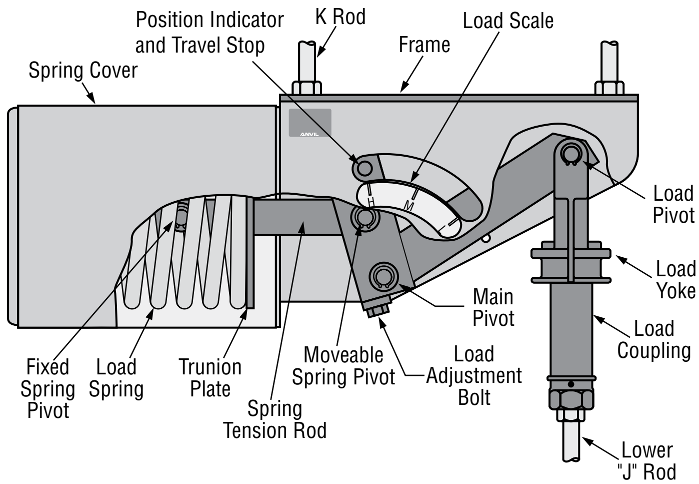
Model R

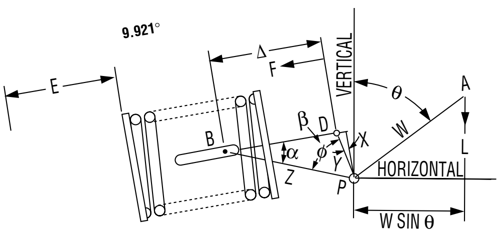
Mathematically Perfect Pipe Support

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.

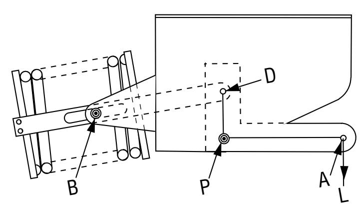
As the lever moves from the high to the low position, the load spring is compressed and the resulting increasing force acting on the decreasing spring moment arm creates a turning moment about the main pivot which is exactly equal and opposite to the turning moment of the load and load moment arm.

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.

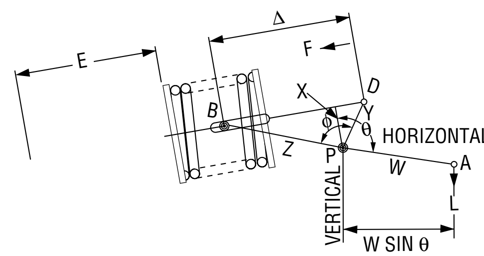




High Position



Middle Position



Low Position

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

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

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

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

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 ($W\sin\theta$), where ($W\sin\theta$) 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 = $F\left(\dfrac{YZ\sin\phi}{\Delta}\right)$,

where $\left(\dfrac{YZ\sin\phi}{\Delta}\right)$ 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 = $KE\left(\dfrac{YZ\sin\phi}{\Delta}\right)$

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

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

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

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

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.