



Installation, Operation and Maintenance Manual

Sizes 18 TO 22.

CLIENT:

CLIENT ORDER N°:

ITEM: VARIABLE EFFORT SPRING SUPPORTS

SIZES 18 TO 22

PROJECT:

BINDER DOCUMENT N°:

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1.0 SCOPE

This Installation, Operation and Maintenance Manual provides recommendations for the installation of the Binder Group's range of variable effort spring supports.

This manual is applicable to spring supports sizes 18 to 22 inclusive.

2.0 INTENDED USE OF VARIABLE EFFORT SPRING SUPPORTS

The range of variable effort spring supports provides a mechanism by which pipe systems may be supported whilst still permitting vertical movement of the pipe due to either thermal expansion or subsidence effects.

The two schematic illustrations below indicate how a series of variable effort spring supports may be used for the support of a line which will encounter an upward movement due to thermal growth during plant operation:

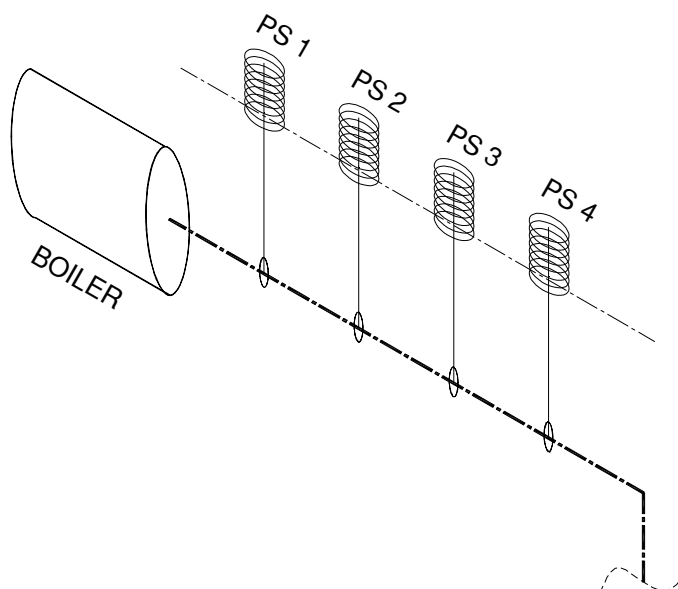


Figure 2.1 – Schematic of Spring Supports in Installed (“Cold Load”) Condition

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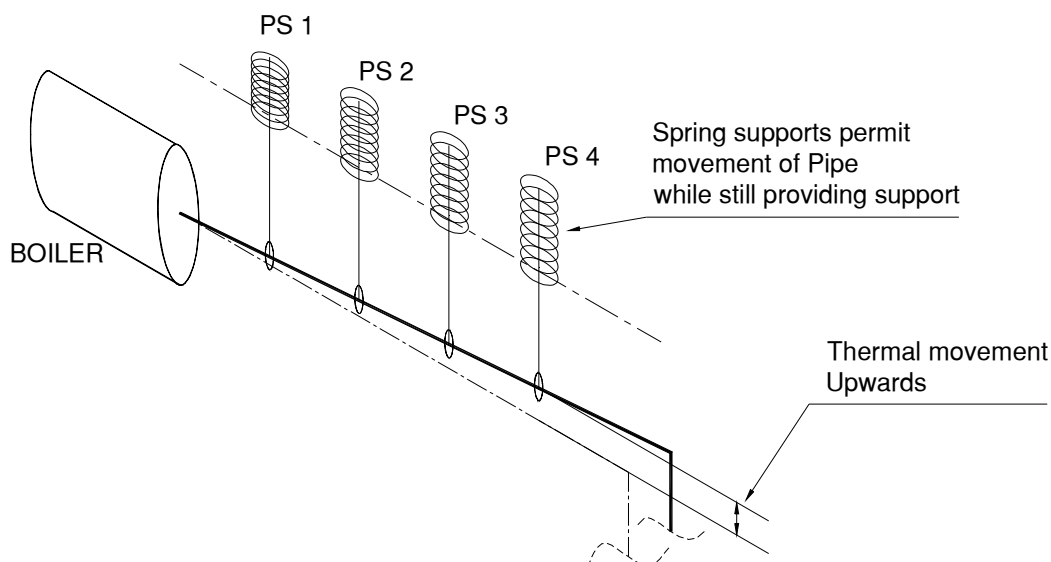


Figure 2.2 – Schematic of Spring Supports in Operating (“Hot Load”) Condition

3.0 VARIABLE EFFORT SPRING SUPPORT DESCRIPTION

The variable effort spring support comprises a helical spring coil housed within a rolled steel canister. The spring coil is loaded in compression to support a pipe or vessel.

They are used for small vertical movements up to about 75mm. These are manufactured in four (4) travel ranges. BV35, BV70, BV140 and BV210 and have a maximum working range of 35mm, 70mm, 140mm and 210mm respectively.

Variable effort spring supports are supplied in two (2) configurations:

- Hanger support - connection to the pipe via a drop rod. Types A, B, C, D and G.
- Pedestal support - support of the pipe from beneath. Type F, H and K.

They are supplied in 23 load range sizes. Sizes 0 to Size 22. Although this manual is limited to sizes 18 to 22 inclusive.



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A particular model of spring support will be identified by three elements:

- 1) The travel range i.e. 35, 70, 140 or 210
- 2) The mounting identifier i.e A,B,C,D,F,G,H or K
- 3) The size i.e 0 through 22 inclusive

A typical model number will read **BV70-C-12**.

For example;

BV = Binder Variable,
70 = travel series,
C = Type "C" hanging support,
12 = Size 12 load range.

Variable effort spring supports must be specifically selected to accommodate the design load and movement calculated for the specific support location. All variable effort spring supports are supplied pre-loaded to the design installation load ("cold load" or "pre-set load").

As indicated in figures 3.1 and 3.2 below, all variable effort spring supports are fitted with a stainless steel tag plate that identifies the support. Tag plates will contain the following information:

- a) The support identification number (tag or mark number).
- b) The model number – a combination of travel range, mounting configuration and size.
- c) Cold Load (pre-set load).
- d) Design Travel.
- e) Travel markers (Blue marker for the "cold load" and a Red marker for the "hot load")

Note: Variable effort spring supports can be set to a "hot load" or "operating load". This is useful when the pipe can not return to cold state or other controlling factors.

