	-	-	-	-	-
SH/SRH/SFH -4	-	-	-	100	100	250	250	500	750	1250	1600	2500	3500	-	-	-	-
Recommended Rod Size (in.)**	0.25	0.38	0.38	0.38	0.38	0.38	0.50	0.50	0.50	0.62	0.75	0.88	1.00	-	-	-	-

Piping Weight and Spacing - Steam

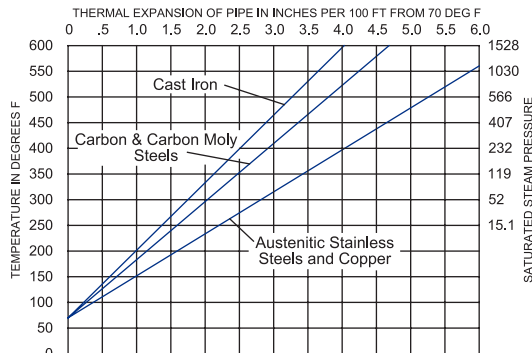
Pipe Size (in.)	1	1.25	1.5	2	2.5	3	4	5	6	8	10	12	14	16	18	20	24
Pipe Schedule	40	40	40	40	40	40	40	40	40	40	40	40	30	30	30	20	20
Insulation (in.)*	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Wt. per Ft. (lbs.)																	
Pipe	1.7	2.3	2.7	3.7	5.8	7.6	10.8	14.7	19.0	28.6	40.6	53.7	54.7	62.7	82.2	78.8	94.9
Insulation	1.2	1.3	1.4	1.6	1.8	2.1	2.5	4.2	4.8	5.9	7.1	8.2	8.9	10.1	11.2	12.3	14.5
Total	2.9	3.6	4.1	5.3	7.6	9.7	13.3	18.9	23.8	34.6	47.7	61.9	63.6	72.8	93.4	91.1	109.4
Wt. @ 10 ft. Spacing (lb.)	-	36	41	53	76	97	133	189	238	346	477	619	636	728	934	911	1094
KNC Hanger Model No.																	
SH/SRH/SFH -1	-	35	35	70	70	125	125	245	245	370	500	625	625	800	1000	1000	1250
SH/SRH/SFH -2	-	35	35	70	70	120	120	220	220	465	720	720	720	720	1025	1025	1200
SH/SRH/SFH -4	-	-	-	100	100	100	100	250	250	500	500	750	750	750	1000	1000	1250
Recommended Rod Size (in.)**	-	0.38	0.38	0.38	0.38	0.38	0.38	0.50	0.50	0.50	0.50	0.62	0.62	0.62	0.62	0.62	0.62
Wt. @ 20 ft. Spacing (lb.)	-	-	-	-	-	-	-	-	477	691	954	1238	1273	1456	1867	1822	2187
KNC Hanger Model No.									500	625	1000	1250	1250	1700	2200	2200	2200
SH/SRH/SFH -1	-	-	-	-	-	-	-	-	720	720	1025	2000	2000	2000	2000	2000	2500
SH/SRH/SFH -2	-	-	-	-	-	-	-	-	500	750	1000	1250	1600	1600	2250	2250	2250
SH/SRH/SFH -4	-	-	-	-	-	-	-	-	0.50	0.62	0.62	0.75	0.75	0.75	0.88	0.88	1.00
Recommended Rod Size (in.)**	-	-	-	-	-	-	-	-	0.50	0.62	0.62	0.75	0.75	0.75	0.88	0.88	1.00
Max. Spacing (ft.)	9	10	12	13	14	15	17	19	21	24	26	30	32	35	37	39	39
Wt. @ Max. Spacing (lb.)	26	36	50	69	107	145	227	359	501	829	1240	1857	2036	2548	3454	3552	4266
KNC Hanger Model No.																	
SH/SRH/SFH -1	35	35	70	70	125	245	245	370	500	1000	1250	2200	2200	2865	-	-	-
SH/SRH/SFH -2	35	35	70	70	120	220	220	465	720	850	2000	2000	2000	2500	-	-	-
SH/SRH/SFH -4	-	-	-	100	100	100	250	500	500	1000	1250	2250	2250	2750	-	-	-
Recommended Rod Size (in.)**	0.25	0.38	0.38	0.38	0.38	0.38	0.50	0.50	0.50	0.62	0.75	0.88	1.00	1.00	-	-	-

*Insulation weight based on industry standard insulation.

