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## ***VARIABLE SPRING UNITS***

### ***TECHNICAL DESCRIPTION***

***incorporating***

***INSTALLATION and***

***OPERATING/MAINTENANCE***

***INSTRUCTIONS***

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1	12.03.01	NAS	BD	-	

1/12

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## **WITCH Pipe Suspension Equipment**

## **1.0 TECHNICAL DESCRIPTION**

### **1.1 RANGE OF SPRING UNITS**

Our standard series of Variable Supports are produced in four basic travel ranges ie 35mm, 70mm, 140mm and 210mm and these are designated Fig DV35, DV70, DV140 and DV210 respectively. The travels stated represent the normal total work range of the springs, but as the supporting effect of a spring is a direct function of spring rate and travel, it is usual only to select variable supports so that the load variation does not exceed 25% of the load to be carried.

In keeping with generally accepted practise, we recommend that the actual load is correctly supported when the pipe has expanded or contracted into its working position. This ensures that no abnormal or excessive force due to out-of-balance supporting is transferred to the pipe system when in its stressed working condition. Whether this or any other principle is followed for the purpose of selecting variable supports, care must be taken to ascertain that sufficient travel is available in the spring assembly to permit free vertical movement of the pipe from either the cold to hot, or hot to cold position.

The variety of types and top fixings available are illustrated in the Carpenter & Paterson catalogue. All spring units are preset to the cold load at our works, according to the load and working travel each unit is to accommodate. The preset/hydrostatic stops should remain in position during installation of the pipeline, and also during any subsequent testing of the system (i.e hydrostatic test). These stops must be removed before the system is commissioned. (refer to Installations Instructions). Max Test Load = 2 x Working Load.

### **1.2 SELECTION**

To select the correct spring unit:-

- 1.2.1 Establish the correct service load
- 1.2.2 Add ancillary weights - ie rods, clamps, etc. which may additionally require to be carried by the spring unit.
- 1.2.3 Travel to be accommodated - 'cold to hot'
- 1.2.4 Decide what variation in load between 'cold' to 'hot' situations can be accepted. This should be kept to less than 25%.
- 1.2.5 Select a spring from the sizes 0-22 which will enable the 'cold' and 'hot' loads to be carried within the desired limits of the spring range.

### 1.3 SURFACE FINISH

All units can be supplied with either:-

- standard paint finish
- hot dip galvanised
- spring coils - plastic coated or plain
- alternative multi coat paint systems

### 1.4 ORDERING

When ordering please specify:-

- load
- travel - direction of travel
- figure number
- type
- size
- thread form
- hydraulic test load, if applicable

## **2.0 INSTALLATION INSTRUCTIONS**

### **2.1 INSTALLATION INSTRUCTIONS FOR VARIABLE SPRING UNITS SIZES 0-17 ONLY)**

Variable spring units are preset to a cold load position before despatch from our works.

The preset / hydrostatic tee bar test stops are coloured “red” and must be removed before the system is commissioned.

#### **2.1.1 To Install Spring Units - Type A, B, C**

The spring unit is fitted between the pipe/duct/bracket to be supported and the steelwork above the unit.

The hanger rod coming up from the pipe clamp/duct/bracket is connected to the turnbuckle which is fitted to all these types of spring unit. Rotation of the turnbuckle transfers the pipe load to the spring unit thus allowing withdrawal of the preset / hydrostatic stops.

Note! Ensure all hydro testing has been completed (if required) prior to removal of stops.

The stops can be retained for future use if required.

No further adjustment is required unless it becomes obvious that incorrect loads are being applied to the supports in the system. In this event we suggest that contact is made with our Engineering Department who will be pleased to advise on remedial action.

#### **2.1.2 To install spring units Type D and E**

Both of these units are mounted on top of the steelwork.

#### **2.1.3 For Type D**

The hanger rod passes through the unit and is secured to the spring unit at the top of the load tube by two nuts. The hanger rod should be of adequate length and threaded sufficiently to take into account any deviation in pipe or duct elevation since these units are not supplied with a turnbuckle. Rotation of the two nuts at the top of the load tube transfers the pipe load to the spring unit thus allowing removal of the preset / hydrostatic stops.

