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SPRING, RUBBER and COMBINATION HANGERS

HANGERS

H-610-10.1 BULLETIN

All rubber parts are LDS (Low Dynamic Stiffness) Rubber. For information on LDS Rubber, see Bulletin ACS-102, page 6.

HANGER DEVELOPMENT – PAST TO PRESENT

Over fifty years ago, vibration control hangers were in their infancy and it was not uncommon to use isolation materials such as a block of cork with a hole drilled through the center, two or three layers of rubber and cork pads or felt within the hanger frame. These products all gave way to the lower frequency bonded steel strip rubber-in-shear elements and then to round rubber-in-shear designs which were lower in cost and higher in capacity. The next step was equivalent deflection in compression.

The compression elements were designed with straight line deflection curves, so that for a given deflection the frequency would be about the same as the rubber-in-shear. The advantages were greater capacity for the same size and a fail safe feature. The upper steel washer in the rubber element is still made larger than the hole in the hanger box, so that if the rubber burns or fails, the piping, equipment, or suspended ceiling remains captive.

Both the round rubber-in-shear and the round compression hangers were also merchandised with a single deflection element in the top and bottom of the box to provide twice the deflection and lower the frequency. Our company went on to develop a larger taller double deflection element capable of providing this same deflection in one piece.

Up until 1965 we manufactured a complete range of 0.2"(5mm) single deflection hangers. They were in the same frequency range as fiberglass and very competitive but we found their performance so limited that we no longer wished to manufacture them although others still do. The only exception to this is the WHR which is still offered for ceiling suspension as a fiberglass substitute or improvement when fiberglass is specified by others.

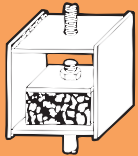
HD Hangers are double deflection units with average static deflections of 0.4"(10mm). They are molded in LDS because of its excellent aging characteristics. If you wish to isolate primary vibration, they should only be considered for smaller equipment running above 800 RPM in non-critical areas. The principle function of HD Hangers is noise isolation.