**Rod size recommendation and max. hanger spacing based on MSS SP-69

Approximate Flanged Fitting Weights (lb.)

Pipe Size (In.)	Bonnet Check Valve	Bonnet Gate Valve	Elbow	Tee	Flange
1	-	9	8	11	4
1.5	-	27	12	18	4
2	26	37	18	24	5
2.5	36	50	27	35	7
3	46	66	33	40	9
4	80	109	56	74	15
5	120	140	78	91	19
6	155	170	97	117	23
8	300	250	160	182	32
10	450	470	260	290	52
12	675	690	390	400	70
14	900	950	520	600	93
16	1200	1250	725	750	120
18	1371	1650	980	930	140
20	1772	2000	1300	1100	175
24	3000	3100	1850	1850	250



Piping/Hanger Selection Data (SI)

Piping Weight and Spacing - Water

Pipe Size (mm)	25	32	38	51	64	76	102	127	152	203	254	305	356	406	457	508	610
Pipe Schedule	40	40	40	40	40	40	40	40	40	40	40	40	30	30	30	20	20
Max. Spacing (m)	2.1	2.1	2.7	3.0	3.4	3.7	4.3	4.9	5.2	5.8	6.1	7.0	7.6	8.2	8.5	9.1	9.8
Insulation (mm)*	25	25	25	25	25	25	25	38	38	38	38	38	38	38	38	38	38
Wt. per M (kg)																	
Pipe	2.5	3.4	4.0	5.5	8.6	11.3	16.1	21.9	28.3	42.6	60.5	80.0	81.4	93.3	122.4	117.3	141.3
Water	0.6	0.9	1.3	2.2	3.1	4.8	8.2	12.9	18.6	32.3	50.9	72.1	89.0	117.9	148.6	187.8	274.0
Insulation	0.9	1.0	1.2	1.3	1.6	1.9	2.2	4.5	5.1	6.2	7.6	9.0	9.7	10.9	12.2	13.4	15.9
Total	4.0	5.3	6.5	9.0	13.3	18.0	26.5	39.3	52.0	81.1	119.0	161.1	180.1	222.1	283.2	318.5	431.2
Wt. @ 3 m Spacing (kg)	-	-	-	27	40	54	80	118	156	243	357	483	540	666	850	955	1294
KNC Hanger Model No.																	
SH/SRH/SFH -1	-	-	-	70	125	125	245	370	370	600	800	1250	1250	1700	2200	2200	3500
SH/SRH/SFH -2	-	-	-	70	120	120	220	465	465	720	850	1025	1200	2000	2000	2500	-
SH/SRH/SFH -4	-	-	-	100	100	100	250	250	500	500	750	1000	1250	1600	2250	2250	3000
Recommended Rod Size (mm)**	-	-	-	10	10	10	13	13	13	13	16	16	19	19	22	22	25
Wt. @ 6 m Spacing (kg)	-	-	-	-	-	-	-	-	-	-	714	966	1080	1332	-	-	-
KNC Hanger Model No.																	
SH/SRH/SFH -1	-	-	-	-	-	-	-	-	-	-	1700	2200	2465	3500	-	-	-
SH/SRH/SFH -2	-	-	-	-	-	-	-	-	-	-	2000	2500	2500	-	-	-	-
SH/SRH/SFH -4	-	-	-	-	-	-	-	-	-	-	1600	2250	2500	3000	-	-	-
Recommended Rod Size (mm)**	-	-	-	-	-	-	-	-	-	-	19	22	22	25	-	-	-
Max. Spacing (m)	2.1	2.1	2.7	3.0	3.4	3.7	4.3	4.9	5.2	5.8	6.1	7.0	7.6	8.2	8.5	9.1	9.8
Wt. @ Max. Spacing (kg)	8.6	11.8	18.1	27.7	44.9	65.8	113.4	190.9	269.4	469.9	724.8	1128.1	1371.7	-	-	-	-
KNC Hanger Model No.																	
SH/SRH/SFH -1	35	35	70	70	125	245	370	500	600	1000	1700	2865	3500	-	-	-	-
SH/SRH/SFH -2	35	35	70	70	120	220	465	465	720	1200	2000	2500	-	-	-	-	-
SH/SRH/SFH -4	-	-	-	100	100	250	250	500	750	1250	1600	2500	3500	-	-	-	-
Recommended Rod Size (mm)**	6	10	10	10	10	10	13	13	13	16	19	22	25	-	-	-	-

