



INSTALLATION, OPERATION AND MAINTENANCE MANUAL

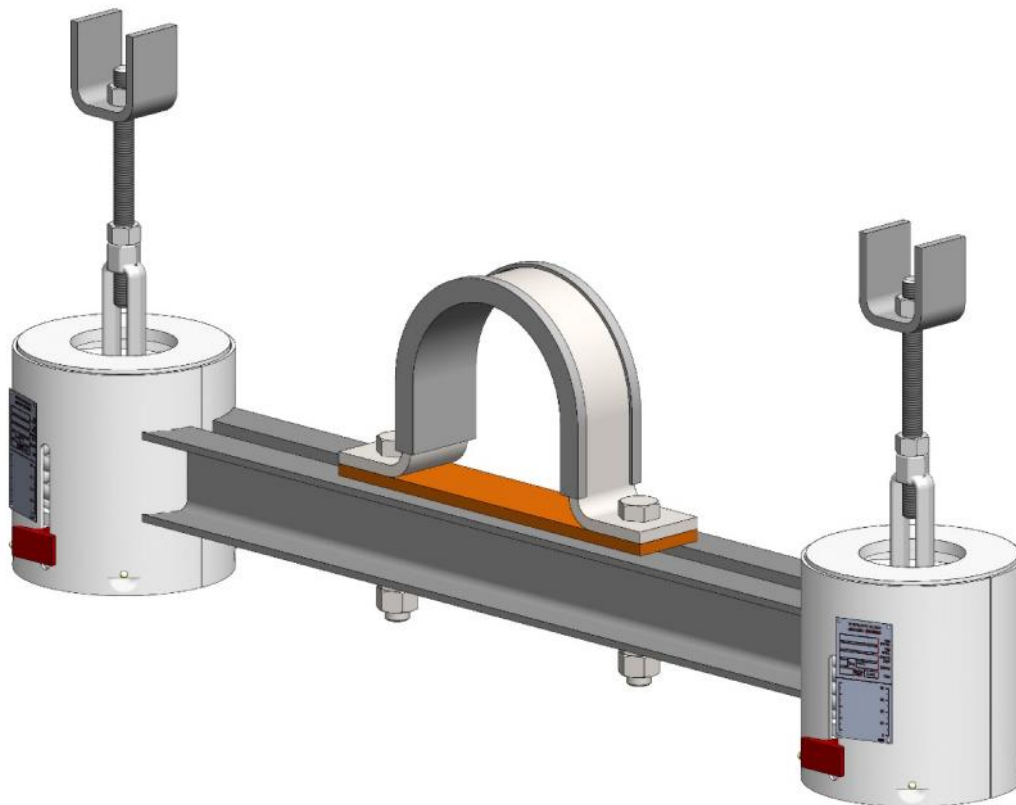
VARIABLE LOAD SPRING SUPPORTS – SIZES 0 to 17

To provide recommendations for the installation of Binder Group's range of Variable load spring supports, Sizes 0 to 17.
Includes a section on the installation when Multi-locks are used.

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Type G – Variable Load Spring Support – example only.

1. SCOPE

This Installation, Operation and Maintenance Manual (IOM) provides recommendations for the installation of Binder Group's range of Variable load spring supports, Sizes 0 to 17.

For sizes 18 to 22, please refer to - Installation, Operation and Maintenance Manual – Sizes 18 to 22. (Separate document).

The purpose of this IOM is to help:

- A) Remove the Pre-set Stops.
- B) Remove the Hydro Stops (if fitted).
- C) Make minor load adjustments.
- D) Adjust Multilocks (when fitted).

2. INTENDED USE

The range of Variable load 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 load spring supports may be used for the support of a line which will encounter an upward movement due to thermal growth during plant operation:

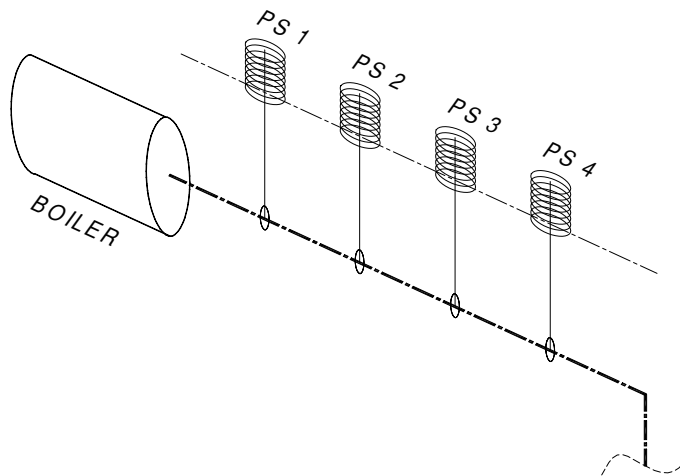


Figure 2.1 – Schematic of Spring Supports in Installed (“Pre-Set”) Condition

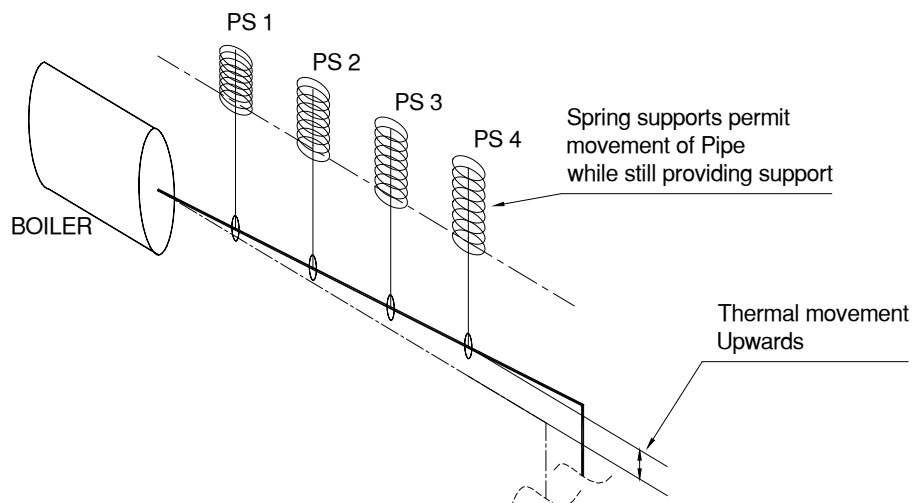


Figure 2.2 – Schematic of Spring Supports in Operating (“Hot Load”) Condition

3. SUPPORT DESCRIPTION

The Variable load spring support comprises a helical spring coil housed within a rolled steel canister (spring can). The spring coil is loaded in compression to support a pipe or vessel and is called the Pre-set load.

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 load spring supports are supplied in two (2) configurations:

- a) Hanger support - connection to the pipe via a drop rod. Types A, B, C, D and G. (figure 3.1)
- b) Pedestal support - support of the pipe from beneath. Type F, H and K. (figure 3.2)

They are supplied in 23 load range sizes. Sizes 0 to Size 22. Although this manual is limited to sizes up to and including size 17.

For ease of reading, the Variable Load Spring Support will sometimes be called “Spring Support”.