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A view of the typical spring hanger is shown as follows:

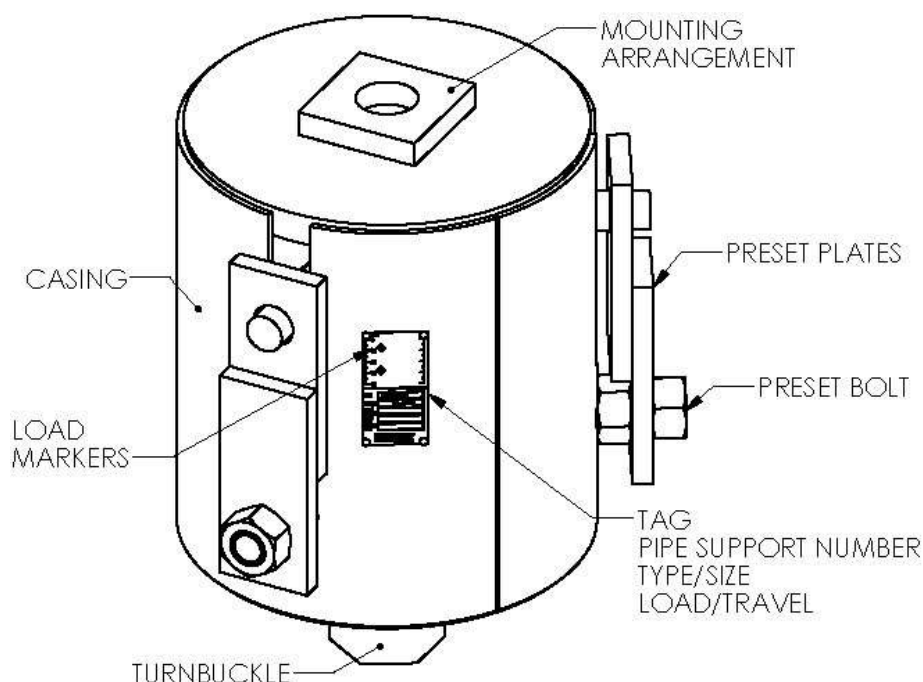


Figure 3.1 – View of a typical ‘Hanger Support’.

Please note:

Optional “multilocks” are not shown in figure 3.1. If these are required, the standard preset and hydrostatic stops are replaced with a multilocking device. A different installation process applies when multilocks are used. See Section 4.0 and 5.0.

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A view of a typical 'pedestal support'. A 'Type F' support.

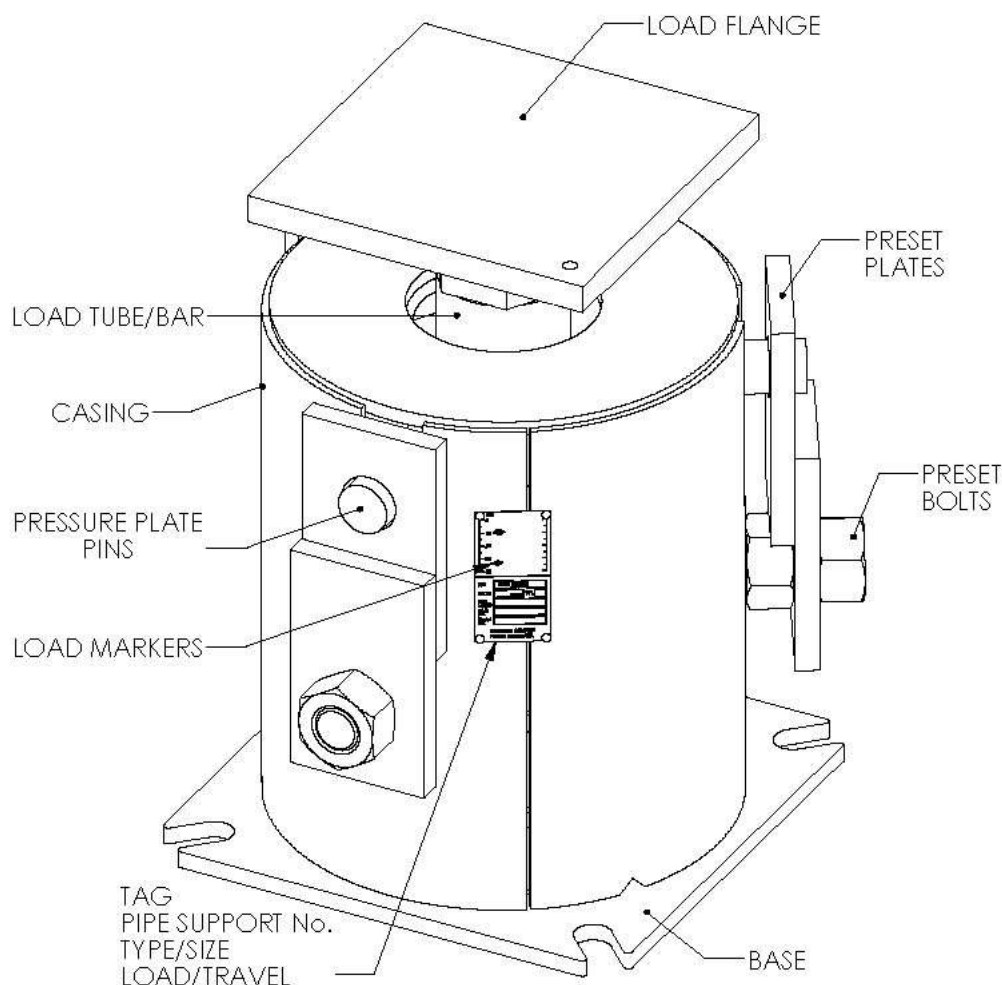


Figure 3.2 – View of a typical 'Pedestal Support'.

Please note:

Optional “multilocks” are not shown in figure 3.1 and 4.1. If these are required, the standard preset and hydrostatic stops are replaced with a multilocking device. A different installation process applies when multilocks are used. See figure 4.2 on Page 8 for further detail.