Piping Weight and Spacing - Steam

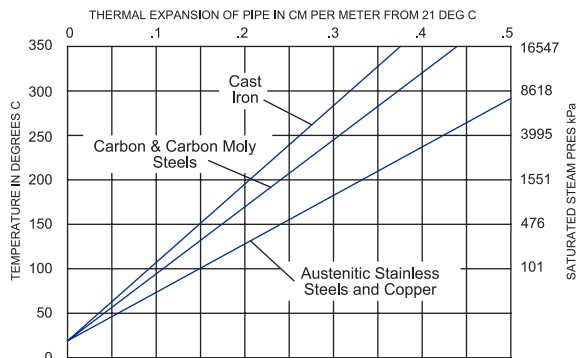
Pipe Size (mm)	25	32	38	51	64	76	102	127	152	203	254	305	356	406	457	508	610
Pipe Schedule	40	40	40	40	40	40	40	40	40	40	40	40	30	30	30	20	20
Insulation (mm)*	38	38	38	38	38	38	38	51	51	51	51	51	51	51	51	51	51
Wt. per m (kg)																	
Pipe	2.5	3.4	4.0	5.5	8.6	11.3	16.1	21.9	28.3	42.6	60.5	80.0	81.4	93.3	122.4	117.3	141.3
Insulation	1.8	1.9	2.1	2.4	2.7	3.1	3.7	6.2	7.1	8.8	10.5	12.2	13.3	15.0	16.7	18.3	21.6
Total	4.3	5.3	6.1	7.9	11.3	14.4	19.8	28.1	35.4	51.4	71.0	92.2	94.7	108.4	139.1	135.6	162.9
Wt. @ 3 m Spacing (kg)	-	16	18	24	34	43	59	84	106	154	213	277	284	325	417	407	489
KNC Hanger Model No.																	
SH/SRH/SFH -1	-	35	35	70	70	125	125	245	245	370	500	625	625	800	1000	1000	1250
SH/SRH/SFH -2	-	35	35	70	70	120	120	220	220	465	720	720	720	720	1025	1025	1200
SH/SRH/SFH -4	-	-	-	100	100	100	100	250	250	500	500	750	750	750	1000	1000	1250
Recommended Rod Size (mm)**	-	10	10	10	10	10	10	13	13	13	13	16	16	16	16	16	16
Wt. @ 6 m Spacing (kg)	-	-	-	-	-	-	-	-	212	308	426	554	568	650	834	814	978
KNC Hanger Model No.																	
SH/SRH/SFH -1	-	-	-	-	-	-	-	-	500	625	1000	1250	1250	1700	2200	2200	2200
SH/SRH/SFH -2	-	-	-	-	-	-	-	-	720	720	1025	2000	2000	2000	2000	2000	2500
SH/SRH/SFH -4	-	-	-	-	-	-	-	-	500	750	1000	1250	1600	1600	2250	2250	2250
Recommended Rod Size (mm)**	-	-	-	-	-	-	-	-	13	16	16	19	19	19	22	22	25
Max. Spacing (m)	2.7	3.0	3.7	4.0	4.3	4.6	5.2	5.8	6.4	7.3	8.0	9.1	9.8	10.7	11.3	11.9	11.9
Wt. @ Max. Spacing (kg)	12	16	23	31	49	66	103	163	227	376	562	842	924	1156	1567	1611	1935
KNC Hanger Model No.																	
SH/SRH/SFH -1	35	35	70	70	125	245	245	370	500	1000	1250	2200	2200	2865	-	-	-
SH/SRH/SFH -2	35	35	70	70	120	220	220	465	720	850	2000	2000	2000	2500	-	-	-
SH/SRH/SFH -4	-	-	-	100	100	100	250	500	500	1000	1250	2250	2250	2750	-	-	-
Recommended Rod Size (mm)**	6	10	10	10	10	10	13	13	13	16	19	22	25	25	-	-	-

*Insulation weight based on industry standard insulation.