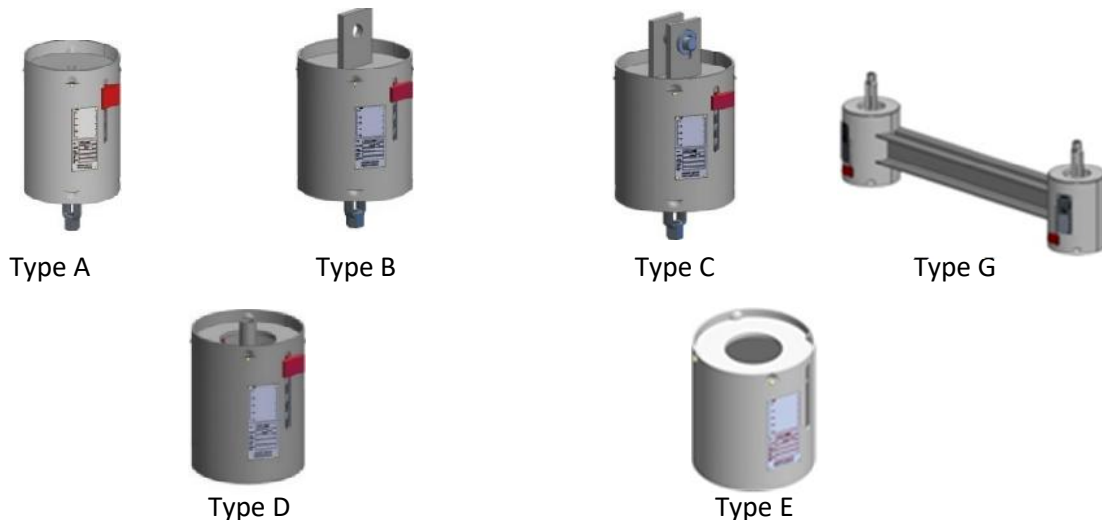


Figure 3.1 – Hanger supports



Figure 3.2 – Pedestal or Base Mounted supports.

Variable load spring supports are 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;

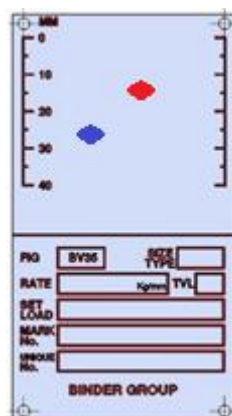
BV = Binder Variable,
70 = Travel series,
C = Type “C” hanging support,
12 = Size 12 load range.

Variable load spring supports are selected to accommodate the design load and movement calculated for the specific support location. The calculations (pipe stress analysis) are produced by pipe stress Engineers and is then supplied to Binder Group for review.

All Variable load spring supports are supplied pre-loaded to the design installation load, which is called the Pre-set load.

As indicated in figures 3.3 and 3.4, all Variable load spring supports are fitted with a stainless steel tag plate that identifies the support. The tag plate will contain the following information:

- a) BV FIG: Travel Series
- b) Size & Type of support.
- c) Set Load. (what load the support is Pre-Set to)
- d) Travel. The pipes design travel.
- e) Mark No. (the supports identification number, usually called the Tag Number)
- f) Travel markers (Blue marker for the “Pre-Set load” and a Red marker for the “Operating”)



Note: Variable load spring supports can be supplied to an “operating load”. This is useful when the pipe cannot return to cold state or other controlling factors. Binder Group must be notified of this in order to correctly pre-set the support in the factory.

Typical items of a Variable load spring support:

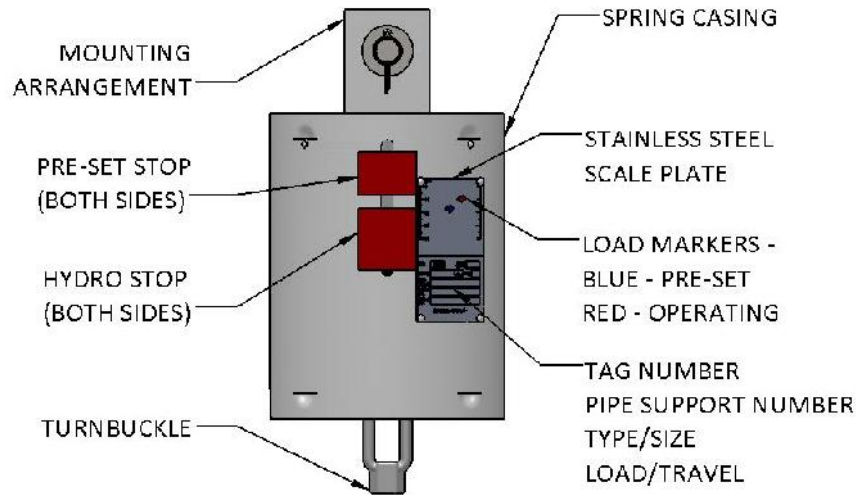


Figure 3.3 – View of a typical ‘Hanger Support’.

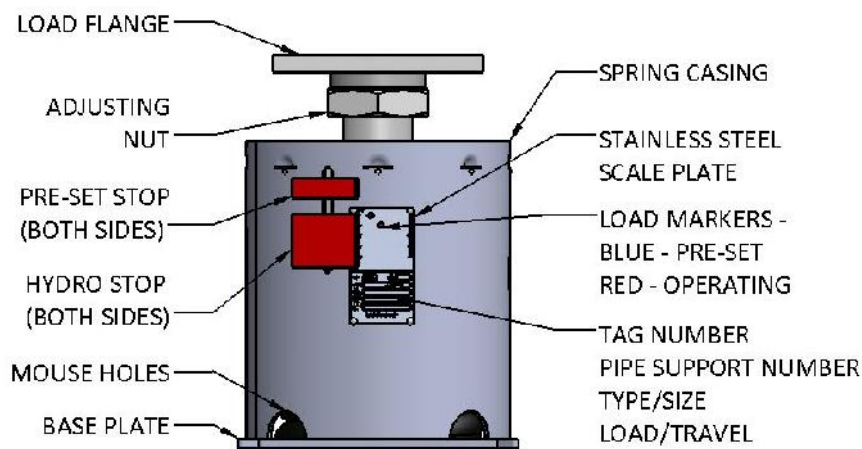


Figure 3.4 – View of a typical ‘Pedestal Support’.

Please note:

1. Hydro Stops are supplied at client request and are required if the support will be subjected to a Hydrostatic Test.
2. Optional Multi-locks can be supplied in replacement of the standard Pre-Set/Hydro Stop design. Refer to Section 6.

4. PRINCIPLE OF OPERATION

A schematic cutaway view of two typical variable load spring supports:

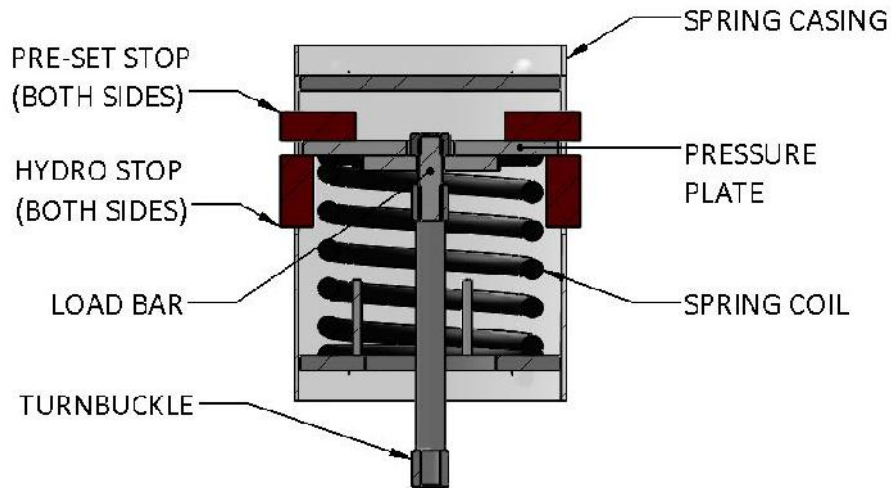


Figure 4.1 – Schematic Cutaway View of a 'Hanger Support'.