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4.0 PRINCIPLE OF OPERATION

A schematic cutaway view of a typical variable effort spring 'Hanger Support' is shown below :

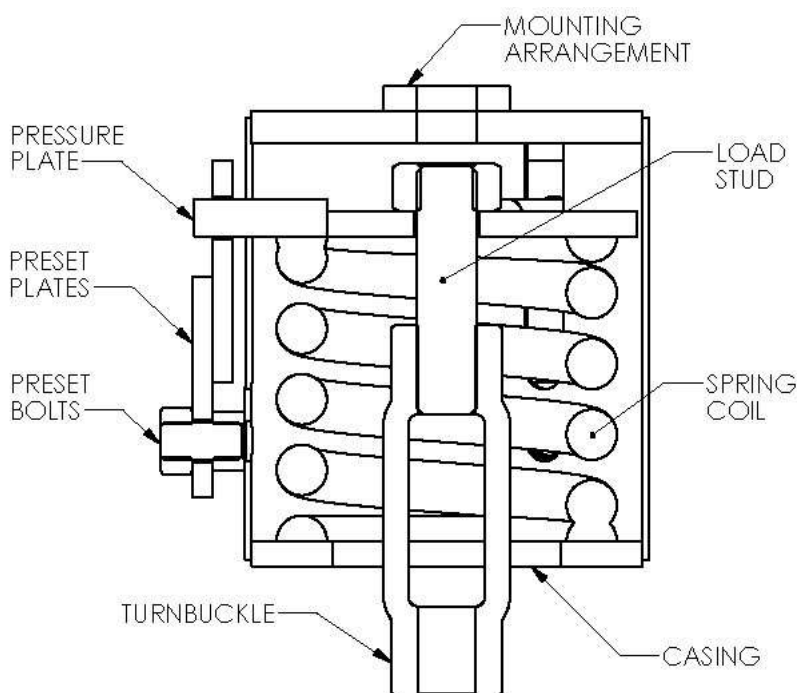


Figure 4.1 – Schematic Cutaway View of a 'Hanger Support'.

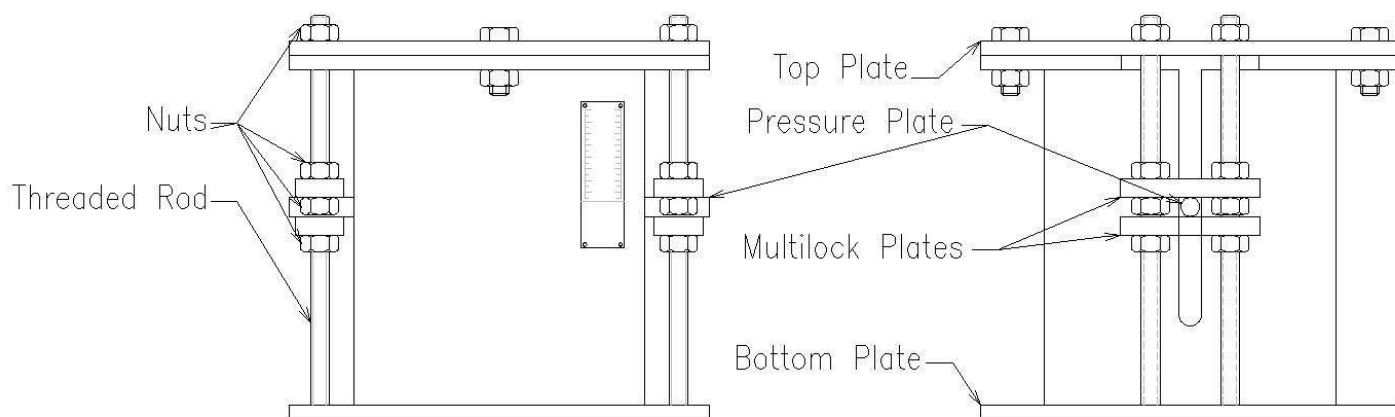


Figure 4.2 – View of a typical assembly with "multilocks". Locked position is shown. Spring Coil, Load Bar and Turnbuckle are not shown, although the same as shown in figure 4.1



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The variable effort spring support carries pipe or vessel load via compression of the spring coil.

In the case of the hanger spring supports, a load bar runs through the center of the coil to the pressure plate above the coil. The unit is connected to the pipe by means of a drop rod.

In the case of pedestal type ("F" type) supports, load is carried on the load flange. This load is transferred to the compressed coil via a threaded load bar which runs through the pressure plate

In order to facilitate installation, the variable effort spring support is supplied with the spring coil compressed to the design 'installed load' or 'cold load' and held at this load by means of 3 equi-spaced preset plates bolted to the spring casing, or when requested a multilocking device called "multilocks".

This configuration acts as both a preset stop and a hydrostatic test stop (hydro-stop). Hydro-stops prevent the spring coil from being compressed beyond the preset position during installation or any hydrostatic testing phase. Hydro-stops are an optional extra for sizes 0-17 but not on sizes 18-22 as the preset stops act as hydro-stops as well. Similarly, if "multilocks" are used, separate hydro-stops are not supplied as "multilocks" also prevent the spring coil from being compressed.

Preset plates and bolts are painted red.

The multilock device can not be added to the support if the support was originally supplied with standard preset stops.

5.0 INSTALLATION AND COMMISSIONING BASIC STEPS

Prior to installation, each installed spring support should be verified to be the correct unit. The units' tag numbers and model numbers should be confirmed correct against the appropriate isometric drawing.

Once the spring support or hanger is installed, a hydrostatic test can be done. Once this has been done, the support may be setup for plant operation.