**Rod size recommendation and max. hanger spacing based on MSS SP-69

Approximate Flanged Fitting Weights (kg)

Pipe Size (mm)	Bonnet Check Valve	Bonnet Gate Valve	Elbow	Tee	Flange
25	-	4.1	3.6	5.0	1.8
38	-	12.2	5.4	8.2	1.8
51	11.8	16.8	8.2	10.1	2.3
64	16.3	22.7	12.2	15.9	3.2
76	20.1	30.0	15.0	18.1	4.1
102	36.3	49.4	25.4	33.6	6.8
127	54.4	63.5	35.4	41.3	8.6
152	70.3	77.1	44.0	53.1	10.4
203	136.1	113.4	72.6	82.6	14.5
254	204.1	213.2	117.9	131.5	23.6
305	306.2	313.0	176.9	181.4	31.8
356	408.2	430.9	235.9	272.2	42.2
406	544.3	567.0	328.9	340.2	54.4
457	621.9	748.4	444.5	421.8	63.5
508	803.8	907.2	589.7	499.0	79.4
610	1360.8	1406.1	839.1	839.1	113.4



Long Form Riser Specification

1.0 General

1.01 Related Work Specified Elsewhere

(Vibration Isolation portion of specs, fill in as required)
(Seismic portion of specs, fill in as required)

1.02 Definitions

- ASHRAE (American Society of Heating, Refrigeration and Air Conditioning Engineers) has developed recommendations for Isolators and Restraint Devices.
- ASME B31 (American Society of Professional Engineers Standard for Pressure Piping).
- MSS SP-58 (Manufacturers Standardization Society of the Valve and Fitting Industry – Pipe Hangers and Supports-Materials, Design and Manufacture)
- SMACNA: (Sheet Metal and Air Conditioning Contractors National Association) has developed Guidelines for the installation of restraints for piping and duct systems.
- VISCMA: (Vibration Isolation and Seismic Control Manufacturers Association) has developed Testing and Rating Standards for Seismic Restraint Components that comply with Code and ASHRAE based requirements.

1.03 Performance Requirements

- For Seismic Parameters refer to the Seismic Portion of the Project Specification.
- Local Design Conditions (Ambient and/or Installation Temperature)
- Riser Operating Temperature(s)
- General Design Parameters (Anchored System, Isolated System, Maximum Permitted Load per Floor (or support point)).

1.04 Submittals

- Product Data: Include all dimensional and capacity data for each Isolator, Guide and Anchor component specified. Include allowed axial displacement on Guides. Where attached to concrete, ratings to be based on ICC allowed anchor capacities.
- Samples: The contractor shall submit samples of specified Riser devices upon request of the engineer for approval
- Shop Drawings: Include the following:
 - Computer generated design calculations: Calculate and document the load requirements when selecting vibration isolators, anchors and guides accounting for “worst case” conditions (empty, full, operating and in some cases partially built). Certification documents to be signed and sealed by a qualified Professional Engineer with at least 5 years experience in the design of Risers and Riser support systems.
 - Seismic-Restraint details (where appropriate): Detail submittal drawings indicating anchorage details including quantity, diameter, and depth of penetration of anchors.
 - Comprehensive submittal drawings for all Anchor, Guide, and Isolation components used.
 - Schematic drawing of the installed Riser system indicating components used, locations and Isolator pre-load for use during installation.

E. Tabulated output data tailored to each riser system indicating initial loads and isolator deflections, operating loads and isolator deflections, axial pipe stresses, hydraulic thrust forces at section changes, assumed installation/ambient temperature, assumed operating temperature, expected variations in elevation at the top and bottom of the riser expected in service and assumed static head at the top of the riser system.

1.05 Work Furnished But Not Installed

- The mechanical contractor shall purchase the materials specified in this section from a single riser materials manufacturer to assure sole source responsibility for the performance of the installed system.
- The subcontractor who installs the mechanical equipment, piping, or ductwork can at the contractor's option, install the materials and systems specified in this section.

1.06 Coordination

- Coordinate size, shape, reinforcement and locate support structure for the riser support isolators, guides and anchors. Where anchoring to concrete, 3000 psi (20.8 N / sq. mm)min material is required and is to be provided by others.
- Coordinate the connections of horizontally interfacing pipes to the riser system such that vertical displacements in the riser will not result in unacceptable stresses in the interfacing piping systems.