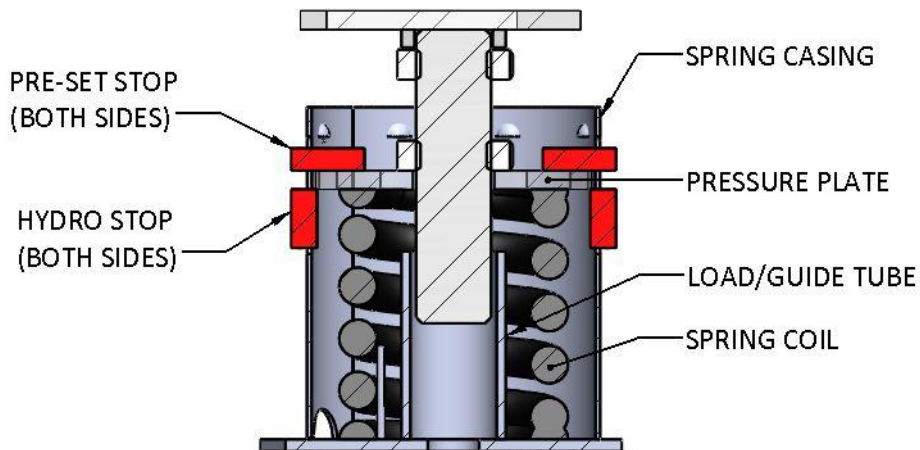


Figure 4.2 – Schematic Cutaway View of a 'Pedestal Support'.

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

In the case of the hanger spring supports (Figure 4.1), a load bar runs through the center of the coil to the pressure plate which sits on top of the coil. The unit is connected to the pipe by means of a drop rod to either a Pipe Clamp, Pipe Lug or a Trapeze.

In the case of pedestal type (“F” type) support (Figure 4.2), load is carried on the load flange. This load is transferred to the compressed coil via a threaded load bar (or load tube) which runs through the pressure plate.

In order to facilitate installation, the Variable load spring support is supplied with the spring coil compressed to the client supplied ‘Pre-Set load’ and held at this load by means of a pair of Pre-set stops.

Hydrostatic test stops are optionally fitted and need to be requested at time of order. The hydrostatic test stops where fitted will be located beneath the pressure plate and prevent the spring coil from being compressed beyond the pre-set position.

Both the pre-set and hydrostatic test stops are painted red and are banded in place.

Further explanation of Pre-set and Operating Loads:

The Pre-set load is often called the Cold load. This is due to the pipe line is usually shut down and is cold.

The Operating load is often called the Hot load due to the pipe line being hot.

This is not always the case, and can cause contradictions. For example, the LNG industry has pipe lines which are cold when in operation.

Therefore, Binder Group recommends to only deal with Pre-set loads and Operating loads.

5. INSTALLATION AND COMMISSIONING, BASIC STEPS.

Prior to installation, each spring support should be inspected and verified to be the correct unit. The units' tag numbers and model numbers should be confirmed correct against the appropriate isometric OR Binder's Approval Drawings.

Once the spring support is confirmed correct, it can be installed to site requirements and regulations.

If a Hydrostatic test on the pipe line is required. Hydrostatic test stops must be installed.

Once this has been completed, the support may be setup for plant operation. The illustrations below explain the sequence of setup.

Please note: If the Variable load spring support have optional Multilocks fitted instead of the standard Pre-set stops, please refer to Section 6 of this IOM.

STEP 1 – REMOVAL OF HYDROSTATIC TEST STOPS.

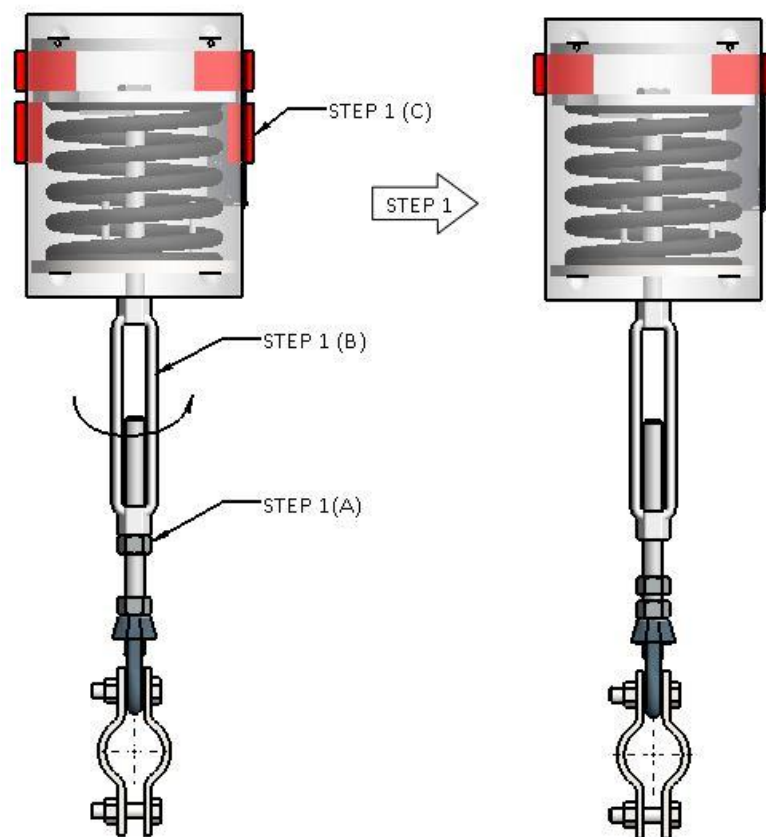


Figure 5.1 – View of a typical assembly with Pre-Set and Hydro Stops installed.

Hydrostatic Stops should be relatively easily removed by hand. In the event the hydrostatic stops are jammed by pipe load, relieve drop rod tension by:

-)] Loosen and wind down the locking nut that is hard up against the Turnbuckle, Step 1(A).
-)] For Type A, B or C supports, rotate the turnbuckle in a Left to Right direction, as shown in Figure 5.1, Step 1 (B).
-)] Remove the Hydrostatic stops, Step 1(C).
-)] In the case of Type D supports, back off (un-wind) 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, wind the threaded load tube down.

These actions will transfer load away from the spring support and the pressure plate will begin to bear UP against the Pre-set stops to allow removal of the hydrostatic stops by hand.

Cautionary Note: Under no circumstances should the Pre-set or Hydro stops be levered or pulled out with any mechanical device, such as a spanner, tyre iron or lever. They must only be removed by hand.