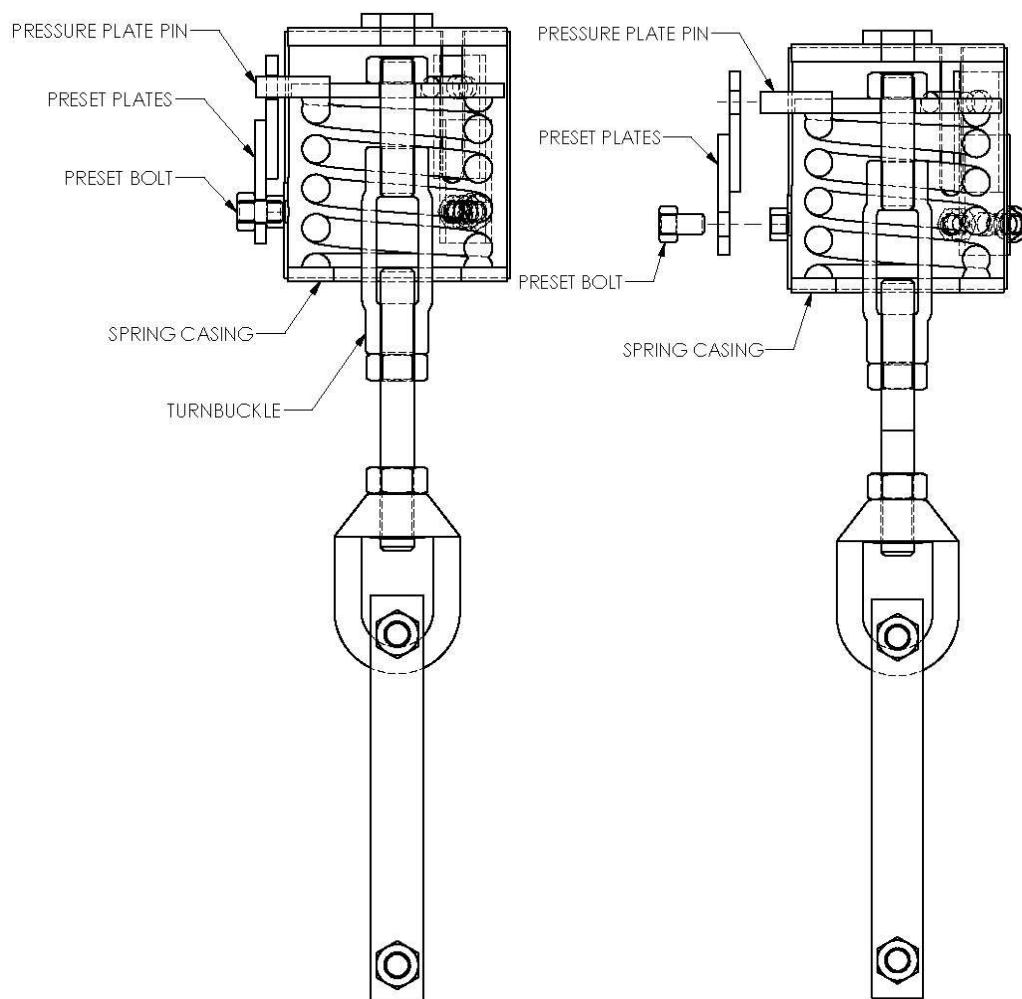
The illustrations below show the sequence of operations required for removable of the stops or adjustment of the multilocking device – "multilocks".

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STEP 1 – REMOVE PRESET PLATES



Preset Plates should be relatively easily removed.

The pipe load needs to balance the pressure plate pin position in the hole in the preset plate. To remove these plates, the pin must 'float' inside the hole. This is done by :

- in the case of type A,B,C or G type supports, either tightening or loosening the turnbuckle on the drop rod.
- In the case of type D supports, either tightening or loosening the nut and lock nut on the drop rod on top of the load tube.
- In the case of type F, H and K supports either winding the pressure plate adjusting nut up or down.

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Tightening the turnbuckle will draw the drop rod up toward the spring, increasing the load on the spring, thereby bringing the pressure plate down and compressing the spring coil.

Loosening has the opposite effect, relaxing the drop rod down away from the spring, decreasing the load on the spring, thereby releasing the pressure plate up and relaxing the spring coil.

Once balanced, the preset plates are not bearing any load. They are able to be removed to allow the spring to move as the pipe dictates.

Remove the preset bolt, which bolts the preset plates through the lower hole, to the spring casing. The preset plates will then be able to be removed.

It is at the customer's discretion as to whether the preset plates are to be reattached to the casing hanging upside down out of the way, or marked with the corresponding tag number and stored safely away from the spring.

If "multilocks" are supplied. Figure 5.0 shows the locked position (after a hydrostatic test). The nuts and multilock plate are to be wound down to the bottom plate, see figure 5.1. This process applies to all Types of Variable effort spring supports.

As mentioned above, if these nuts are hard to turn, caused by the pipe load, refer to "Step 1", by adjusting the turnbuckle.

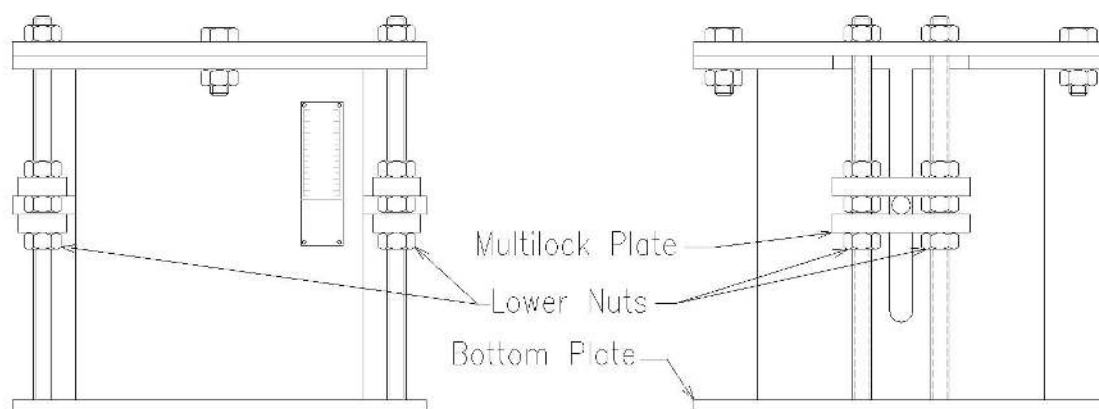


Figure 5.0 – View of Multilocks in the "locked position".