1.07 Description of System

- It shall be understood that the requirements of this section are in addition to other requirements as specified elsewhere for the support and attachment of equipment and mechanical services, and for the vibration isolation of same equipment. Nothing on the project drawings or specifications shall be interpreted as justification to waive the requirements of this riser support section.
- The work under this section shall include furnishing all labor, materials, tools, appliances, and equipment, and performing all operations necessary for the complete execution of the installation of the riser support assemblies as shown, detailed, and/or scheduled on the drawing and/or specified in this section of the specifications
- All Riser Anchors and Guides shall meet the following minimum requirements:
 - All shall include a minimum ½” (12 mm) thick neoprene isolation cushion in all applicable axes. (3 axis for the anchors and 2 axis for the guides). The elastomeric element shall be so positioned as to ensure that no un-cushioned shock can occur.
 - All Guides shall have the capability to vertically “slip” a minimum +/- 1.62 in (41 mm).
 - All Guides, Isolators and Anchors must be selected to offer seismic restraint as required by project parameters.
 - Seismic restraint capacities to be verified by an independent test laboratory or certified by an experienced registered Professional Engineer to ensure that the design intent of this specification is realized.

1.08 System Design

- The Riser support hardware manufacturer shall be responsible for the design and selection of attachment hardware as required to attach the Anchors, Guides and Isolators to the supporting structure.

- The contractor shall furnish a complete set of drawings of the riser interface indicating the pipe materials of construction, conveyed fluids, couplings or connecting elements to be used, relative elevations of features on the riser system including structural floors and/or support points, section changes, and termination points.
- All Riser piping is to be restrained to meet code requirements. Spacing between restraints is not to exceed the allowable spacing listed in the latest revision of the SMACNA manual (Sheet Metal and Air Conditioning Contractors National Association, Inc.) “Seismic Restraint Manual Guidelines for Mechanical Systems”, Second Edition, 1998.
- The contractor shall ensure that all riser support points (to the building structure) are adequately reinforced and are properly integrated into the building structure, so to withstand anticipated vertical and horizontal forces. If connecting to concrete, that adequate edge distances are provided to allow the full design anchor capabilities.
- Allowable stresses in the riser shall be designed to meet the requirements identified in ASME B31.9 (Pressure Piping Standards as related to Building Service Piping).
- Pipe Riser Clamps and Hanger Brackets and Threaded Support Rods are to conform to MSS SP-58 Manufacturing Standards.

1.09 Alternate Systems

- Provisions of the General Conditions and Supplemental Conditions of the specifications shall govern the use of alternate systems to those specified.
- Manufacturers not listed as approved in “Part 2 Materials” of this section must secure approval to bid a minimum of ten (10) days prior to the project bid date.

1.10 Installation

- Installation of all riser support hardware specified herein shall be accomplished following the manufacturer's written instructions. Installation instructions shall be submitted to the engineer for approval prior to the beginning of the work.

2.0 Materials

2.01 Source of Materials

- All Anchors, Guides, Isolators and Seismic components specified herein shall be provided by a single manufacturer to assure sole source responsibility for the proper performance of the materials used. Manufacturer is to be a member of VISCMA (Vibration Isolation and Seismic Control Manufacturers Association).
- Mechanical anchor types and sizes are to be per the design data as provided by the riser support hardware manufacturer.
- Materials and systems specified herein and detailed or scheduled on the drawings are based upon materials manufactured by Kinetics Noise Control, Inc. Materials and systems provided by other manufacturers are acceptable, provided that they meet all requirements as listed in this specification.
- Except in the case of fully enclosed Anchor assemblies, resilient materials shall be easy to visually inspect for damage.

2.02 Factory Finishes

- Manufacturer's standard prime-coat finish ready for field painting.

Long Form Riser Specification

2. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.
 - A. Powder coating on springs and housings.
 - B. All hardware shall be electrogalvanized. Hot-dip galvanize or powder coat metal housings for exterior use.
 - C. Enamel or powder coat metal components on isolators for interior use.
 - D. Color-code or otherwise mark vibration isolation devices to indicate capacity range.

2.03 Seismic Snubber Types

Isolator / Snubber Types contained herein are per ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.) Handbook, 2003 HVAC Applications, Chapter 54 "Seismic and Wind Restraint Design", Pages 12 and 13 or Chapter 47 "Sound and Vibration Control", Page 44. Anchor and Guide Types that have yet to be classified by ASHRAE.