STEP 2. – TRANSFER LOAD ONTO THE VARIABLE LOAD SPRING SUPPORT;

Next step is to remove the Pre-Set stops. Having removed excess load from the Hydrostatic stops as outlined in Step 1, the pressure plate should be bearing up against the pre-set stops. In illustrations following show the methods of Pre-set stop removal and adjustment for the various different types of spring supports.

-)] For Types A, B and C Supports (Figure 5.2), transfer load from pipe to spring support by rotating the turnbuckle in a Right to Left, Step 2(A). Then Remove the Pre-set stops by hand, Step 2(B).
-)] Type D Springs (Figure 5.3), transfer load from pipe to spring support by rotating the nut above the load tube in a Right to Left action, STEP 2(A). Then remove Pre-set stops by hand, STEP 2(B).
-)] Type F Springs (Figure 5.4), transfer load from pipe to spring support by rotating the half Nut that's welded on the threaded load tube in a Left to Right action. A mechanical tool (such as a spanner) is recommended rather than adjusting by hand. Then remove pre-set stops by hand.

For supports with Multilocks, refer to Section 6.

If further technical advice is required, please contact Binder's technical department via email: Sales@Bindergrp.com

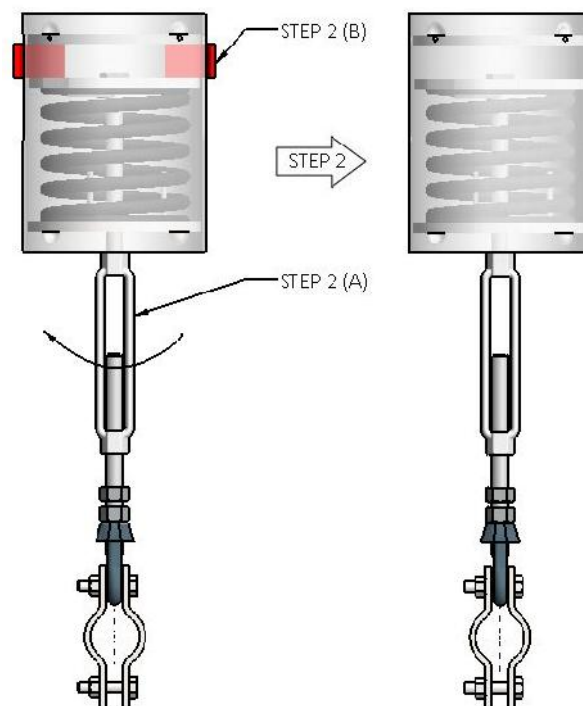


Figure 5.2 – Type A, B & C: View with Pre-Set Stops installed.

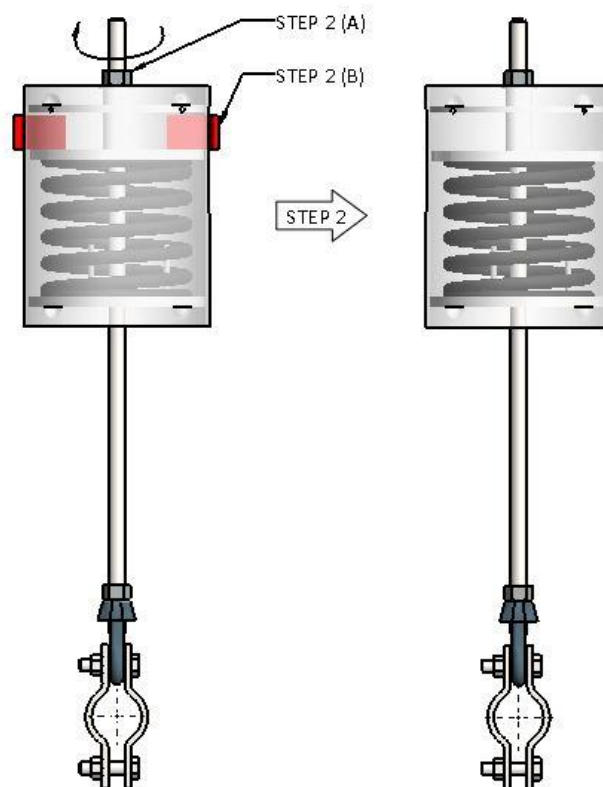


Figure 5.3 – Type D: View with Pre-Set Stops installed.

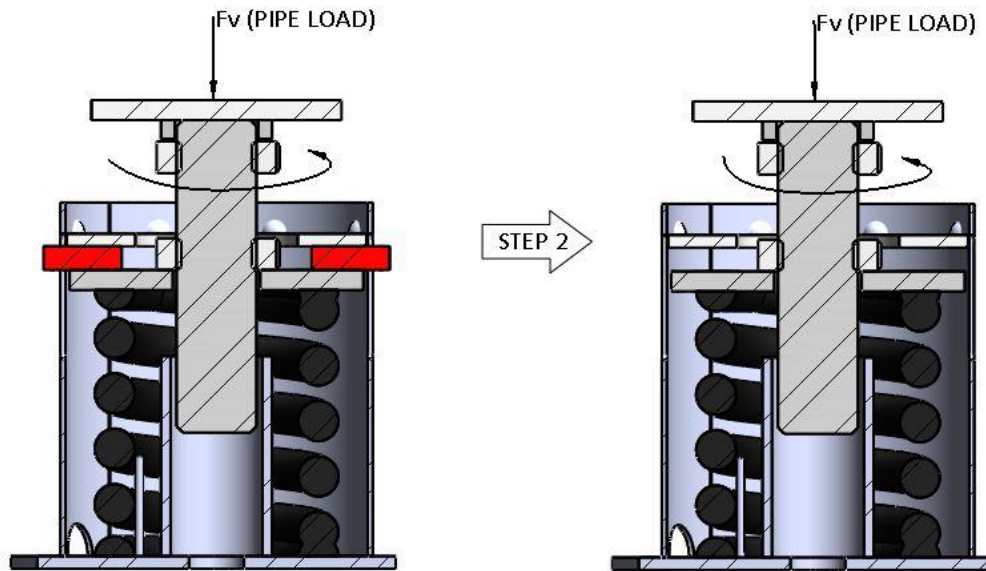


Figure 5.4 – Type F: View with Pre-Set Stops installed.

STEP 3. – INSPECTION & CALIBRATION.