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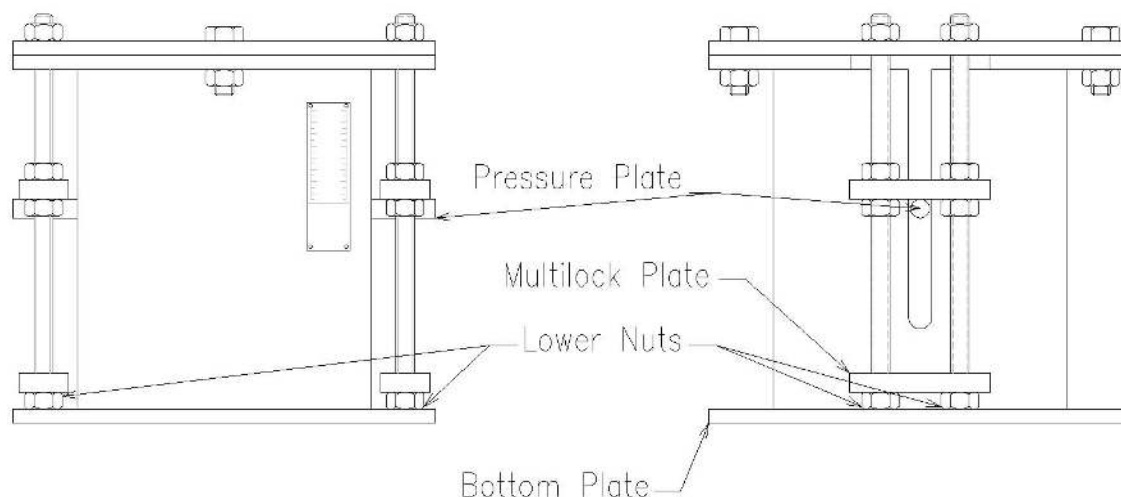


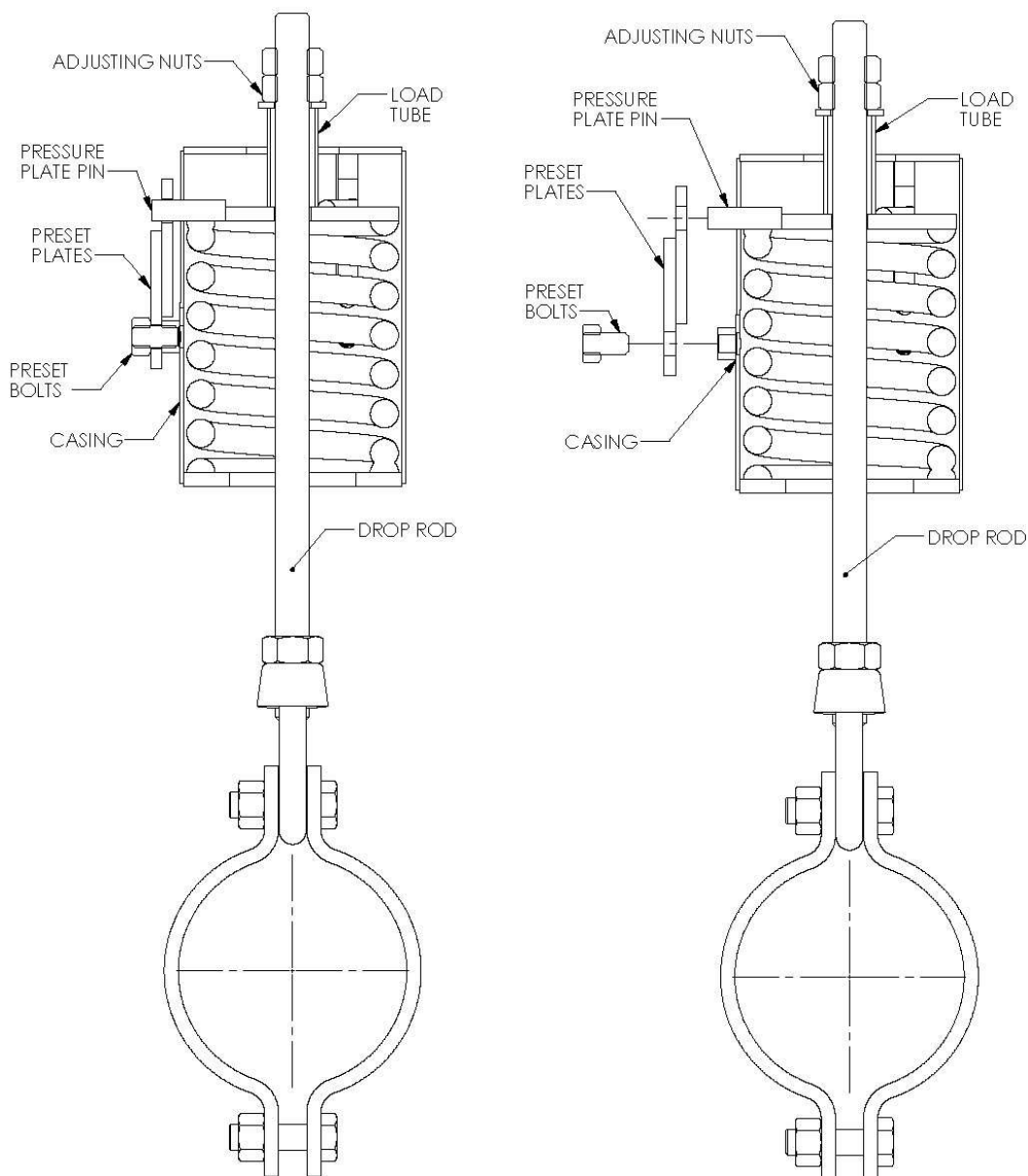
Figure 5.1 – View of Multilocks, nuts wound down after Hydrostatic test.

Note: Nuts above and below the pressure plate are still locked in “cold load” or “pre-set load” position.