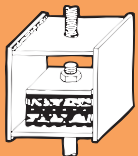
**TYPE 30
SPRING HANGER**



**TYPE 30N
COMBINATION SPRING
and
DOUBLE DEFLECTION
LDS HANGER**



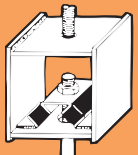
BLOCK OF CORK



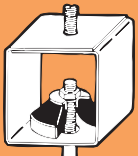
LAYERS OF
RUBBER PADS



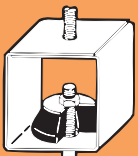
BLOCK OF FELT



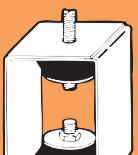
STRIP
RUBBER-IN-SHEAR



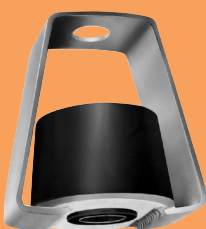
ROUND
RUBBER-IN-SHEAR



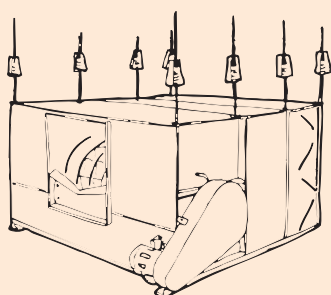
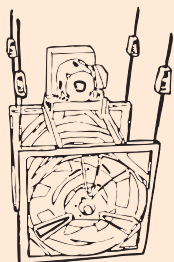
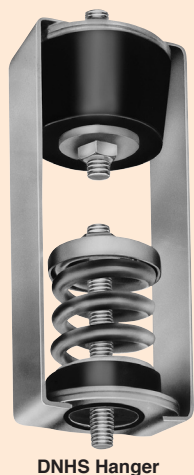
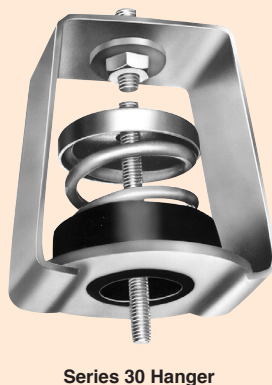
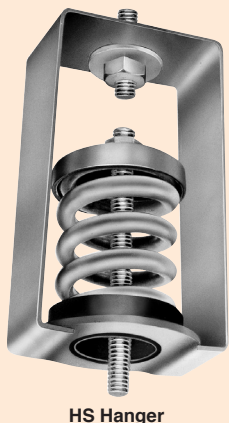
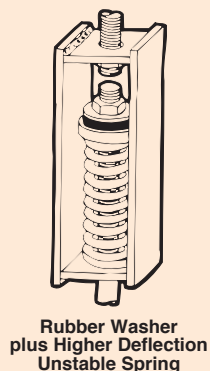
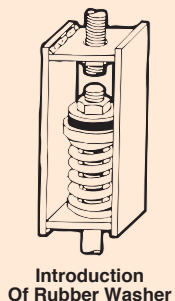
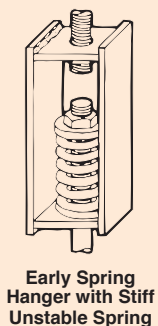
SINGLE
COMPRESSION
ELEMENT



2 SINGLE
COMPRESSION
ELEMENTS



**HD DOUBLE DEFLECTION
LDS HANGER**



Spring Hangers followed their own evolution. As in the case of mountings, early spring hangers had very stiff, tall, unstable springs and it was not unusual to sell hangers with 0.375"(10mm) deflection. Spring Hangers contained no rubber for high frequencies and the first improvement was the introduction of a rubber washer. This was normally located under the top of the box, or later on against the spring cup on top of the spring. A steel washer over the rubber washer spread the load to the outside of the steel spring so a cheaper steel cup could be used. When the rubber washer was located under the top of the box or over the steel spring, the design was still extremely poor as there was nothing to keep the rubber washer centered on the steel cup. Thus, the steel hanger rod would rub the steel cup or the steel hanger box and short circuit the action of the rubber. This was not recognized as a worry in that era, so the next step was to increase the deflection. Since spring stability was not clearly understood increased deflection was accomplished by making the springs taller, but not necessarily larger in diameter. The springs could not collapse or fall over because the lower hole in the box continued to be conveniently small. When the spring tended to topple, the rod would hit the side of the box and stop. Of course, the rubber continued to be short circuited and often the rods would lock vertically (especially if they were fully threaded) so that the springs were bypassed as well.

We reduced these problems by writing specifications and manufacturing hangers with the hole in the bottom of the hanger box as large as the I.D. of the spring. The HS Spring Hangers evolved using our standard A, B and C Springs and seating them in LDS cups with projecting bushings to line the hole in the lower end of the box. A, B and C Springs are designed for horizontal stiffness as described on Page 1, 4, 5 and 8 of Bulletin SLF-200, so they do not fall over or buckle. Centering the spring in the acoustical cup made steel-to-steel contact of the rod and the top steel cup unimportant and put the rubber in the right location on the leaving end of the spring.

The Series 30 was designed in recognition of a consultant's field criticism that he was tired of walking job sites and seeing the hanger rods rubbing on the rubber bushings. This happened because standard hangers allow for only limited rod angularity. The only way to solve the problem was to design a whole new series of springs which would be larger in diameter and shorter. To the best of our knowledge this was the first time that a group of hangers were designed to provide a specific angular capability. The designation 30 means the rod can swing through an arc of 30 degrees from side to side in any direction before contacting the rubber bushing. The photographs show HS and series 30 hangers. The difference in the proportion of the springs and the angular capability is quite apparent. Spring hangers provide good vibration isolation where there is very little high frequency noise. They are generally recommended for applications like ductwork suspension or for suspending pipe lines where twin-sphere rubber connectors were used to take out the high frequencies first.