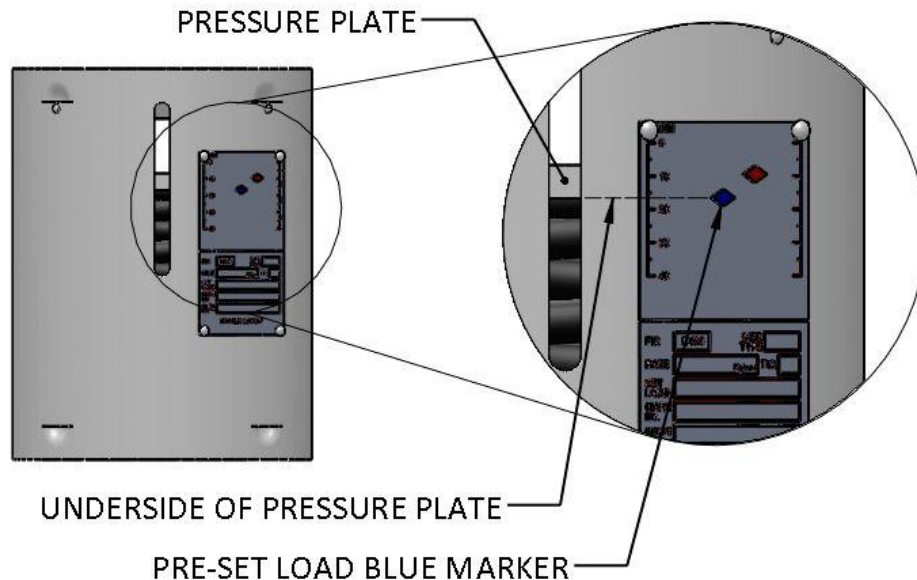


Figure 5.5 – Typical view of a Scale plate.

Once the Variable load spring support is loaded (supporting the pipes weight), a visual check is required to confirm the position of the pressure plate is in the correct position.

The underside of the pressure plate should align with the blue marker indicating the correct Pre-set load. Refer to Figure 5.5 above. Where a deviation from the cold position is noted, the pressure plate may be adjusted by rotating either the Turnbuckle or Hex Nut depending on the type of support, as mentioned in Section 2 above.

If there is a large deviation, over 5mm, then the site Piping Stress Engineer should be advised.

If there is more than one spring support along the pipe line there is a recommended sequence of adjustments. Refer to Section 8 for further details.

6. PRICIPLE OF OPERATION – MULTI-LOCKS.

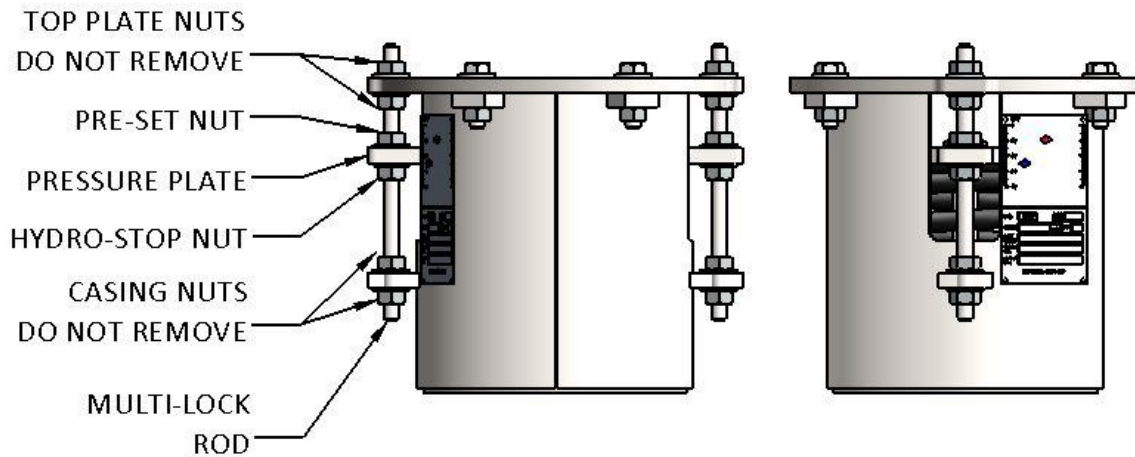


Figure 6.1 – View of a typical assembly with Multi-locks.

Multi-locks are an optional replacement for the standard locking system (Pre-set and Hydrostatic Stops). These need to be requested at time of order as they cannot be retro fitted to existing spring supports.

Like Pre-set stops, these also lock the spring support at the required pre-set load

The main difference between the two is Multi-locks allow the support to be locked to any position throughout the travel range. This is useful when the support needs to be locked while the pipe line is required to remain in operation.

Cautionary note: Multi-locks must not be used to adjust the load on the spring coil, i.e. tighten or loosen the Pre-set nuts. If the load on the coil is required to be adjusted, then this must be done via the Turnbuckle, Load Tube or Hex Nuts, as outlined in Section 5.

7. INSTALLATION AND COMMISSIONING, BASIC STEPS – MULTI-LOCKS.

Prior to installation, each variable load spring support should be inspected and verified to be the correct unit. The units' tag numbers and model numbers should be matched up against the appropriate isometric OR Binder's Approval Drawings.

Once the spring support has been confirmed correct, it can be installed to site requirements and regulations.

STEP 1 – Setting up.

If a Hydrostatic test is required, wind the 2 x Hydro-stop nuts down to have a 1 to 2mm gap between the top of the nut and the Pressure Plate. This is aid in the winding of the Pre-set nuts.

The support is now ready for the Hydrostatic test.

STEP 2 – Moving the Hydro-stop Nuts.

Once the Hydrostatic test is completed OR the test is not required, wind the 2 x Hydro-stop nuts down to the Casing nuts and tighten them half a turn with a spanner/wrench. These must be below the slot in the casing to allow the Pressure Plate to move freely without clashing.

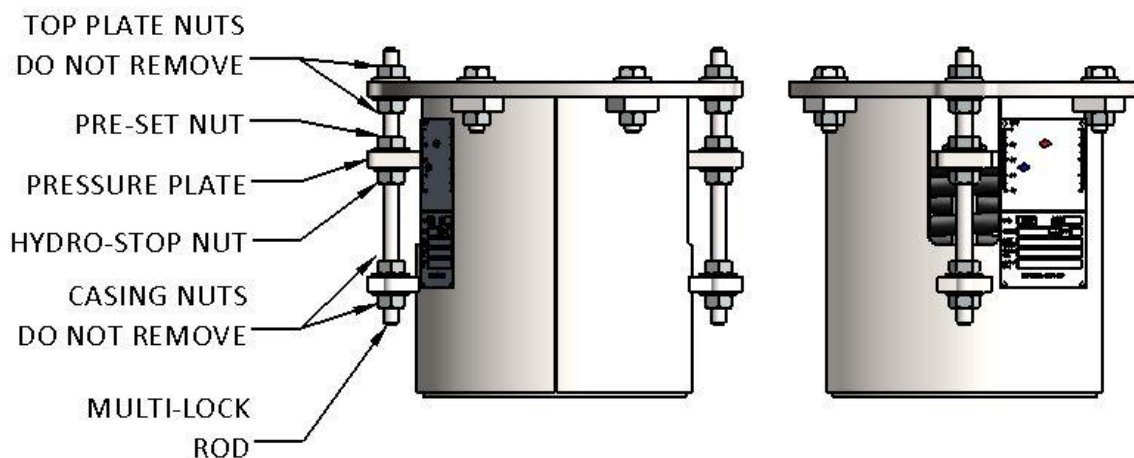


Figure 7.1 – View of a typical assembly with Multi-locks.

STEP 3 – TRANSFER LOAD ONTO THE VARIABLE LOAD SUPPORT;

Next, the 2 x Pre-Set nuts are required to be wound up and locked against the Top Plate nuts. To do this:

The Pressure plate will be bearing up against the 2 x Pre-Set nuts. To allow movement of these nuts the pipe weight needs to be transferred onto the variable load spring support.

The following explains how to transfer the load depending on the Type of support.