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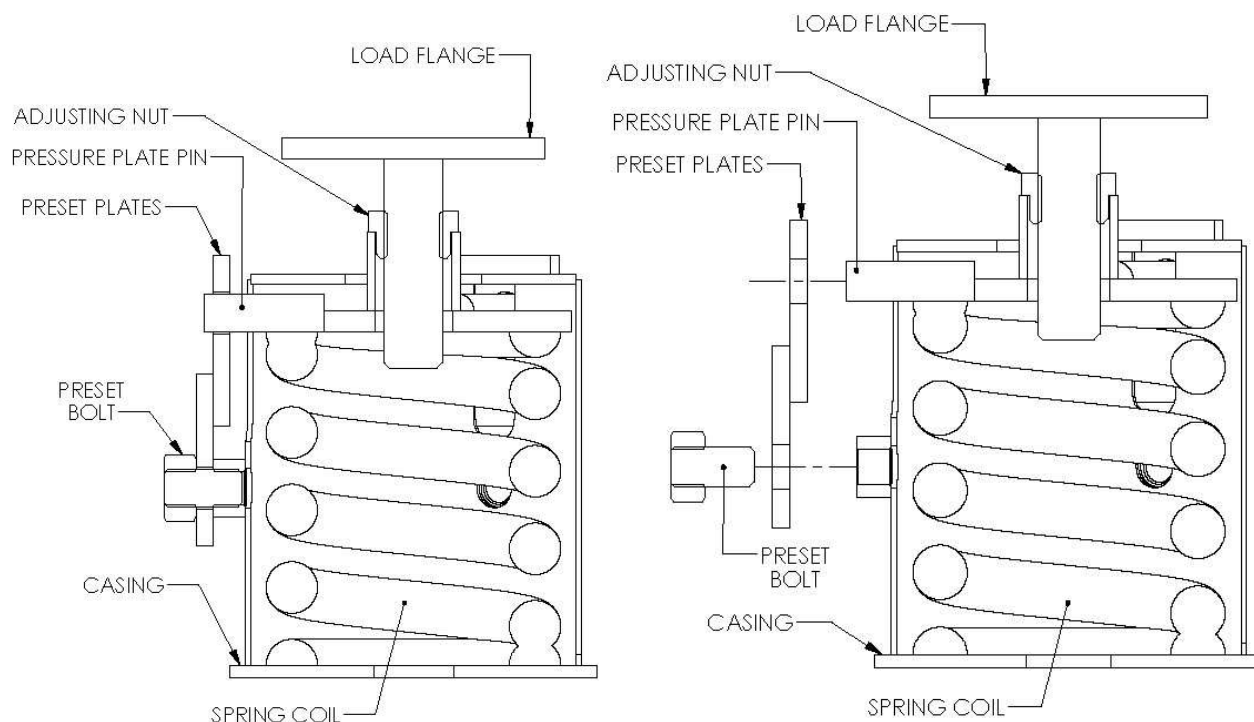


Type D Springs, transfer load from pipe to spring support by rotation of the adjusting nut above the load tube. Ensure pressure plate pin is 'floating' inside preset plate holes. Remove preset bolts, then preset plates. For adjusting of multilocks refer to Step 3.

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Type F Springs, transfer load from pipe to spring support by rotation of the adjusting nut above the load tube. Ensure pressure plate pin is 'floating' inside preset plate holes. Remove preset bolts, then preset plates. For adjusting of multilocks refer to Step 3.

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STEP 3. – FOR ADJUSTMENT OF MULTILOCKS.

Once Step 2 has been completed (ie. the load has been transferred onto the Variable Effort Spring Support). The multilock can now be adjusted.

Figure 5.2 shows the multilocks position before the upper and middle nuts have been adjusted.

Wind the upper nuts up to the top plate. There are two “upper nuts” on each side of the support. Then wind the middle nuts and multilock plate up to the upper nuts. See figure 5.3. This completes the adjustment of the multilocking device.