Note! Ensure all hydro testing has been completed (if required) prior to removal of stops.

#### 2.1.4 **For Type E**

The hanger rod passes through the spring units and should be provided with two nuts to prevent it passing through the spring pressure plate. To provide adjustment in length to the rod it may be necessary to provide a turnbuckle at a more convenient situation in the hanger assembly.

Installation is then similar to Type 'D' units.

#### 2.1.5 **To install spring units Type F and H**

These units are base mounted and should be aligned directly below the point of support, the height of the load flange is then adjusted to contact the lower surface of the support point by rotation of the adjustment nut on the load column.

Further rotation of this nut will transfer the load onto the spring unit and then the preset / hydrostatic stops can be withdrawn.

Note! Ensure all hydro testing has been completed (if required) prior to removal of stops.

#### 2.1.6 **To install spring unit Type G**

This unit is fitted with turnbuckles so that the hanger rods which having been connected to the steelwork above can be inserted into the turnbuckles. The rotation of the turnbuckle can transfer the load to the spring unit.

When the load is being correctly supported the preset / hydrostatic stops can be withdrawn.

Note! Ensure all hydro testing has been completed (if required) prior to removal of stops.

## 2.2 INSTALLATION INSTRUCTIONS FOR VARIABLE SPRING UNITS SIZES 18-22 ONLY

Spring Units Fig V35, V70, V140 and V210 sizes 18-22 are preset to a cold load position before despatch from our Works using three preset bars.

The preset bars are fitted with a label drawing attention to the fact that these bars must be removed before the system is commissioned; nevertheless the preset bars should remain in position until such time as commissioning procedure requires their removal. When the pipeline is subject to hydraulic test the preset bars should remain in position thus preventing any deflection on the spring assembly due to the additional load of the pipework.

### 2.2.1 **To install all Variable Spring Units except Type F**

The Variable Spring Unit is installed in the hanger assembly and depending on the type of unit ordered, ie top hung types A, B and C or mounted types D and E the unit can be connected on the bottom end to the pipe clamp or bracket via the drop rod.

### 2.2.2 **For Types A, B, C and G**

A turnbuckle is provided with the spring unit and thus the rod from the bracket or pipe clamp is connected into the turnbuckle.

### 2.2.3 **For Type D**

A turnbuckle is not provided unless specifically requested and thus the drop rod passes through the unit and connects to the bracket or pipe clamp.

### 2.2.4 **For Type E**

This unit does not have a turnbuckle unless specifically requested although one is sometimes required. The location of the turnbuckle (if required) depends on the hanger assembly design.

## 2.3 LOAD TRANSFER

To transfer load from the installed situation (after any hydro testing has been completed) onto the spring unit is achieved as follows:

### 2.3.1 **For Types A, B, C and G**

Rotating the turnbuckle until the dowel on the spring pressure plate centralises in the hole in the preset bars thus allowing them to be released. The preset bars can then be stored for future use by hanging them down on the bolts provided with the Spring Unit ensuring they will not impede the operation of the unit.

### 2.3.2 **For Type D and E**

Type D. The tightening of the adjusting nuts at the top end of the spring pressure tube transfers the load onto the unit and allows the preset bars to be released as described in the previous paragraph.

Type E. When there is a turnbuckle incorporated treat as Types A, B, C and G. When there is no turnbuckle available install as Type D.

### 2.3.3 **To Install Spring Units Type F**

The units are base mounted and should be aligned directly below the point of support and the height of the load flange is adjusted to contact the lower surface of the support point by rotation of the adjustment nut on the load column. Further rotation of this nut will transfer the load onto the spring unit and when the dowels are once again centralised in the preset bars they can be released. The preset bars should be stored for future use as described for Types A, B, C and G.