For Types A, B and C Supports:

Loosen and wind down the locking nut from the Turnbuckle, Step 3 (A). Next, rotate the turnbuckle in a Right to Left until the Pre-Set Stop nuts become loose, Step 3 (B). Then wind the Pre-Set Stop nuts up hard against the Top Plate nuts, and then tighten half a turn with a spanner/wrench.

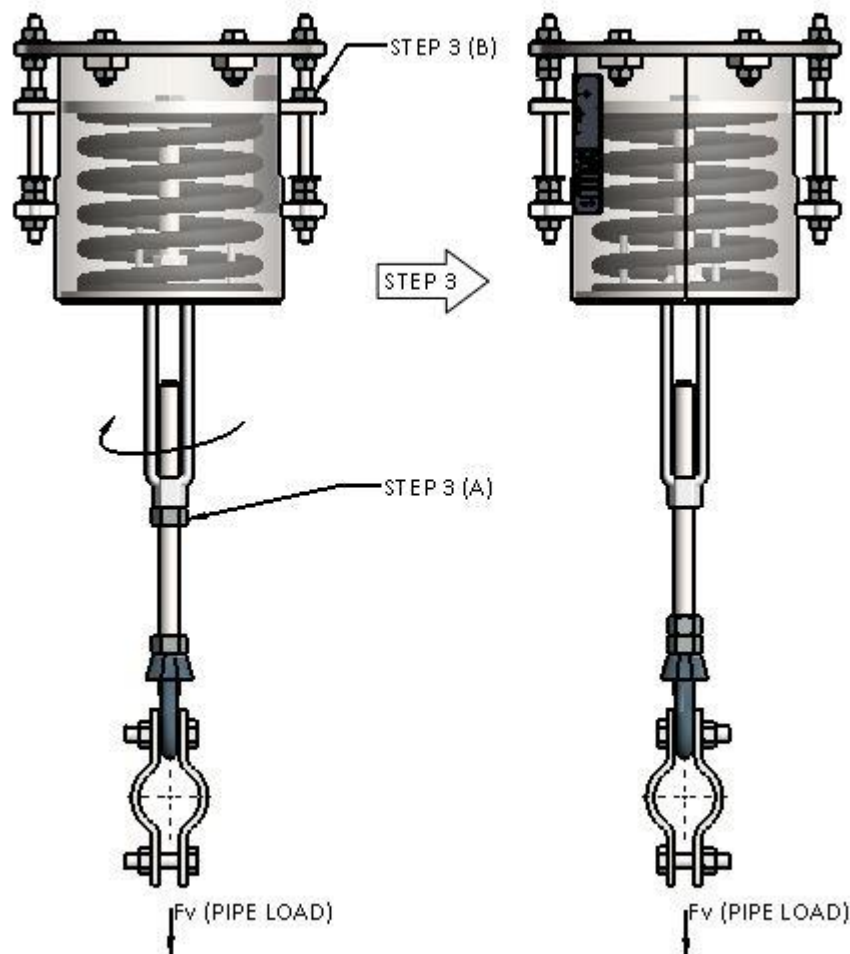


Figure 7.2 – View of a Type A, B & C assembly with Multi-locks

) Type D & E Supports:

Rotate nut above the load tube in a Right to Left action (STEP 3 (A)) until the Pre-Set Stop nuts become loose. Then wind the Pre-Set Stop nuts (STEP 3 (B)) up to the Top Plate nuts, and then tighten half a turn with a spanner/wrench.

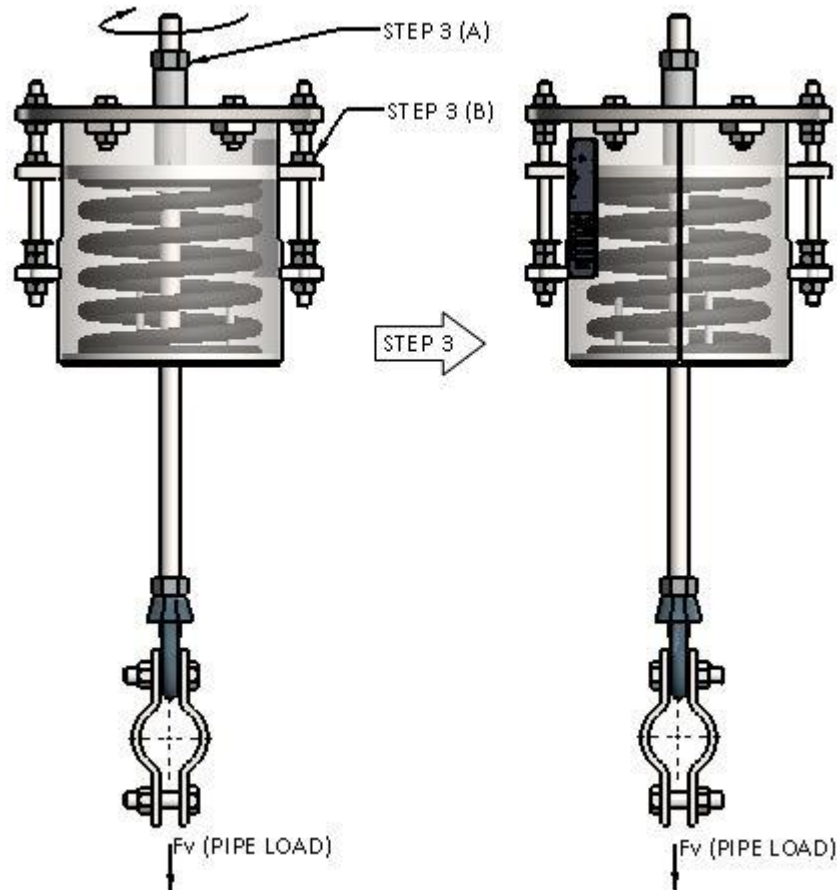


Figure 7.3 – View of a Type D assembly with Multi-locks

) Type F, H & K Supports:

With a spanner/wrench, rotate the Hex Nut on the threaded load tube in a Left to Right action, STEP 3 (A). This cause the Load Flange to move up. Rotate in half a turn increments until Pre-Set nuts become loose.

Next, wind the Pre-Set nuts, STEP 3 (B) up to the Top Plat nuts and then tighten half a turn with a spanner/wrench.

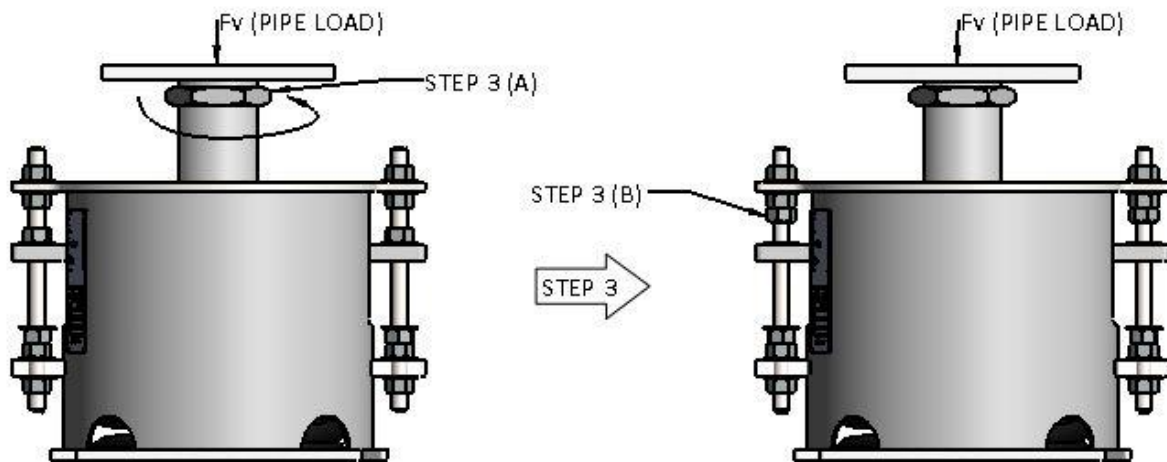


Figure 7.4 – View of Type F assembly with Multi-locks.

