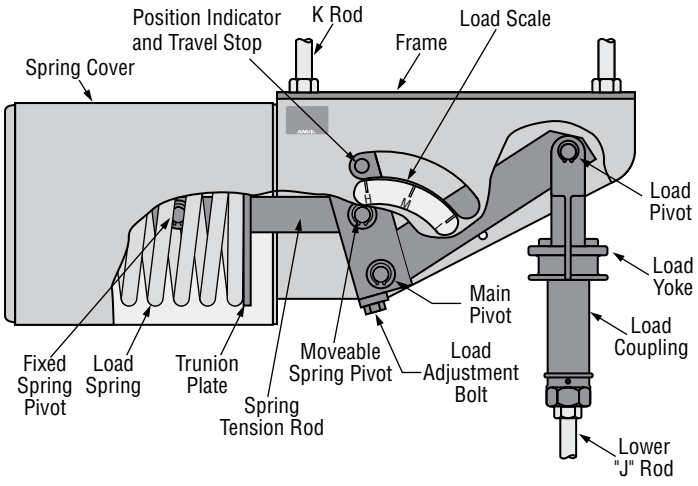
Model R

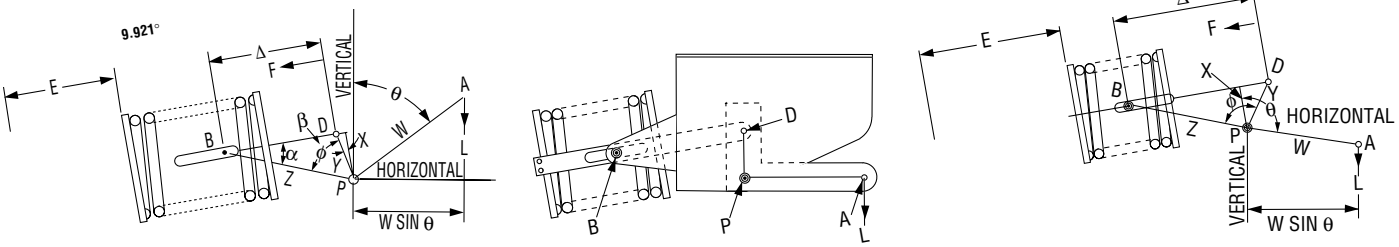
Mathematically Perfect Pipe Support

The exclusive geometric design of Anvil Model R Constant Support Hanger assures perfectly constant support through the entire deflection of the pipe load. This counter-balancing of the load and spring moments about the main pivot is obtained by the use of carefully designed compression type load springs, lever, and spring tension rods.

As the lever moves from the high to the low position, the load spring is compressed and the resulting increasing force acting on the decreasing spring moment arm creates a turning moment about the main pivot which is exactly equal and opposite to the turning moment of the load and load moment arm.

As the lever moves from the low to the high position, the load spring is increasing in length and the resulting decreasing force acting on the increasing spring moment arm creates a turning moment about the main pivot which is exactly equal and opposite to the turning moment of the load and load moment arm.





High Position | Middle Position | Low Position

(1) $\frac{\sin\alpha}{Y} = \frac{\sin\phi}{\Delta}$ $\quad \sin\beta = \frac{X}{Y}$

$\frac{\sin\alpha}{Y} = \frac{\sin\beta}{Z}$ $\quad \sin\alpha = \frac{X}{Z}$

$\sin\alpha = \frac{Y\sin\beta}{Z}$

Substituting in (1), we have (2) $\frac{X}{YZ} = \frac{\sin\phi}{\Delta}$ and (3) $X = \frac{YZ\sin\phi}{\Delta}$

The load "L" is suspended from the lever at point "A" and at any point within the load travel range the moment of the load about the main lever-pivot "P" is equal to the load times its moment arm, thus:

(4) Load moment = L (Wsinθ), where (Wsinθ) is the load moment arm

The spring is attached at one of its ends to the fixed pivot "B". The spring's free end is attached by means of a rod to the lever-pivot "D". This spring arrangement provides a spring moment about the main lever-pivot "P" which opposes the load moment and is equal to the spring force "F" times its moment arm; thus:

(5) Spring Moment = $F\left(\frac{YZ\sin\phi}{\Delta}\right)$,

where $\left(\frac{YZ\sin\phi}{\Delta}\right)$ is the spring moment arm

The spring force "F" is equal to the spring constant "K" times the spring deflection "E"; thus:

(6) F = KE; Therefore equation (5) may be written as:

(7) Spring Moment = $KE\left(\frac{YZ\sin\phi}{\Delta}\right)$

To obtain perfect constant support the load moment must always equal the spring moment. Therefore:

(8) $LW\sin\phi = \left(\frac{KEYZ\sin\phi}{\Delta}\right)$

By proper design "ϕ" and "θ" are made equal. Therefore, equation (8) maybe written as:

(9) $LW = \left(\frac{KEYZ}{\Delta}\right)$

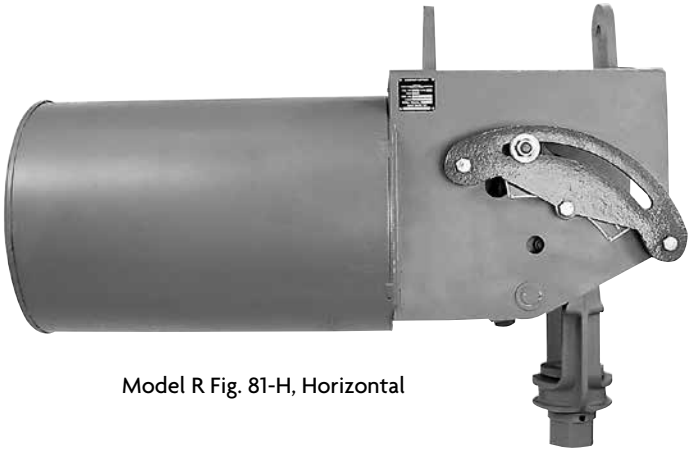
The spring and the rod are so arranged that the spring deflection "E" always equals the distance "Δ" between pivots "B" and "D". Therefore, equation (9) may be written as:

(10) LW = KYZ or, (11) L = (KYZ)/W

Since equation (11) holds true for all positions of the load within its travel range and "K", "Y", "Z", and "W" remain constant it is therefore true that perfect constant support is obtained.

Model R Fig. 80-V, C-80-V Vertical Constant Support
Model R Fig. 81-H, C-81-H Horizontal

Model R Fig. 80-V, Vertical



Model R Fig. 81-H, Horizontal

Finish: Standard finish; painted with semi gloss primer. Corrosion resistant; galvanized with coated coil or painted with CZ11 and coated coil.
Recommended Service: When piping stress is critical and pipe is subject to vertical movement in excess of 1/2" due to thermal expansion, and also at locations where it is necessary to avoid any transfer of stress from support or onto critical terminals or connecting equipment.
Approvals: WW-H-171E (Types 52, 58 and 59), ANSI/MSS SP-69 and MSS SP-58 (Types 54, 55 and 56).
Features:

- Because of exclusive geometric design, mathematically perfect constancy of support is maintained throughout the full range of load adjustment.
- Compactness – design provides smaller and more versatile units.
- Increased load and travel capacity.
- Each hanger is individually calibrated before shipment to support the exact load specified.
- All model R constant supports have a wide range of load adjustability. No less than 10% of this adjustability is provided either side of the calibrated load.
- White button marked "C" denotes cold setting of hanger; red button marked "H" denotes hot or operating setting.
- Field load adjustment is made by turning the single load adjustment bolt.
- Covered spring provides protection and good appearance.
- J-rod swings at least 4° from vertical.
- Non-resonant to all vertical vibrations.