The Series 30 design solved the short circuiting problem, but we were still dealing with a design having poor high frequency control. The elastomeric cup is a much improved washer that cannot short circuit, but still a washer. The idea of placing a steel spring in series with a rubber hanger element started about 1957. Our DNHS Series was the first improvement on early designs, and the 30N configuration was the obvious advance on the DNHS as they incorporate the 30 degree swing capacity. Series 30N are the top-of-the-line and recommended for all highly critical locations where it is equally important to isolate both noise and vibration.

HS and DNHS designs using our standard A, B, C and multiple C designs are nominal 1"(25mm) and 1.35"(34mm) deflection hangers respectively. The Series 30 and 30N are grouped out with similar deflections, but then go on to our Series 30N-100 utilizing the 2"(50mm), 3"(76mm), 4"(102mm) and 5"(127mm) deflection springs used in the SLF-100 Mountings. The 3"(76mm) & 4"(102mm) Series 30N-1000 were introduced to satisfy lighter capacity needs. The newer B2 and C2 designs are nominal 2"(50mm) and 2.35"(60mm) deflection hangers meeting lower cost competitive criteria.

While most problems are addressed by the hangers listed above, we had need for one more variation. This is a precompressed PCHS, PCDNHS, PC-30 or PC-30N. When these hangers are released, they have the same vibration isolation characteristics as the standard versions. They have the advantage, however, of being preloaded in our shop by means of the washer and adjustment nut on the bottom. The spring deflection is shown on a scale inside the box so you know both the rated load and the deflection. A precompressed 1000 pound hanger acts as a rigid connection during installation unless the load exceeds the 1000 pounds (454kgs). Therefore, the installation may proceed in much the same manner as one with solid rods. This is particularly important when installing large diameter (6" (152mm) and over) pipe where the changes in elevation that would occur with ordinary spring hangers have forced contractors to install the piping systems solidly and then cut the rods and install the spring hangers later.

When the PC designs are used the whole run is completed and then the nuts below the lower washer are released to allow the spring to act freely. Any minor errors in load assignment results in negligible elevation changes and any major error would be noticed on the deflection scale and corrected by adjustment. In addition to installations as described above these hangers are recommended for the first three suspension points near the equipment so loads can be accurately determined to eliminate the effects of the piping weight and stress on the equipment flanges. They are recommended for seismic applications where the precompression washers act as upward limit stops when cable restraints are used. Hanger housings must be strong enough to accept the compressive force and transfer it to the 1/4" rebound washer on top.

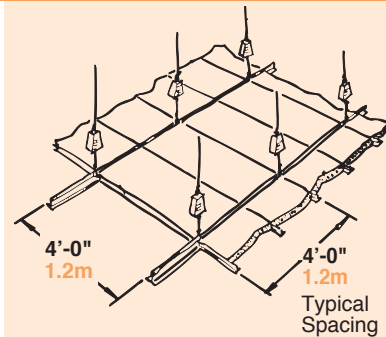
With the exception of a few very low capacity hangers and welded high-capacity and multiple-spring designs all of our hanger boxes are made by bending steel flats into an inverted U shape with return bends on the bottom, and arc welding them to thick American Standard or special steel washers. We believe that this construction is far better in appearance and safer than the more common spot welded, overlapped sheet metal designs favored by our competitors. That is why we continue to use this more expensive construction.

This heavy box construction serves another purpose in seismic zones. When an earthquake occurs, the spring allows vertical pipe motion. Wherever cable cross bracing is used, the piping tends to swing upward as well. In order to control this motion, we use the "RW" design. "RW" stands for Rebound Washer. It is an oversized molded assembly with 1/4" (6mm) LDS Rubber bonded to a steel washer that is set 1/4" (6mm) below the bottom. As motion becomes excessive, it pushes the box upward. The upward motion is cushioned by a 1/4" (6mm) rebound washer between the hanger and the overhead. See page 5 for a typical installation. The hanger box must have the strength to withstand major forces. Our schedules call out the vertical G ratings. The competition doesn't bother.