STEP 4. – INSPECTION & CALIBRATION – ALL MULTI-LOCK SUPPORTS.

Once the Variable load spring support is loaded (supporting the pipes weight), a visual check is required to confirm the position of the pressure plate is in the correct position.

The underside of the pressure plate should align with the blue marker indicating the correct Pre-set load. Refer to Figure 7.5 below.

Where a deviation from the cold position is noted, the pressure plate may be adjusted by rotating either the Turnbuckle, Load Tube or Hex Nut depending on the type of support.

If there is a large deviation, over 5mm, then the site Piping Stress Engineer should be advised.

If there is more than one spring support along the pipe line, there is a recommended sequence of adjustments. Refer to Section 8 for further details.

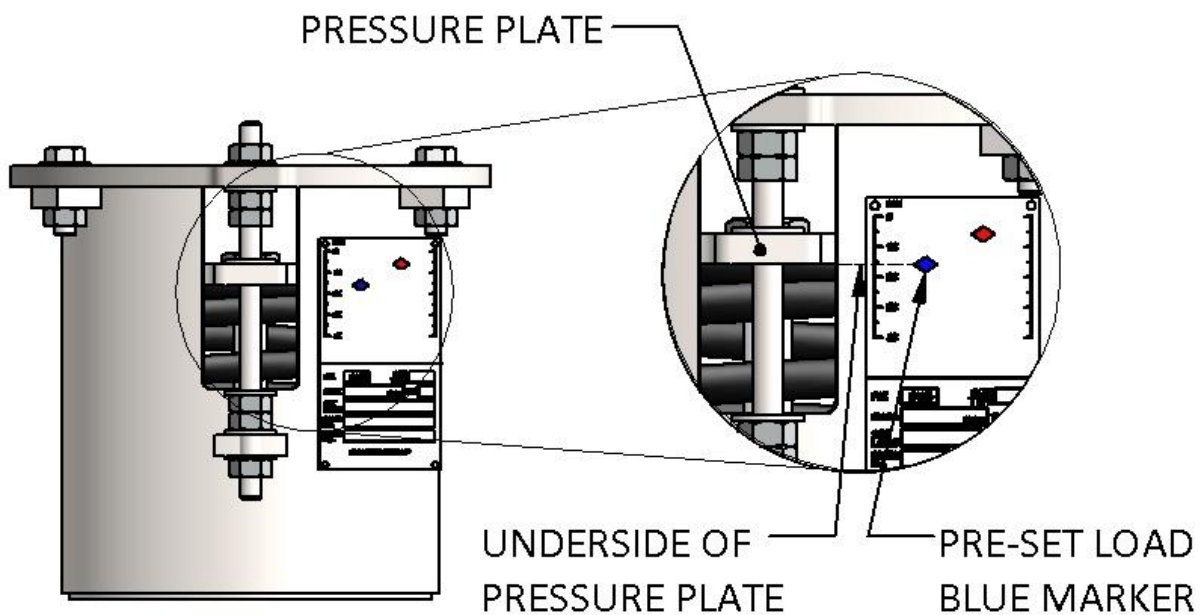


Figure 7.5 – View of Type F assembly with Multi-locks.

8. INSTALLATION AND COMMISSIONING SEQUENCE OF LOADING AND ADJUSTMENT

The loading and adjustment of spring supports on a line, which incorporates multiple spring supports, is a balancing exercise. As spring supports are loaded and the pre-set stops removed or adjusted away from the pressure plate, 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 spring supports, commencing with the 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.

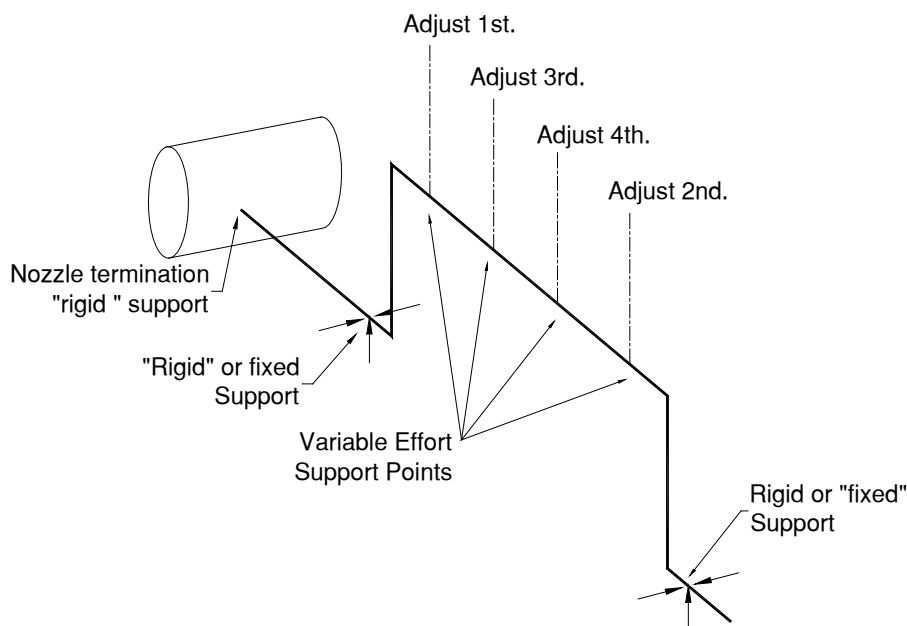


Figure 8.1 – Schematic of Spring Supports in Installed –Horizontal

SEQUENCE B: VERTICAL PIPE RUNS

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

The figure below illustrates this adjustment sequence.