1. Type A – Chpt 54): Coil Spring Isolator Incorporated Within A Ductile Iron Or Cast Aluminum Housing
 - A. Cast iron or aluminum housings are brittle when subjected to shock loading and are therefore not approved for seismic restraint applications, however for low thermal deflection systems, they can be applied in non-seismic riser applications.
2. Type B – Chpt 54): Coil Spring Isolator Incorporated Within A Steel Housing
 - A. Spring isolators shall be seismic control restrained spring isolators, incorporating a single or multiple coil spring element, having all of the characteristics of free standing coil spring isolators as specified in the vibration isolation portion of this specification. Springs shall be restrained using a housing engineered to limit both lateral and vertical movement of the supported piping during erection, maintenance or an earthquake without degrading the vibration isolation capabilities of the spring during normal operating conditions.
 - B. Vibration isolators shall incorporate a steel housing and neoprene snubbing grommet system designed to limit motion to no more than ¼" (6 mm) in any direction and to prevent any direct metal-to-metal contact between the supported member and the fixed restraint housing. The restraining system shall be designed to withstand the design forces in any lateral or vertical direction without yield or failure. Where the capacity of the anchorage hardware in concrete is inadequate for the required loading, a steel adapter base plate to allow the addition of more or larger anchors will be fitted to fulfill these requirements. In addition to the primary isolation coil spring, the load path will include a minimum ¼" (6 mm) thick neoprene pad.
 - C. Spring elements shall be color coded or otherwise easily identified. Springs shall have a lateral stiffness greater than 1.2 times the rated vertical stiffness and shall be designed to provide a minimum of 50% overload capacity. Non-welded spring elements shall be epoxy powder coated and shall have a minimum of a 1000 hour rating when tested in accordance with ASTM B-117.
 - D. To facilitate servicing, the isolator will be designed in such a way that the coil spring element can be removed without the requirement to lift or otherwise disturb the supported riser system.
3. Type C – Chpt 54): Coil Spring Isolator Incorporated Within A Steel Housing
 - A. Spring isolators shall be seismic control restrained spring isolators, incorporating one or more coil spring elements, having all of the characteristics of free standing coil spring isolators per the vibration isolation section of this specification. Isolators shall consist of one or more laterally stable steel coil springs assembled into fabricated welded steel housings designed to limit movement of the supported riser in all directions.
 - B. Housing assembly shall be made of fabricated steel members and shall consist of a top load plate complete with adjusting and leveling bolts, adjustable vertical restraints, isolation washers, and a bottom load plate with internal non-skid isolation pads and holes for anchoring the housing to the supporting structure. Housing shall be hot dipped galvanized for outdoor corrosion resistance. Housing shall be designed to provide a constant free and operating height within 1/8" (3 mm).
 - C. The isolator housing shall be designed to withstand the project design forces in all directions.
 - D. Coil spring elements shall be selected to provide static deflections as shown on the vibration isolation schedule or as indicated or required in the project documents. Spring elements shall be color coded or otherwise easily identified. Springs shall have a lateral stiffness greater than 1.2 times the rated vertical stiffness and shall be designed to provide a minimum of 50% overload capacity. Non-welded spring elements shall be epoxy powder coated and shall have a minimum of a 1000 hour rating when tested in accordance with ASTM B-117.
 - E. Spring isolators shall be Model FLSS as manufactured by Kinetics Noise Control, or by other manufacturers who can meet the requirements as listed in sections 1.04 through 1.09 inclusive, and sections 2.01, 2.02 and 2.03 (5)
4. Type D – Chpt 54): Coil Spring Isolator Incorporated With Integral Seismic Restraint