Size Range: Anvil Model R constant support hangers are made in two basic designs, 80- V (vertical design) and 81-H (horizontal design). Combined, the 80-V and 81-H constant supports are made in nine different frame sizes and 110 spring sizes to accommodate travels from 1 1/2" to 20" and loads from 27 lbs to 87,500 lbs.
Single rod suspension: Available in Types A, B and C, Fig. 80-V (see page 188 through 190) and Fig. 81-H (see page 196 through 198).
How to select hanger sizes: Determine the total load to be supported by the hanger as well as the actual travel – that is, the actual vertical movement of the pipe at the point of hanger location. Refer to the Load-Travel table for constant support hangers (see page 184 through 187) and select a size hanger which will accommodate the known load and actual travel. It must be noted that the travel shown in the table is a total travel – that is, the maximum vertical movement which the hanger will accommodate. The total travel of the hanger should always be greater than the calculated travel of pipe line to allow for some discrepancy between calculated travel and actual travel.
It is suggested that the total travel for constant supports should be equal to "actual travel" plus 1" or 20% whichever is greater.
How to determine type: After the size of the constant support is determined, consideration of available room for suspending the pipe and hanger will indicate whether a vertical (80-V series, page 188 - 195) or horizontal (81-H series, page 196 - 202) hanger is desirable.
How to determine design: After the hanger size and design are determined, the type of constant support to be used depends upon the physical installation required by the suspension problem, i.e., whether the hanger is to be installed above, between or below steel members (see line cuts referring to Types A, B, C, etc.). It will be noted that the Type F is made in horizontal design only and the type G is made in the vertical design only. **Special constant support hangers can be fabricated for unusual conditions**.
J-rod and K-hole diameter: Tapping or drilling for standard rod size will be furnished as shown in the J-rod and K-hole selection charts unless otherwise specified. Upper attachments, turnbuckles and clamps should be tapped to agree with the rod as shown in the selection chart. Standard rod diameters are based on the load to be carried by the upper rod which includes the weight of the hanger assembly as well as the pipe line. Tapped connections for hanger rod sizes 3" and smaller are UNC-Thread Series, Class 2 fit. 3 1/4" and large rod tappings are 8UN Series Threads.

Model R (Continued)

Ordering: Specify:

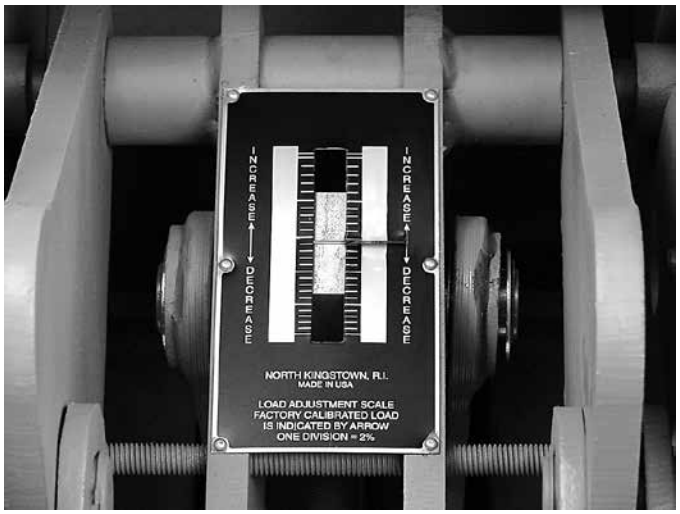
(1) Hanger size number
(2) Figure number
(3) Type
(4) Name of hanger
(5) Loads to be supported (pounds)
(6) Total travel (inches)
(7) Actual travel (inches)
(8) Direction of movement "cold to hot"
(9) Customer's hanger mark.
(10) When ordering Type G, specify C-C rod dimension as well as load per spring and total load.
(11) For Types A, B, C, Fig. 81-H when required specify "for single rod suspension."
(12) Constant Support Hangers are also available corrosion-resistant as figures C-80-V and C-81-H.

