



Carpenter & Paterson Ltd.

Crown Works, Welshpool, Powys SY21 7BE, U.K.

+44 (0)1938 552061 Fax: +44 (0)1938 555306/552818

email : info@cp-ltd.co.uk

web : <http://www.cp-ltd.co.uk/>

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CONSTANT SPRING UNITS

TECHNICAL DESCRIPTION

incorporating

INSTALLATION and

OPERATING/MAINTENANCE

INSTRUCTIONS

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1/10

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WITCH Pipe Suspension Equipment

1.0 TECHNICAL DESCRIPTION

1.1 DESIGN DETAILS

The Constant Spring Support designed and manufactured by Carpenter & Paterson Ltd incorporates the latest design concepts, resulting in a constant support effort through the total travel of the unit. The simplified construction, together with the established principles of a compression spring, working in conjunction with a bell crank lever, achieves a mathematically perfect counter balancing of spring and load moments about the main pivot point.

With a fixed spring housing of substantial construction the unit can be installed in many arrangements. The spring housing prevents the ingress of foreign bodies such as construction debris, thus reducing the danger of damage or restriction of the unit's function.

The standard range of constant supports are constructed to accommodate loads between 12kg and 45700kg with a standard range of travels from 40mm to 610mm in 10mm increments.

Constant supports are manufactured having a maximum deviation of $\pm 5\%$ of the specified load.

Upper and lower travel stops are incorporated in all units to prevent excessive overtravel.

All supports are fitted with a travel scale.

Special constant spring supports can be designed to suit customer's specific requirements ie higher loads, travels and configurations other than those indicated in the standard range.

The standard range as illustrated on sheet 9 have various types of attachment which can be adapted to suit the contract requirements.

Note: The variable position locking mechanism and load adjust facility is illustrated on sheet 10 fig 1.

1.2 PRESETTING

All constant supports are fitted with preset pins. These pins are factory positioned within the unit to suit the customers specified installed condition. On completion of installation and prior to removal of pins, the pipework system can be hydraulically tested or acid cleaned without further deflection of the spring assembly. The preset pins must be removed before commissioning the system (refer to installation instructions).

Our standard presetting pins will enable loads up to twice the capacity of the support to be taken during the hydraulic testing period.

Should it be necessary to carry loads in excess of this, we must be notified at the time of ordering to ensure the supports are designed with adequate safety margins.

Variable position locking mechanisms can be fitted if specified on customer purchase order.

1.3 LOAD ADJUSTMENT

Although the supports are preset to the customer's specified load and travel, it is sometimes necessary to adjust this preset load to accommodate minor variations in actual site conditions. A simple operation of turning the load adjuster screw in the appropriate direction to increase or decrease the load is all that is necessary. The amount of adjustment being $\pm 20\%$ of the mean load.

1.4 SURFACE FINISH

All units are painted, other corrosion resistant finishes are available if required at extra cost.

1.5 MAJOR FEATURES

The major features of the C&P Constant Spring Unit are shown on Fig.1

This is shown as a C50 type O but is typical for all of the C&P range of Constant Spring Units.

2.0 INSTALLATION INSTRUCTIONS

2.1 INSTALLATION PROCEDURE

The installation instructions are similar for all types of Constant Spring Units.

For example assume the unit illustrated in fig 1 is a C50 type O fitted with a variable position locking mechanism, the following procedure should be adopted when installing the unit. It should be noted that the standard unit is not fitted with a variable position locking mechanism. The installation instructions however are the same.

Attachment of the Constant Spring Units to the new or existing steelwork

The Constant Spring Unit is attached by either welding or bolting in accordance with the support detail drawings.

2.2 CONNECTING AND LOADING OF CONSTANT SPRING UNITS

2.2.1 Sling Rod Connection C50, C51, C52, & C53

The sling rod connecting the Constant Spring Unit to the pipe clamp should be adjusted so that it becomes tight. By rotating the turnbuckle, load will be transferred from the temporary support into the Constant Spring Unit. At this stage the locking pin will still be fitted to the unit. If a variable position locking mechanism (VPLM) is fitted the nuts at the rear of the spring casing should be wound back to the end of the spring tension bars which pass through the channel section, and to the nuts at the back of the pressure plate. Both sets of nuts to be locked back.

2.2.2 Base Mounted C54 & C55

The load column is adjusted so that it becomes tight under the pipe support shoe. By rotating the load adjuster nut the load will be transferred from temporary support onto the Constant Spring Unit. At this stage the locking pin will still be fitted in place. Any VPLM (if fitted) should be wound to the full extent of the allowable travel and locked in that position.

2.3 PRE-COMMISSIONING

The locking pins should normally remain in position for any pre-commissioning overload conditions but **must** be removed prior to the pipeline being put into service. The pin should be stored in the storage washer provided on the unit for future use.

The variable position locking mechanism, when fitted, is provided so that the lever arm can be fixed in any position. The mechanism should not be used unless instructed to do so by the customer. The VPLM is engaged by winding the nuts both sides of the channel section thereby trapping the spring tension rods in the channel. The unit is now locked in that position.