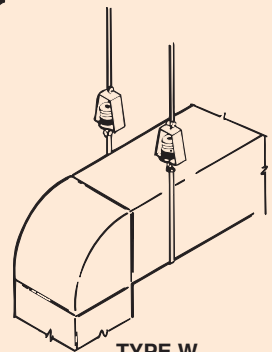
On the bottom of this page, we illustrate "W" hangers originally designed for suspending ceilings by means of wire. Many ceilings are supported by bolted arrangements, but we have continued with the "W" designation. For information on these hangers, please refer to Bulletin CH-620 in our Architectural section.

The following pages detail all of our current designs. Please call us when special designs are needed.

Type 30	30° Swing Spring Hangers – 1" (25mm) Defl.	4
Type 30N	30° Swing Spring & LDS Hangers – 1.2" (30mm) Defl.	5
Type HS	Spring Hangers – 1" (25mm) Defl.	6-7
Type DNHS	Spring and LDS Hangers – 1.2" (30mm) Defl.	8-9
Type 30N-100	30° Swing Spring & LDS Hangers – 2" (50mm), 3" (75mm), 4" (100mm) & 5" (125mm) Defl.	10-11
Type 30N-1000	30° Swing Light Capacity Spring & LDS Hangers – 3" (75mm) & 4" (100mm) Defl.	12
Type HES	Pipe Expansion Hangers	13
Type IM	Simple Spring Hangers	14-15
Type HD	Double Deflection LDS Hangers	15
Type WHR	LDS Ceiling Hangers	16



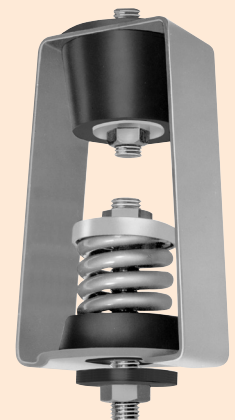
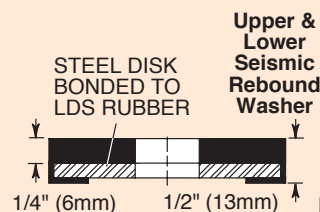
TYPE W as Ceiling Hangers