Installation:

(1) Securely attach the hanger to the building structure at a point where the load coupling is directly over the desired point of attachment to the pipe in the operating position.
(2) Make certain that the moving parts of the hanger will be unobstructed.
(3) Attach the lower J-rod between the pipe attachment and the load coupling. Make certain that the lower J-rod has enough thread engagement before taking up the load. A sight hole is provided for this.
(4) Turn the load coupling, as you would a turnbuckle, until the travel indicator rotates to the desired cold setting (white button) marked "C" indicated on the position scale. If the constant support incorporates a travel stop see below.
(5) After the line is in operation, check hanger for indicated hot setting. If necessary, make adjustment by turning the load coupling to bring the indicator to the hot position (red button) marked "H". No other adjustment is normally required since the load as calibrated at the factory is equal to the load specified to be supported.

Adjustment: When the hanger is installed, its supporting force should be in balance with the portion of the piping weight assigned to it. Each hanger is individually calibrated before shipment to support the exact load specified. All model "R" Constant Supports have a wide range of load adjustability. Special instructions for field recalibration of individual hangers may be obtained from Anvil representatives. No less than 10% adjustability is provided either side of the calibrated load for plus or minus field load adjustment. The percentage increase or decrease from the factory calibrated load should be carefully calculated. The calibrated load setting of each hanger is indicated by a die-stamp on the load adjustment scale. Load adjustments should be made from this reference point, with each division on the patented scale equal to 2% except sizes 84-110 where each division is valued at 1%. The load adjustment is made by turning the single load adjustment bolt. For example, a calibrated load of 3,000 pounds revised to 2,760 pounds is a decrease of 240 pounds. 240/3,000 = 8%. By turning the load adjusting bolt the arrow moves in the "Decrease" direction four divisions.

Note: Field Recalibration of load does not decrease total travel.



Load adjustment scale shown applies to size 1 through 83 only. The load adjustment scale for sizes 84 through 110
1 division equals 1%.

Travel stop: The functional design of the Constant Support Hanger permits the incorporation of a travel stop that will lock the hanger against upward or downward movement for temporary conditions of underload or overload, such as may exist during erection, hydrostatic test or chemical clean-out. Anvil Constant Supports are designed for hydrostatic test load of at least 2 times the normal operating load for the Constant Support. The travel stop for sizes 19 - 110 consists of two plates, with matched serrations, attached to the hanger frame with two or more cap screws and with a socketed piece which engages the position indicator. It is installed at the factory to hold the hanger in the "cold" position. A series of serrations can be engaged to lock the hanger at any position along the total travel range. The travel stop, which is furnished only when specified, is painted red. The stop must be removed before the piping system is put into operation, but not before the hanger is installed and fully loaded. The travel stop is released by removing the cap screws. A tag marked "Caution" and containing instructions for removal of the travel stop is attached to the hanger.

Note: See installation procedures PE-217-80 for a travel stop description on sizes 1-18.

Model R (Continued)

Model R lifting lugs:
To help alleviate the problem of lifting large size Constant Supports into position for installation, this product is available with lifting lugs (if requested) on sizes ten and larger.

Lifting Lugs (Figure 81-H): Not available on Type F.

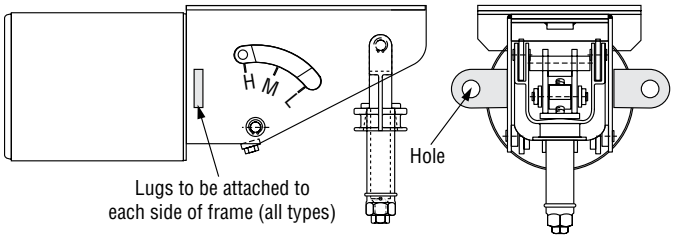
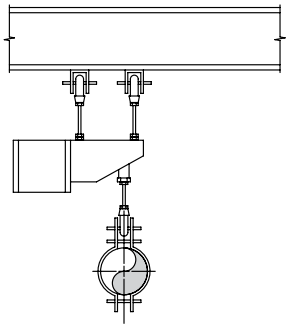
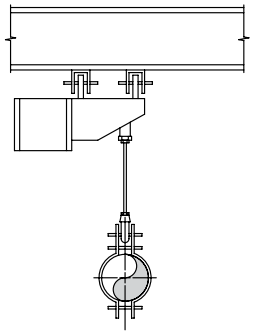
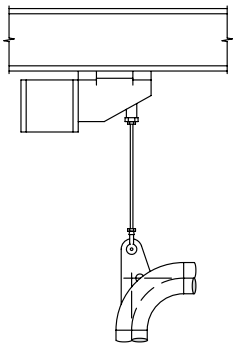
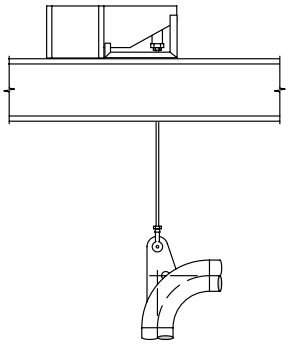