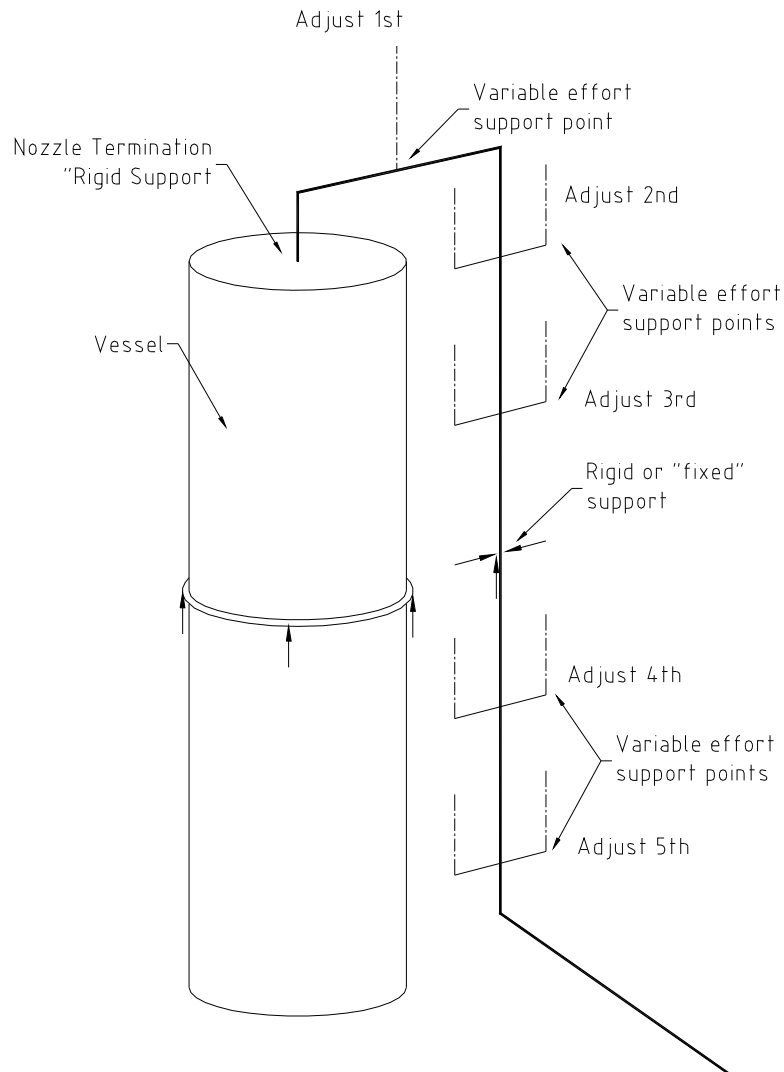


Figure 8.2 – Schematic of Spring Supports in Installed - Vertical

9. OPERATIONAL REQUIREMENTS OF VARIABLE LOAD SPRING SUPPORTS.

Variable spring supports are automatic in operation. Generally, they follow the thermal movement of the pipe.

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

Prior to operation, check the Hydrostatic Test Stops have been removed from their original locked position. Where Multilocks are attached, make sure the locking nuts holding the pressure plate have been moved out to the extreme ends, i.e. top and bottom of the threaded rods. Refer to figure 5.7 for identification of parts.

Check the position of the pressure plate is at the correct position, that is:

-) If the spring support has been installed with the pipe line shut down (cold load) the pressure plate should be in line with the Blue marker.
-) If the spring support has been installed with the pipe line in operation (hot hold) the pressure plate should be in line with the Red marker.

On achieving plant steady state operating conditions, check to ensure that the pressure plate is inline with the corresponding marker. Minor variations between the marker and pressure is allowable. If the variations are excessive, then this should be brought to the attention of the Piping Stress Engineer.

10. MAINTENANCE REQUIREMENTS OF VARIABLE LOAD SPRING SUPPORTS.

Maintenance requirements for the variable load spring supports are minimal. The inspection frequency will vary due to environmental conditions, clients onsite maintenance requirements etc.

The following observations are recommended:

Monitor condition of surface treatment and touch up as necessary. Inspect items such as the scale plate and identification markers are still attached. Inspect the position of the pressure plate, unit function and corrosion etc.

Maintain a covering of appropriate lubricant on threaded items to facilitate future adjustment and removal.

Monitor the operational range of movement and note any deviations from the Red and Blue markers attached to the scale plate.

Should major maintenance be required it is usually advised to replace the entire support rather than refurbishing. For this to be confirmed, photos and a brief comment on the operational performance can be sent to Binder for comment.

The variable load spring support houses a spring coil. This is restrained within the body of the unit under compression and is known as stored energy. The unit must not be dismantled without specialised knowledge of the design as this could lead to damage or even injury.

11. SPARE PARTS & SPECIAL TOOLS

No spare parts or special tools are required for variable load spring supports.

Generally, the only tool needed to adjust the spring support is as a spanner/wrench to rotate the Turnbuckle or Adjusting Nut.

If the client is unsure of the condition, Binder Group can offer a Pipe Support Inspection service, and provide a written report on each spring support and surrounding steelwork.

Please contact Binder for further information.

12. REMOVAL OF VARIABLE LOAD SPRING SUPPORT – WITHOUT A MULTI LOCKING DEVICE.

Removal of a variable load spring support is the reverse of the installation procedure. Please refer to the installation procedures applicable to the model of a variable spring unit as detailed in section 5.0.

The following is a brief explanation:

Before removing, it is assumed that the system has undergone cool-down and the pressure plate of the spring support has returned to a position either at or very close to the original cold installed position (in line with the Blue marker).

NOTE: If the system can not be shut down, new (usually longer) pre-set stops will need to be used.

The spring support may require adjusting as necessary in order to re-insert the pre-set stops into the slots.

Suitable strapping must be used to securely hold the pre-set stops in position.

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

13. REMOVAL OF A VARIABLE LOAD SPRING SUPPORT – WITH A MULTI LOCKING DEVICE.

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

The main reason a multi locking device is chosen is due to the pressure plate can be locked in its current position (anywhere within the travel range).

In order to lock the pressure plate, the pre-set nuts must be wound down on to the pressure plate and the hydro-stop nuts must be wound up to the pressure plate. These 4 x nuts are to hold the pressure plate in its current position.

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

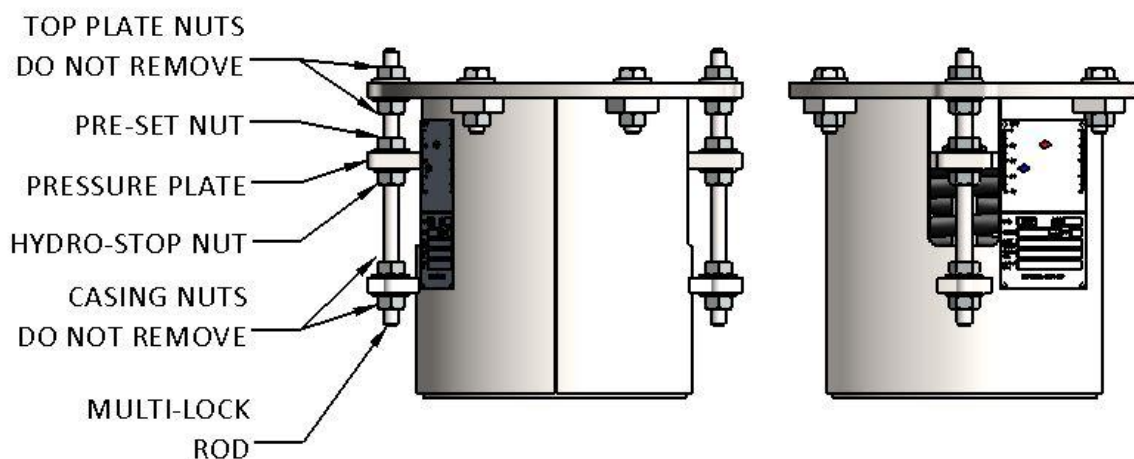


Figure 13.1 – Schematic of Spring Supports in Installed - Vertical

END.