The standard units will need to be returned to its original preset position for refitting of the locking pin.

2.4 TO WITHDRAW THE LOCKING PIN

Check with Pipework Erection Programme regarding timing for removal of pin. (This is a client decision).

The locking pin passes through the Constant Spring Units sideplates and through the bell crank lever arm, for ease of checking the hole in the unit sideplates is larger than in the lever arm. When the locking pin is centralized in the hole in the unit sideplate the design load of the unit is being carried and the locking pin can be withdrawn.

If difficulty is found with the removal of the pre set locking pin then contact should be made initially with the Engineering Office of the Designer of the pipework system. The fact that the pin cannot be removed indicates either over or under loading. This will be indicated by the position of the pin in the hole. If the pin is trapped against the side nearest the spring coils, then the support is exerting more load than being generated by the pipe weight. If the pin is trapped against the side furthest from the spring coil then the pipe is exerting more load than the spring effort generated by the spring coil.

Load adjustment can be made using the load adjusting mechanism - Any changes must be authorised by the piping designer.

2.5 ADJUSTMENT OF UNIT TO MODIFY THE LOAD

The unit has a facility which can enable the original calibrated design load to be adjusted $\pm 20\%$. The units have a scaleplate fixed to them denoting this load adjust facility. By turning the load adjuster nut in the appropriate direction the load can be increased or decreased as required. The load adjuster scaleplate is calibrated in 2% divisions.

3.0 OPERATING

3.1 COMMISSIONING

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

- 3.1.1 All preset pins are removed and stored
- 3.1.2 The unit travel indicator is set at the correct preset position
- 3.1.3 If fitted the VPLM locking nuts are wound back away from the channel section in both directions.

3.2 INSPECTION DURING OPERATIONAL LIFE OF THE CONSTANT SPRING UNITS

- 3.2.1 Prior to operation check that items 3.1.1 to 3.1.3 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 indicator, minor variations are allowable. If the lever arm is against either the lower or upper travel stop then remedial action should be taken by the piping designers since either
 - 3.2.1 loads/travels have been incorrectly specified
 - 3.2.2 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 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 especially the load adjuster assembly and spacer washers 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 CONSTANT SPRING UNIT

4.1 The units are fitted with maintenance free bearings. This however does depend on the environment in which the unit is situated.

4.2 In a land based power station for example little or no maintenance is required other than perhaps the occasional spray over the area of the load adjuster spacer washers/bearings with a medium grade lubricating oil.
This requirement should be apparent from the inspection reports.

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 painting contractor.

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

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

4.3.2 Saturation by the use of penetrating oil between all moving parts, with particular attention being paid to the spacer washers between the load adjuster block and the lever side arms.

This treatment should be followed by the application of a good grade of engineering grease over the area treated.

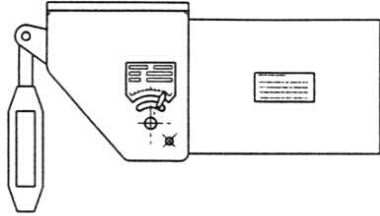
This should be carried out on a three monthly basis, but this can be modified by reference to the Inspection reports.

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

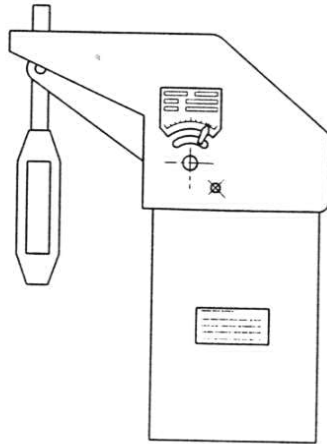
5.0 ADDITIONAL SERVICE

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.

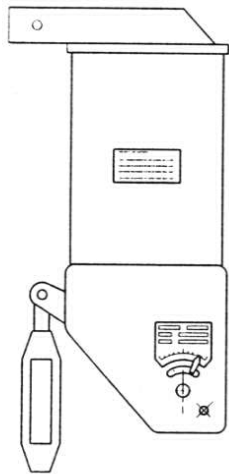
C50



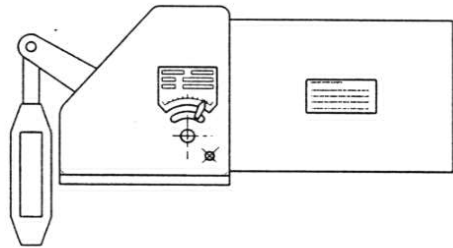
C51



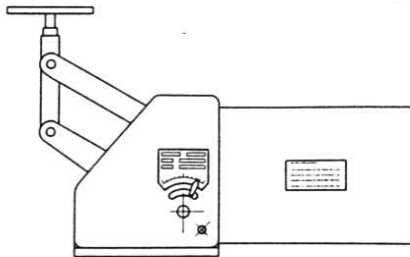
C52



C53



C54



C55