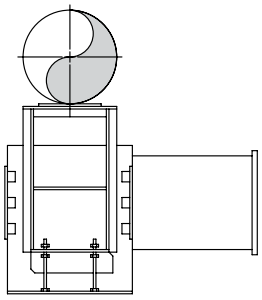
Fig. 81-H (Horizontal): Typical Applications


Type A

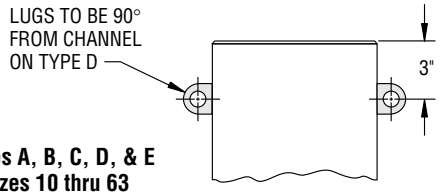

Type B and Type C


Type D

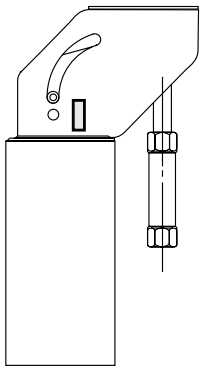

Type E


Type F

Lifting Lugs (Fig 80-V):



Types A, B, C, D, & E sizes 10 thru 63


sizes 84 thru 110

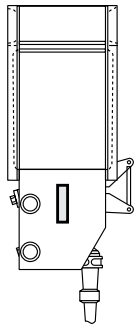
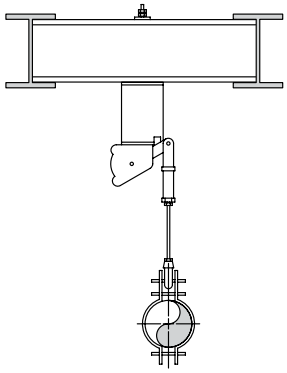
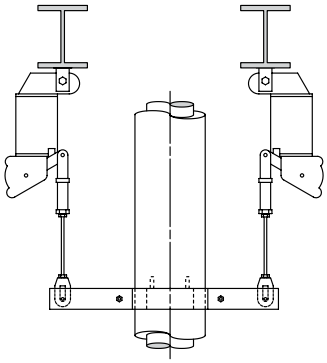
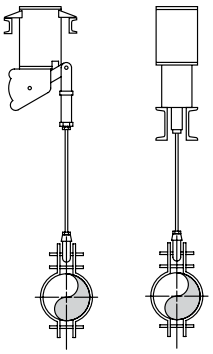

sizes 64 thru 83
Lugs to be attached to each side of frame and will need stabilizing rigging when being lifted

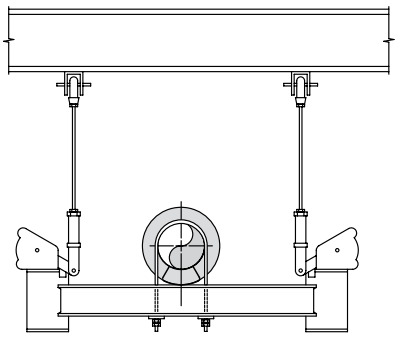
Fig. 80V (Vertical): Typical Applications


Type A


Type B and Type C


Type D

Type E


Type G