 - A. Spring isolators shall be single or multiple coil spring elements which have all of the characteristics of free standing coil spring isolators as specified in the vibration isolation portion of this specification, incorporating lateral and vertically restrained seismic housing assemblies. Spring elements shall be readily replaceable without the need to lift or remove the supported riser system.
 - B. Restraint housing shall be sized to meet or exceed the force requirements of the application and shall have the capability of accepting coil springs of various sizes, capacities, and deflections as required to meet the required isolation criteria. All spring forces shall be contained within the coil / housing assembly, and the restraint anchoring hardware shall not be exposed to spring generated forces under conditions of no seismic force. Spring element leveling adjustment shall be accessible from above and suitable for use with a conventional pneumatic or electric impact wrench.
5. Type 3 – Chpt 47): Free Standing Coil Spring Isolator
 - A. Spring isolators shall be free-standing spring isolators, incorporating one or more coil spring elements, having all of the characteristics of free standing coil spring isolators per the vibration isolation section of this specification. Isolators shall consist of one or more laterally stable steel coil springs with an adjustable leveling screw and neoprene faced baseplate suitable for riser applications.
 - B. Coil spring elements shall be selected to provide static deflections as shown on the vibration isolation schedule or as indicated or required in the project documents. Spring elements shall be color coded or otherwise easily identified. Springs shall have a lateral stiffness greater than 1.2 times the rated vertical stiffness and shall be designed to provide a minimum of 50% overload capacity. Non-welded spring elements shall be epoxy powder coated and shall have a minimum of a 1000 hour rating when tested in accordance with ASTM B-117.
 - C. Spring isolators shall be Model FDS as manufactured by Kinetics Noise Control, or by other manufacturers who can meet the requirements as listed in sections 1.04 through 1.09 inclusive, and sections 2.01, 2.02 and 2.03 (3)
6. Type 4 – Chpt 47): Free Standing Restrained Coil Spring Isolator
 - A. Spring isolators shall be free-standing restrained spring isolators, incorporating one or more coil spring elements, having all of the characteristics of free standing coil spring isolators per the vibration isolation section of this specification. Isolators shall consist of one or more laterally stable steel coil springs with an adjustable leveling screw and neoprene faced baseplate suitable for riser applications. Isolators shall further include a mechanism to internally pre-load the spring coil, capturing all pre-load forces within the isolator itself.
 - B. Coil spring elements shall be selected to provide static deflections as shown on the vibration isolation schedule or as indicated or required in the project documents. Spring elements shall be color coded or otherwise easily identified. Springs shall have a lateral stiffness greater than 1.2 times the rated vertical stiffness and shall be designed to provide a minimum of 50% overload capacity. Non-welded spring elements shall be epoxy powder coated and shall have a minimum of a 1000 hour rating when tested in accordance with ASTM B-117.
 - C. Spring isolators shall be Model FRS as manufactured by Kinetics Noise Control, or by other manufacturers who can meet the requirements as listed in sections 1.04 through 1.09 inclusive, and sections 2.01, 2.02 and 2.03 (6)
- C. Restraint element shall incorporate a steel housing with elastomeric elements at all dynamic contact points. Elastomeric elements shall be replaceable. Restraint shall allow ¼" (6 mm) free motion in any direction from the neutral position. Restraint shall have an overturning factor (ratio of effective lateral snubber height to short axis anchor spacing) of 0.33 or less to ensure optimum anchorage capacity.
- D. Spring isolators shall be Model FMS as manufactured by Kinetics Noise Control, or by other manufacturers who can meet the requirements as listed in sections 1.04 through 1.09 inclusive, and sections 2.01, 2.02 and 2.03 (4).