### **3.0 OPERATING**

#### **3.1 Commissioning**

Prior to commissioning for service the following checks must be carried out:-

- 3.1.1 All preset/hydrostatic stops are removed and stored
- 3.1.2 The unit travel indicator is set at the correct preset position

#### **3.2 INSPECTION DURING OPERATIONAL LIFE OF THE VARIABLE SPRING UNITS**

3.2.1 Prior to operation check that items 3.1.1 and 3.1.2 of the commissioning instructions have been carried out.

3.2.2 On achieving plant steady state operating condition check to ensure that the unit is now in its operating position. This will be indicated by the position of the travel indicators, minor variations are allowable. If the variations are excessive, then this should be brought to the attention of the piping designer since this may be due to either:

- loads/travels have been incorrectly specified
- other reasons which become apparent during the examination stage.

3.2.3 On achieving an early plant steady state cold condition carry out same check as in 3.2.2 above but with reference to the cold condition position on the travel scale.

3.2.4 The supports should be inspected at regular intervals during the life of the plant. The frequency of the inspection depends on environmental and operating conditions.

For example, a land based power station where the supports are indoors, an inspection once per year would be adequate. In an hostile environment for example an offshore platform a monthly inspection may be required.

The frequency of the inspection is very dependent on the service environment and should then be changed to suit the inspection findings.

3.2.5 Inspections should be so timed to ensure a mix of cold and operating condition is achieved.

3.2.6 Inspection should cover at least, but not limited to, the following points:-

- that the unit is in its correct position for the operating condition of the plant
- that the unit is correctly functioning
- that the spring coil is still complete (the coil may be viewed through the slot in the unit casing)
- corrosion of the unit is at an acceptable level – recommendations should be made if any repair to finish etc is required

In extremely hostile environments, such as an offshore platform, particular attention should be made to inspection of the units. Excessive build-ups of corrosion can occur rendering the unit inoperable. Checks must be made to ensure the unit is functioning.

- 3.2.7 Comprehensive records of inspections should be made and reviewed on a regular basis.
- 3.2.8 If any doubt exists as to the functioning of a unit it should be returned to the manufacturer for testing.

#### **4.0 MAINTENANCE DURING OPERATIONAL LIFE OF THE VARIABLE SPRING UNIT**

- 4.1 On an inland site or indoors environment, little or no maintenance is required other than perhaps the occasional application of a suitable grease to site threaded components.

The units are finished in the appropriate surface coating – painting system or galvanised. This may need repairing from time to time by the on-site contractor.

- 4.2 In a more hostile environment additional maintenance will be required and this should cover at least, but not limited to the following:-

4.2.1 Repair to any coating showing signs of significant red rust corrosion.  
Repairs to be carried out to an accepted/approved procedure.

4.2.2 Application of an acceptable grade of engineering grease to all threaded components.

This should be carried out on a three monthly basis, but this can be modified by reference to the Inspection reports.

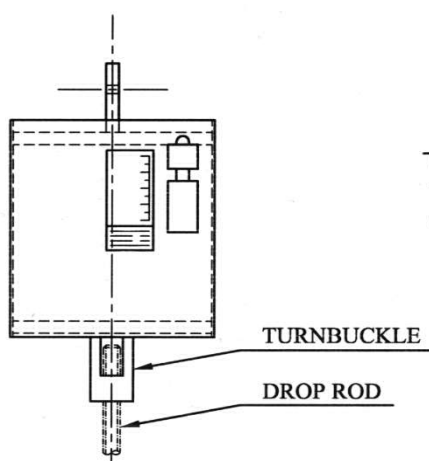
Details of the maintenance carried out should be recorded and reviewed with the inspection reports.

