1. SCOPE

This specification shall apply for the design and fabrication of all hangers, supports, anchors, and guides. Where piping design is such that exceptions to this specification are necessary, the particular system will be identified, and the exceptions clearly listed through an addendum which will be made a part of the specification.

2. DESIGN

(a) All supports and parts shall conform to the latest requirements of the ASME Code for Pressure Piping B31.1 and MSS Standard Practice SP-58, SP-69, SP-89 and SP-90 except as supplemented or modified by the requirements of this specification.

(b).Designs generally accepted as exemplifying good engineering practice, using stock or production parts, shall be utilized wherever possible.

(c) Accurate weight balance calculations shall be made to determine the required supporting force at each hanger location and the pipe weight load at each equipment connection.

(d) Pipe hangers shall be capable of supporting the pipe in all conditions of operation. They shall allow free expansion and contraction of the piping, and prevent excessive stress resulting from transferred weight being introduced into the pipe or connected equipment.

(e) Wherever possible, pipe attachments for horizontal piping shall be pipe clamps.

(f) For critical high-temperature piping, at hanger locations where the vertical movement of the piping is 1/2" or more, or where it is necessary to avoid the transfer of load to adjacent hangers or connected equipment, pipe hangers shall be an approved constant support design, as Anvil Fig. 80-V and Fig. 81-H Constant Support Hangers, or equal.

Where transfer of load to adjacent hangers or equipment is not critical, and where the vertical movement of the piping is less than 1/2", Variable Spring Hangers may be used, provided the variation in supporting effect does not exceed 25% of the calculated piping load through its total vertical travel.

(g) The total travel for Constant Support Hangers will be equal to actual travel plus 20%. In no case will the difference between actual and total travel be less than 1". The Constant Support Hanger will have travel scales on both sides of the support frame to accommodate inspections.

(h) Constant Support Hanger should be individually calibrated before shipment to support the exact load specified. The calibration record of constant support shall be maintained for a period of 20 years to assist the customer in any redesign of the piping system. Witness marks shall be stamped on the Load Adjustment Scale to establish factory calibration reference point.

A Typical Pipe Hanger Specification, Cont'd.

(i) In addition to the requirements of ASTM-125 all alloy springs shall be shot peened and examined by magnetic particle. The spring rate tolerance shall be ±5%. All three critical parameters (free height, spring rate and loaded height) of spring coils must be tested for. Each spring coiled must be purchased with a C.M.T.R. and be of domestic manufacture.

(j) Constant Supports should have a wide range of load adjustability. No less than 10% of this adjustability should be provided either side of the calibrated load for plus or minus field adjustment. Load adjustment scale shall be provided to aid the field in accurate adjustment of loads. Additionally, the constant support should be designed so that load adjustments can be made with-out use of special tools and not have an impact on the travel capabilities of the supports.

(k) Constant Supports shall be furnished with travel stops which shall prevent upward and downward movement of the hanger. The travel stops will be factory installed so that the hanger level is at the "cold" position. The travel stops will be of such design as to permit future re-engagement, even in the event the lever is at a position other than "cold", without having to make hanger adjustments.

(l) For non-critical, low temperature systems, where vertical movements up to 2" are anticipated, an approved pre-compressed Variable Spring design similar to Anvil Fig. B-268 may be used. Where movements are of a small magnitude, spring hangers similar to Anvil Fig. 82 may be used.

(m) Each Variable Spring shall be individually calibrated at the factory and furnished with travel stops. Spring coils must be square to within 1° to insure proper alignment. Each spring coil must be purchased with a C.M.T.R. and be of domestic manufacture.

(n) All rigid rod hangers shall provide a means of vertical adjustment after erection.

(o) Where the piping system is subject to shock loads, such as seismic disturbances or thrusts imposed by the actuation of safety valves, hanger design shall include provisions for rigid restraints or shock absorbing devices of approved design, such as Anvil Fig. 200 shock and sway suppressor, or equal.

(p) Selection of vibration control devices shall not be part of the standard hanger contract. If vibration is encountered after the piping system is in operation, appropriate vibration control equipment shall be installed.

(q) Hanger rods shall be subject to tensile loading only (see Table III). At hanger locations where lateral or axial movement is anticipated, suitable linkage shall be provided to permit swing.

(r) Where horizontal piping movements are greater than 1/2" and where the hanger rod angularly from the vertical is less than or equal to 4 degrees from the cold to hot position of the pipe, the hanger pipe and structural attachments shall be offset in such manner that the rod is vertical in the hot position. When the hanger rod angularity

is greater than 4 degrees from vertical, then structural attachment will be offset so that at no point with the rod angularity exceed 4 degrees from vertical.

(t) Hangers shall be spaced in accordance with Table 1 and Table 2 on the following page.

(u) Where practical, riser piping shall be supported independently of the connected horizontal piping.

Pipe support attachments to the riser piping shall be riser clamp lugs. Welded attachments shall be of material comparable to that of the pipe, and designed in accordance with governing codes.

(v) Supports, guides, and anchors shall be so designed that excessive heat will not be transmitted to the building steel. The temperature of supporting parts shall be based on a temperature gradient of 100F° per inch distance from the outside surface of the pipe.