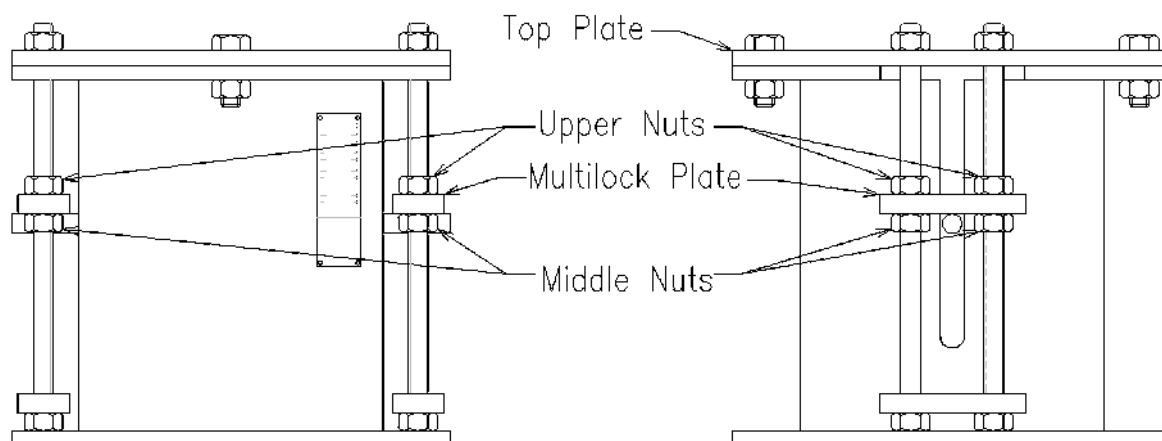


Figure 5.2 – View of multilocks (front and side view) before adjustment

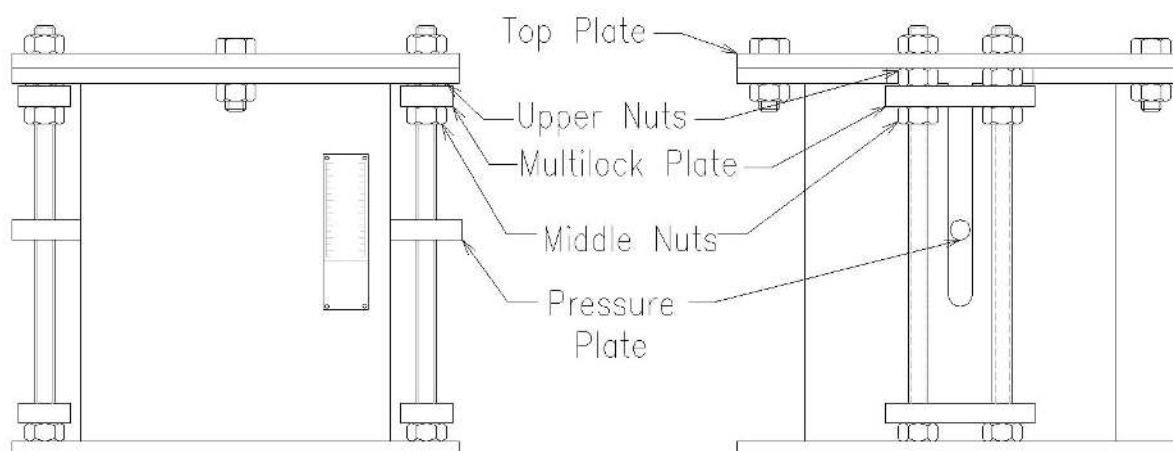


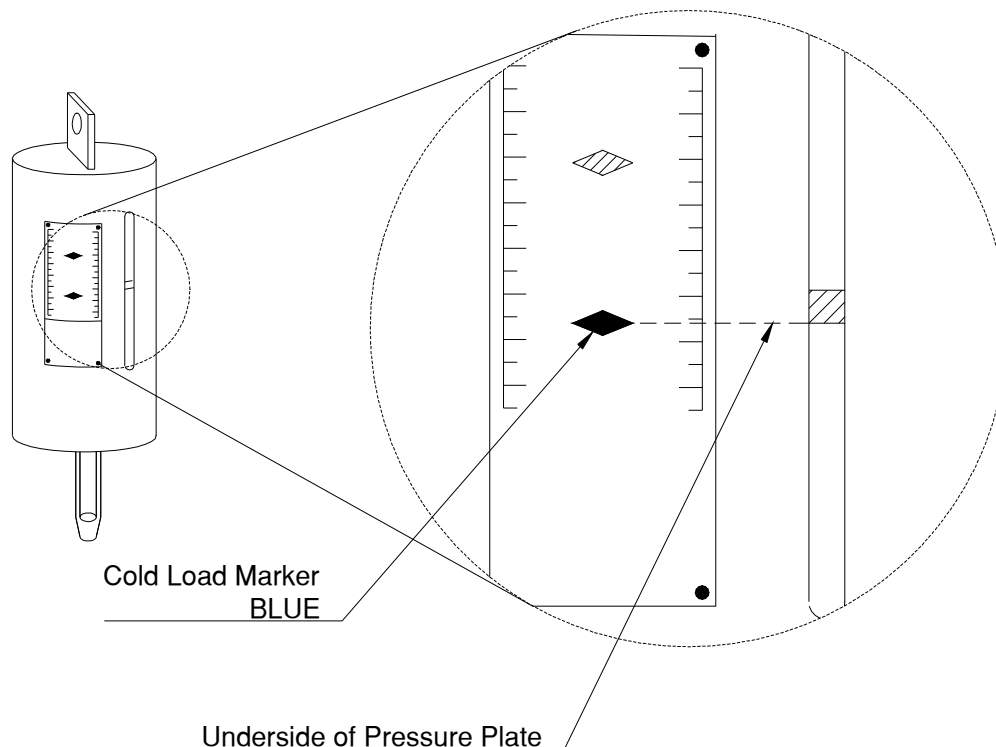
Figure 5.3 – View of multilocks (front and side view) after adjustment

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STEP 4 – INSPECT COLD LOAD SETTING



Once loaded and with preset stops removed or multilock nuts wound out to ends, a visual check on the position of the pressure plate in relation to the design “cold” load must be conducted.

The underside of the pressure plate should align with the blue marker indicating the correct cold load. Where a deviation from the cold position is noted, the unit may be adjusted via rotation of the turnbuckle in the appropriate direction.

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6.0 INSTALLATION AND COMMISSIONING SEQUENCE OF LOADING AND ADJUSTMENT

The loading and adjustment of spring supports on a line which incorporates multiple units is a balancing exercise. As units are loaded and the preset stops removed, adjacent supports may be affected and adjustment may be required.

The following loading and adjustment sequences are recommended to achieve a commissioning sequence with a minimum amount of post installation adjustment

SEQUENCE A: HORIZONTAL PIPE RUNS

For horizontal runs, it is recommended to load and adjust units, commencing with units nearest fixed supports and working in sequence from either end of the pipe section until the centre of the section is reached.

The figure below illustrates this sequence.

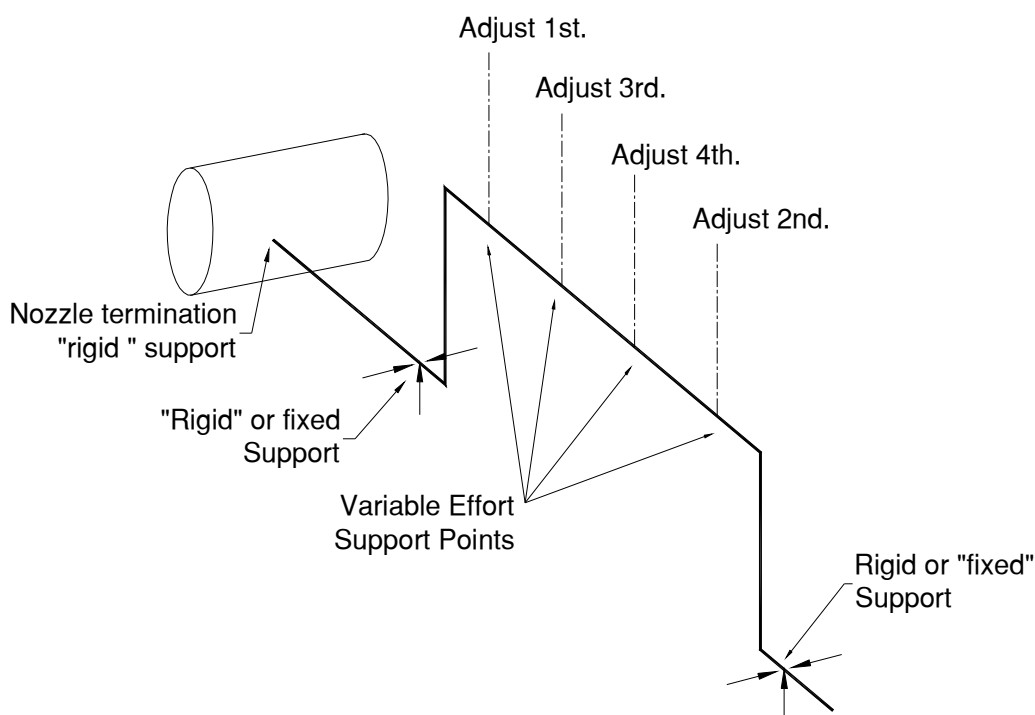


Figure 7.1 – Schematic of Spring Supports in Installed –Horizontal

SEQUENCE B: VERTICAL PIPE RUNS

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For vertical lines, it is recommended to load and adjust units, commencing with units nearest the top of the line and working in sequence from the upper most unit down the line until a change of direction is or a fixed support is reached.

The figure below illustrates this adjustment sequence.