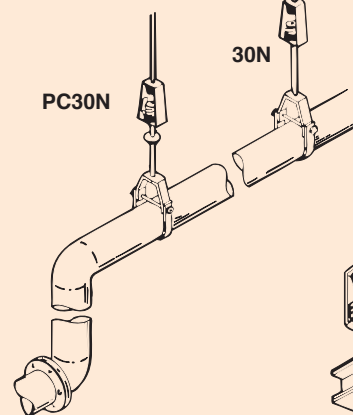
TYPE W As Duct Hangers



PC30S Hanger

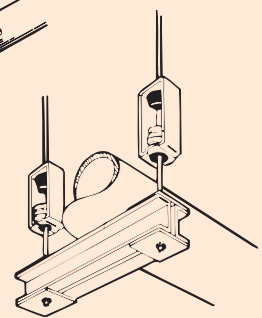


RW30N Hanger

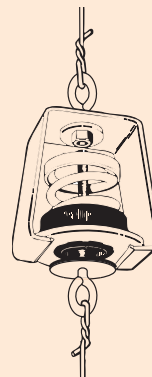


PC30N

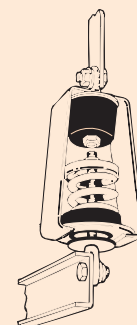
30N



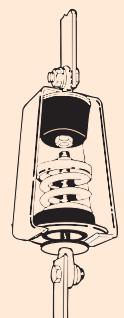
Trapeze Hung Pipe



TYPE W30 Secured by Wire



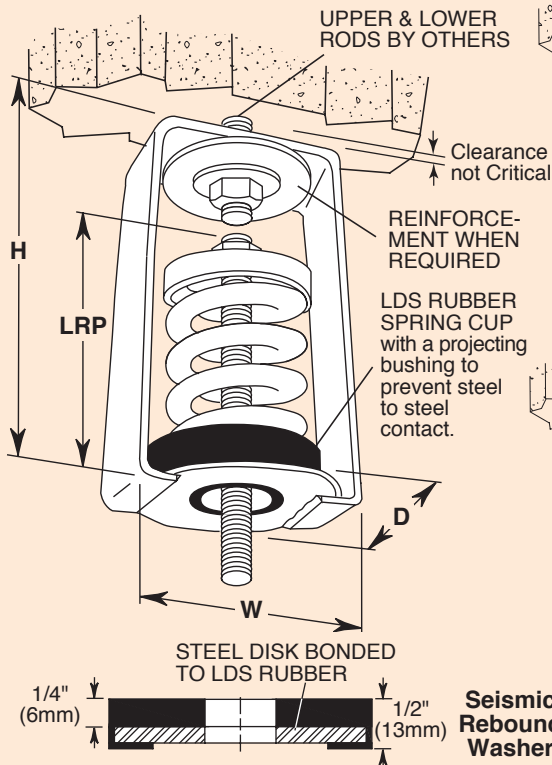
TYPE W30N Bolted to Ceiling Channel



TYPE W30N Bolted to Straps

1"(25mm) Deflection X, A & B SPRING HANGERS

HS FOR ROD ATTACHMENT

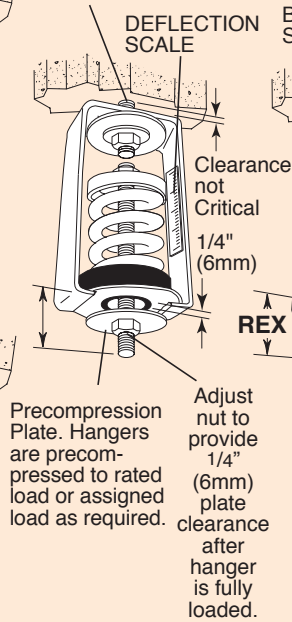


2 Spring HS-2

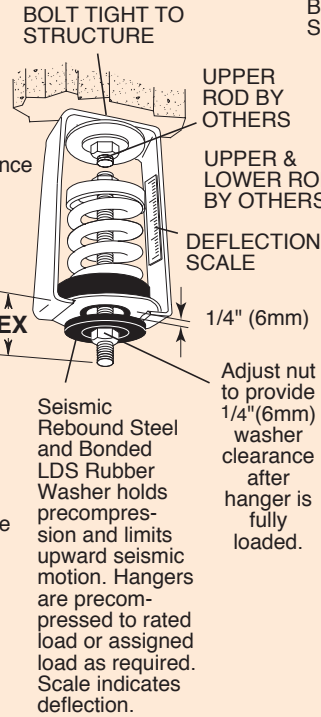
4 Spring HS-4

Seismic Rebound Washer

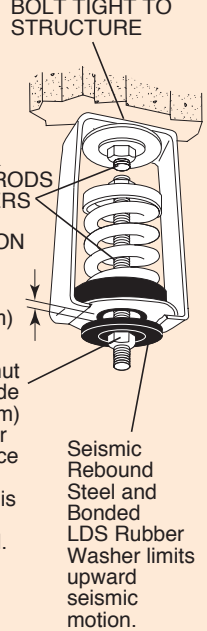
PCHS TYPE HS PRECOMPRESSED



PCHSS TYPE HS PRECOMPRESSED & SEISMIC RESTRAINT



RWHS TYPE HS SEISMIC RESTRAINT



Ratings & Dimensions for 1"(25mm) Deflection Spring Hangers (inches mm)