#### **5.0 ADDITIONAL SERVICE**

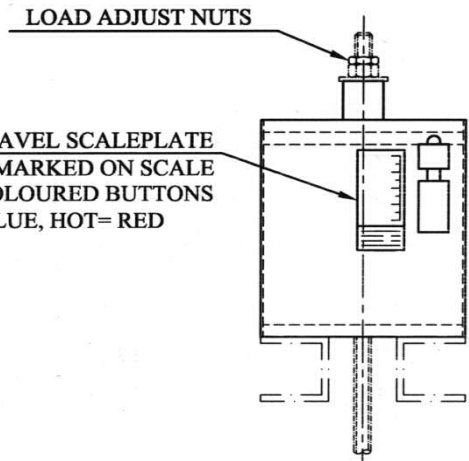
Please note that Carpenter & Paterson offer a full inspection service, including stress analysis of all pipework and pipe support systems. Contact our Welshpool office for further details - telephone (01938) 552061.

**DV35, DV70, DV140 & DV210 VARIABLE SPRING SUPPORTS SIZES 0-17.**

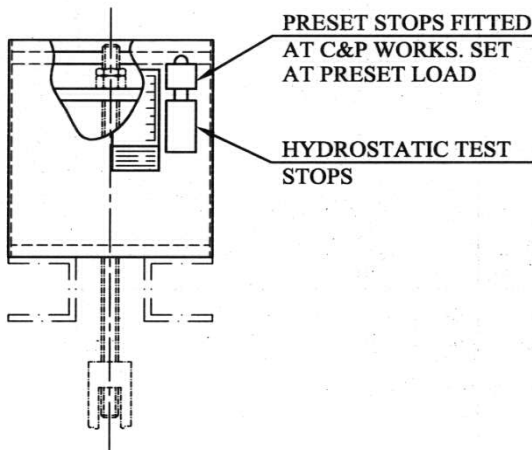
DIAGRAM ILLUSTRATION OF STANDARD VARIABLE SPRING UNITS WITH DESCRIPTION & ILLUSTRATION OF THE PRESET/HYDROSTATIC TEST STOPS TO BE USED IN CONJUNCTION WITH STANDARD INSTRUCTIONS SUPPLIED WITH CONTRACT



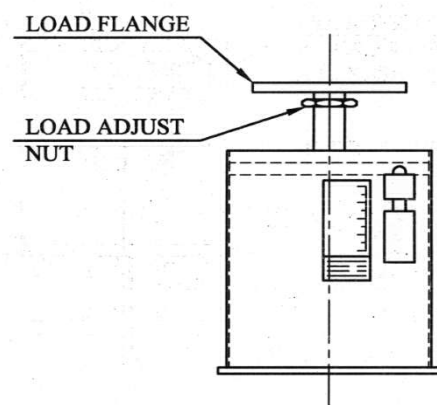
**TYPES A, B & C**  
(WELDING OR ROD ATTACHMENT)



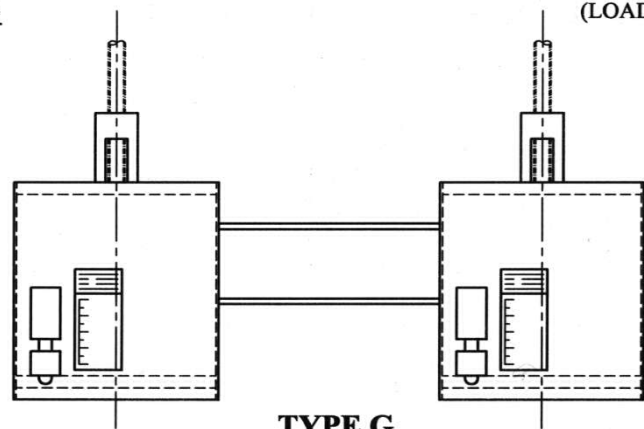
**TYPE D**



**TYPE E**



**TYPE F, H & K**  
(LOAD FLANGE OR ROLLER)



**TYPE G**

**V35, V70, V140 & V210 VARIABLE SPRING SUPPORTS SIZES 18-22.**

DIAGRAM ILLUSTRATION OF STANDARD VARIABLE SPRING UNITS WITH DESCRIPTION & ILLUSTRATION OF THE PRESET BARS.

TO BE USED IN CONJUNCTION WITH STANDARD INSTRUCTIONS SUPPLIED WITH CONTRACT