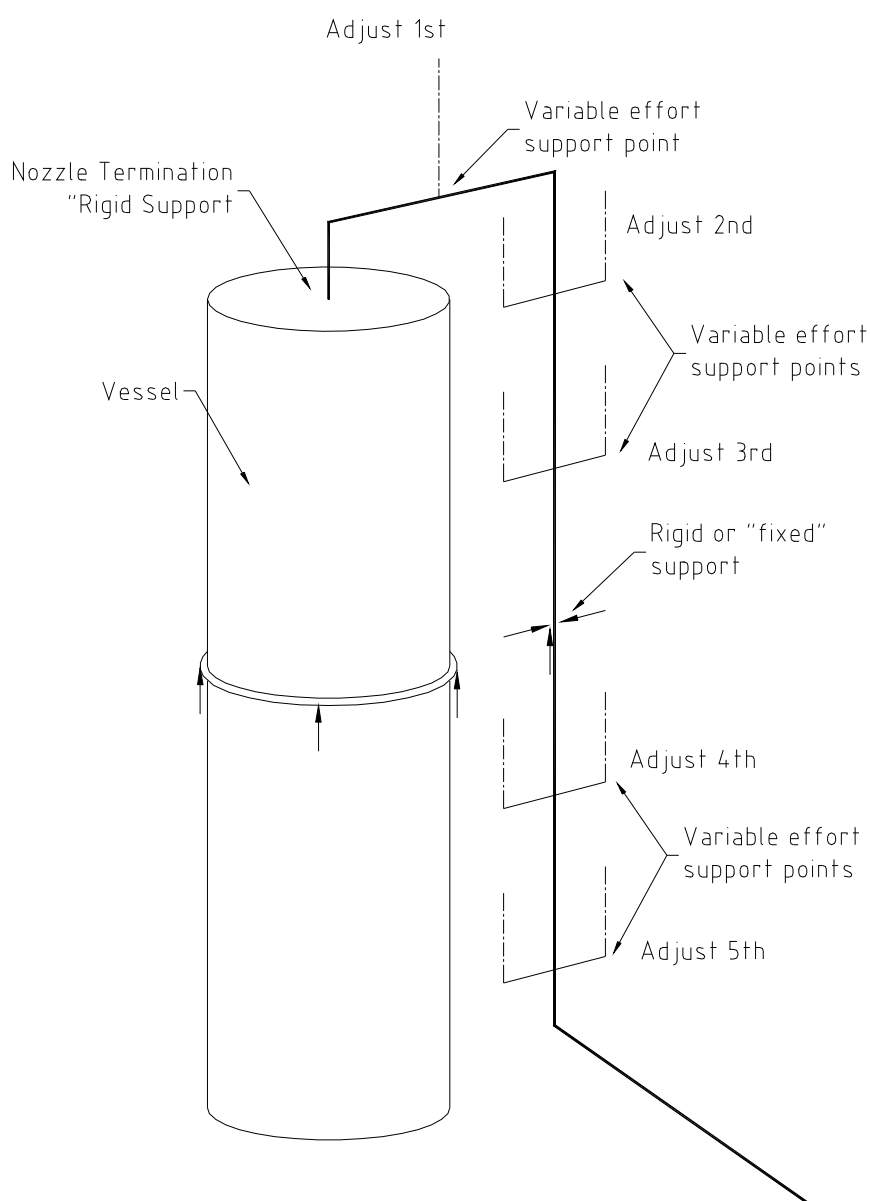


Figure 7.2 – Schematic of Spring Supports in Installed -Vertical



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7.0 OPERATIONAL REQUIREMENTS OF VARIABLE EFFORT SPRING SUPPORTS

Variable effort spring supports are automatic in operation and do not require separate control for operational requirements.

The supports are fitted with a tag which provides details of the unique support tag number, the size and travel range of the unit and a scale which allows direct reading of pipe movement during plant operation.

8.0 MAINTENANCE REQUIREMENTS OF VARIABLE EFFORT SPRING SUPPORTS

Maintenance requirements for the variable effort supports are minimal. The following observations are recommended:

Monitor condition of surface treatment and touch up as necessary.

Maintain a covering of appropriate lubricant on drop rod threads at turn-buckles to facilitate future adjustment and removal.

Monitor the operational range of movement and note any deviations from the range provided for on the load indicator panel.

Should maintenance be required, the unit should be removed and returned to the factory. Please refer to section 10.0 below for details regarding removal.

The variable effort spring support unit houses a spring coil. This is restrained within the body of the unit under compression. The unit must not be dismantled without specialised knowledge and equipment. This required in order to avoid uncontrolled release of the energy in the spring coil leading to injury or damage.

9.0 SPARE PARTS

Spare Parts are not required for variable spring units under normal operating conditions.

Damaged units or units past the end of their life should be changed out as a unit. Please contact Binder Group for any replacement requirements.



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10.0 REMOVAL OF VARIABLE EFFORT SPRING SUPPORTS – WITHOUT A MULTILOCKING DEVICE.

Removal of variable effort supports is the reverse of the installation procedures. Please refer to the installation procedures applicable to the model of variable spring unit as detailed in section 5.0 above.

It is assumed that the system has undergone cool-down and the load indicator has returned to a position either at or very close to the original cold installed position.

The turn-buckle is adjusted as necessary in order to re-insert the preset stops into the slots in the side plates to lock the unit and make it safe for removal. The variable effort support mounting fixings must not be removed before the preset stops have been re-fitted.

Arrangements for any temporary bracing/support of the pipe during and after removal is the responsibility of the person responsible for the undertaking of the removal.

11.0 REMOVAL OF VARIABLE EFFORT SPRING SUPPORTS – WITH A MULTILOCKING DEVICE.

Removal of variable effort supports is the reverse of the installation procedures. Please refer to the installation procedures as detailed in section 5.0 above and below.

One advantage of a multilocking device is the Variable effort spring support does not have to return to cold state / “cold load”. As the multilocking device can be adjusted within the entire travel range, all that is required, is the lower nuts and multilock plate is to be wound up to the underside of the pressure plate and the middle nuts, multilock plate and upper nuts are to be wound down on to the top of the pressure plate. The two multilock plates must firmly hold the pressure plate to avoid any movement of the pressure plate or spring coil.

Arrangements for any temporary bracing/support of the pipe during and after removal is the responsibility of the person responsible for the undertaking of the removal.