Type	Size	Rated Capacity (lbs)(kg)	Rated Defl. [†] (in)(mm)	Spring Constant (lbs/in)(kg/mm)	Spring Color/Stripe	Spring Only Spring Free OD Height	D	H	W	Lower Rod Penetration LRP	Max. Rod Dia. MRD	Rod Extension REX	Vertical 'G' Ratings Tension Compression
1" 25mm	X-12	12 5	1.25 32	10 0.18	Orange								10.0* 10.0*
	X-23	23 10	1.30 33	18 0.30	Brown								10.0* 10.0*
	X-33	33 15	1.10 28	30 0.54	Red								10.0* 10.0*
	X-54	54 24	1.20 30	45 0.80	White								10.0* 10.0*
	X-76	76 34	1.02 25	73 1.36	Black	11/2 21/2	21/2 64	41/4 108	27/8 73	31/2 89	3/8 10	13/4 44	10.0* 10.0*
	X-113	113 51	1.00 25	113 2.04	Yellow	38 64							10.0* 7.6
	X-130	130 59	1.00 25	130 2.36	Purple								10.0* 6.6
	X-175	175 79	1.00 25	175 3.16	Silver								10.0* 4.9
	X-210	210 95	1.00 25	210 3.80	Blue								9.0 4.1
Defl.	A-12	12 5	1.00 25	12 0.20	Red	13/4 17/8	23/4 70	53/4 146	31/4 83	31/2 89	5/8 16	21/4 57	10.0* 10.0*
	A-18	18 8	1.00 25	18 0.32	Gray	44 48							10.0* 10.0*
	A-25	25 11	1.00 25	25 0.44	Orange								10.0* 10.0*
	A-41	41 19	1.18 30	35 0.63	Pink								10.0* 10.0*
HS-	A-56	56 25	1.14 30	49 0.83	Black	13/4 21/4	23/4 70	53/4 146	31/4 83	4 102	5/8 16	21/4 57	10.0* 10.0*
	A-73	73 33	1.06 27	69 1.22	Tan	44 57							10.0* 10.0*
	A-95	95 43	1.01 26	94 1.65	Green								10.0* 10.0*
	A-45	45 20	1.60 41	28 0.49	Blue								10.0* 10.0*
PCHS-	A-75	75 34	1.50 38	50 0.89	Orange								10.0* 10.0*
	A-125	125 57	1.33 34	94 1.68	Brown	13/4 3	23/4 70	53/4 146	31/4 83	4 102	5/8 16	21/2 64	10.0* 10.0*
	A-200	200 91	1.15 29	174 3.14	Black	44 76							10.0* 10.0*
	A-310	310 141	1.00 25	310 5.64	Yellow								10.0* 7.1
PCHSS-	A-400	400 181	1.00 25	400 7.24	Green								10.0* 5.5
	A-510	510 231	1.00 25	510 9.24	Red	13/4 31/8 44 79	23/4 70	53/4 146	31/4 83	4 102	5/8 16	21/2 64	10.0* 4.3
RWHS-	A-625	625 283	1.00 25	625 11.3	White	13/4 33/8 44 86	23/4 70	53/4 146	31/4 83	4 102	5/8 16	21/2 64	9.0 3.5
	B-65	65 29	2.10 53	31 0.55	Brown								10.0* 10.0*
	B-85	85 39	2.10 53	40 0.74	White/Blk								10.0* 10.0*
	B-115	115 52	2.00 51	57 1.02	Silver								10.0* 10.0*
	B-150	150 68	2.00 51	75 1.33	Orange	23/8 4 60 102	4 102	71/4 184	43/4 121	41/4 108	3/4 19	21/4 57	10.0* 5.4
	B-280	280 127	1.60 41	174 3.10	Green								10.0* 3.3
	B-450	450 204	1.31 33	344 6.18	Red								10.0* 2.0
	B-750	750 340	1.12 28	670 12.1	White								
	B-1000	1000 454	1.00 25	1000 18.2	Blue	23/8 4 60 102	4 102	71/4 184	43/4 121	41/4 108	3/4 14	21/4 57	10.0* 1.5