(w)Hanger components shall not be used for purposes other than for which they were designed. They shall not be used for rigging and erection purposes.

(x) Hydraulic Snubbers - The hydraulic units shall have a temperature stable control valve. The valve shall provide a locking and bleed rate velocity that provides for tamper proof settings. The fluid level indicator for exact reading of reservoir fluid level in any snubber orientation.

The valve device shall offer a minimum amount of resistance to thermal movement. Any shock force shall cause the suppressor valve to close. With the suppressor valve closed the fluid flow shall essentially stop, thereby causing the unit to resist and absorb the disturbing forces. After the disturbing forces subside, the suppressor valve shall open again to allow free thermal movement of the piping. The suppressor shall have a means of regulating the amount of movement under shock conditions up to the design load for faulted conditions without release of fluid. The suppressor design shall include a fluid bleed system to assure continued free thermal movement after the shock force subsides. The suppressor shall have a hard surfaced, corrosion resistant piston rod supported by a rod bushings and shall be designed so that it is capable of exerting the required force in tension and compression, utilizing the distance.

(y) Paint - Variable Spring and Constant Support units will be furnished painted with Stewart Bros. Green Semi-Gloss Primer (#10947). All other material will receive one shop coat of a red chromate primer meeting the requirements of Federal Specification TT-P-636.

For corrosive conditions hangers will be galvanized or painted with carbo-zinc #11.

(z) All threads are UNC unless otherwise specified.

A Typical Pipe Hanger Specification, Cont'd.

HANGER DESIGN SERVICE

Hanger for piping 2½" and larger, and all spring support for assemblies, shall be completely engineered.

(a) Engineered hanger assemblies shall be detailed on 8½" x 11" sheets.

Each sketch will include a location plan showing the location of the hanger in relation to columns of equipment.

Each sketch will include an exact bill of material for the component parts making up each assembly.

(b) Each engineered hanger assembly will be individually bundled and tagged as far as practical, ready for installation.

Hanger material for piping 2" and smaller shall be shipped as loose material, identified by piping system only. A piping drawing marked with approximate hanger locations and types, and hanger sketches showing typical support arrangements will be furnished.

(c) Hanger inspections shall be performed in accordance with MSS-SP-89 (Section 7.7) and ASME B31.1 (Appendix V).

TABLE 1: Maximum Horizontal Spacing Between Pipe Supports for Standard Weight Steel Pipe*

	Nominal Pipe Size (in)																			
	½	¾	1	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	24	30
Max. Span (Ft) Water Service	7	7	7	9	10	11	12	13	14	16	17	19	22	23	25	27	28	30	32	33
Max. Span (Ft) Vapor Service	8	9	9	12	13	14	15	16	17	19	21	24	26	30	32	35	37	39	42	34
Recommended Hanger Rod Sizes	⅜					½			⅝		¾		⅞		1		1 or trapeze	1¼	1½	1½

The above spacing and capacities are based on pipe filled with water. Additional valves and fittings increase the load and therefore closer hanger spacing is required.

*Many codes and specifications state "pipe hangers must be spaced every 10ft. regardless of size." This local specification must be followed.

TABLE 2: Maximum Horizontal Spacing Between Copper Tubing Supports

	Nominal Tubing Size (in)									
	½	¾	1	1¼	1½	2	2½	3	3½	4
Max. Span (Ft) Water Service	5	5	6	7	8	8	9	10	11	12
Max. Span (Ft) Vapor Service	6	7	8	9	10	11	13	14	15	16

NOTE: Spans shown in Tables 1 and 2 do not apply where there are concentrated loads between supports or where temperatures exceed 750°F.

TABLE 3: Load Carrying Capacities of Threaded Hanger Rods.
Materials Carbon Steel with Minimum Actual Tensile Strength of 50 Ksi.

Rod Diameter (in)	Threads per Inch	Root Area of Coarse Thread (in^2)	Maximum Safe Load (lbs) Rod Temperature, 650° F	Maximum Safe Load (lbs) Rod Temperature, 750° F
3/8	16	0.068	730	572
1/2	13	0.126	1,350	1,057
5/8	11	0.202	2,160	1,692
3/4	10	0.302	3,230	2,530
7/8	9	0.419	4,480	3,508
1	8	0.552	5,900	4,620
1 1/4	7	0.889	9,500	7,440
1 1/2	6	1.293	13,800	10,807
1 3/4	5	1.744	18,600	14,566
2	4 1/2	2.292	24,600	19,265
2 1/4	4 1/2	3.021	32,300	25,295
2 1/2	4	3.716	39,800	31,169
2 3/4	4	4.619	49,400	38,687
3	4	5.621	60,100	47,066
3 1/4	8 UN	6.720	71,900	56,307
3 1/2	8 UN	7.918	84,700	66,331
3 3/4	8 UN	9.214	98,500	77,139
4	8 UN	10.608	113,400	88,807
4 1/4	8 UN	12.100	129,400	101,337
4 1/2	8 UN	13.690	146,600	114,807
4 3/4	8 UN	15.379	164,700	128,982
5	8 UN	17.165	184,000	144,096

Standard UNC thread thru 3" diameter and 8-UN-2A thread series for 3 1/4" diameter and larger.