Long Form Riser Specification

7. Type E – Chpt 54): All Direction Neoprene Isolator

- A. Vibration Isolators shall be neoprene, molded from oil resistant compounds, designed to operate within the strain limits of the isolator so to provide the maximum isolation and longest life expectancy possible using neoprene compounds. Isolators shall include encapsulated cast-in-place top steel load transfer plate for bolting to Riser and a steel base plate with anchor holes for bolting to the supporting structure.
- B. Isolator shall be capable of withstanding the design loads in all directions with no metal-to-metal contact.
- C. Isolator shall have minimum operating static deflections as shown on the project Vibration Isolation Schedule or as otherwise indicated in the project documents and shall not exceed published load capacities.
- D. Neoprene isolators shall be Model RQ as manufactured by Kinetics Noise Control, or by other manufacturers who can meet the requirements as listed in sections 1.04 through 1.09 inclusive, and sections 2.01, 2.02 and 2.03 (7)

8. Riser Anchor): All Direction 3-Axis Riser Anchor Assembly

- A. Risers shall be restrained against excessive movement during service by the use of 3-axis resilient anchors designed to withstand the required installation and operating forces. Anchors are intended to be used in sets of two (2), and be oriented to effectively restrain the riser in all three directions, with particular emphasis on large and variable vertical loads that would be imparted by changes in the riser weight.
- B. Anchors shall be of steel construction and shall be attached to the riser with either a heavy-duty riser clamp or a welded support bracket in a manner consistent with anticipated design loads. Snubbers shall limit lateral and vertical riser movement at each anchor location to a maximum of ¼" (6 mm) in any direction.
- C. Anchors shall include a minimum 1/2" (13 mm) thick resilient neoprene pad to cushion any impact and to avoid any potential for metal-to-metal contact. Maximum neoprene bearing pressure shall not exceed 1500 pounds / sq. inch (10.4 N / sq. mm). Anchors shall be capable of withstanding an externally applied force of up to their rated capacity in any direction.
- D. Riser Anchors shall be Model KPA as manufactured by Kinetics Noise Control, or by other manufacturers who can meet the requirements as listed in sections 1.04 through 1.09 inclusive, and 2.01, 2.02 and 2.03 (8)

9. Riser Guide): Horizontal motion limiting Riser Guide Assembly

- A. Risers shall be restrained against excessive lateral movement during service by the use of 2-axis resilient guides designed to withstand the required installation and operating forces. Guides are intended to be used in sets of two (2), and be oriented to effectively restrain the riser in all horizontal directions, but to allow free motion within their operating range in the vertical axis.
- B. Guides shall be of steel construction and shall be attached to the riser with either a heavy-duty riser clamp or a welded support bracket in a manner consistent with anticipated design loads. Guides shall limit lateral riser movement at each Guide location to a maximum of ¼" (6 mm) in any direction.
- C. Anchors shall include a minimum 1/2" (13 mm) thick resilient neoprene pad to cushion any impact and to avoid any potential for metal-to-metal contact. Maximum neoprene bearing pressure shall not exceed 1500 pounds / sq. inch (10.4 N / sq. mm). Anchors shall be capable of withstanding an externally applied lateral force of up to their rated capacity in any direction.
- D. Riser Guides shall be Model KPG as manufactured by Kinetics Noise Control, or by other manufacturers who can meet the requirements as listed in sections 1.04 through 1.09 inclusive, and 2.01, 2.02 and 2.03 (9)

3.0 Execution

3.01 Installation

1. Installation of all Riser support components and materials specified in this section shall be accomplished as per the manufacturer's written instructions.
2. Upon completion of installation of all Riser hardware and before filling and start up of riser system, all debris shall be cleaned from locations where it could restrict the free expansion and contraction of the piping.
3. No rigid connections between the Riser and the building structure shall be made which degrades the seismic restraint system herein specified.
4. All isolators are to be adjusted to the preset dimensions as provided by Kinetics Noise Control prior to filling. After the piping systems have been filled, equipment is operational and the riser is at its normal operating temperature, all restrained spring isolators are to be inspected and where/if they remain preloaded, the preload nuts are be backed off the minimum amount to ensure that contact in the preload screw no longer exists.
5. Torque anchor bolts according to Kinetics Noise Control provided written recommendations to resist system forces.

3.02 Execution

1. Where installation anchor bolts to concrete:
 - A. Install adequate reinforcement in the concrete structural element to ensure its integrity if subjected to appropriate lateral or vertical loads.
 - B. Install wedge type anchors into floor. If thickness is inadequate for full anchor embedment, install bolts that extend through the floor slab and secure them with nuts fitted to the underside of the structural concrete floor.
 - C. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - D. Install anchor bolts to elevations required for proper attachment to supported componentry.
 - E. Install anchor bolts according to Kinetics Noise Controls written instructions.

3.03 Inspection

1. The contractor shall notify the local representative of the Riser materials manufacturer prior to installing any riser hardware. The contractor shall seek the representative's guidance in any installation procedures with which he is unfamiliar.
2. Upon completion of the installation of all riser support devices herein specified, the local representative of the riser hardware manufacturer shall, at the contractors request, inspect the completed system and report in writing any installation errors, improperly selected devices, or other fault in the system which could affect the performance of the system.
3. The installing contractor shall submit a report upon request to the building architect and/or engineer, including the manufacturer's representative's final report, indicating that all riser support material has been properly installed.

End of Section



kineticsnoise.com
sales@kineticsnoise.com
1-800-959-1229