46 GDS Helpsheet

World Leaders in Computer Controlled Testing Systems for Geotechnical Engineers and Geologists

Hardware

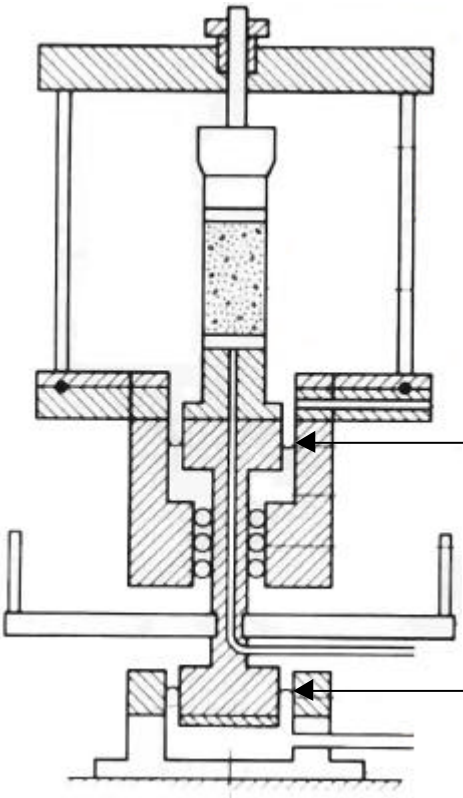
Bishop and Wesley “Stress Path” Triaxial Cell

Changing Bellofram Rolling Diaphragms

1. Introduction

The Bellofram Rolling Diaphragm (BRD) is formed in the shape of a truncated cone or top hat. The diaphragm is turned in on itself when installed so that during the stroke it rolls and unrolls alternately. The pressure load is almost entirely supported by the piston head. Only a small amount of liquid or gas pressure is supported by the narrow convolution of the rolling diaphragm. The convolute must be maintained at all times by positive pressure differential i.e. the pressure inside the convolute must exceed the pressure outside the convolute. Failure to do this will cause the convolute to collapse and be damaged by mechanical movement. In other words you must never move the piston by hand. Only move the piston by applying a pressure difference.

When you disassemble the triaxial cell to remove the BRD you will see that it is clamped to the top of the piston by a retainer plate. This retainer plate helps to prevent the BRD re-inverting to its original "as-moulded" position.



Bellofram Rolling Diaphragm (BRD)

The BRD is made from a range of rubber-like artificial materials called "elastomers" e.g. nitrile. The elastomer is reinforced with a fabric such as polyester or nylon. Inspect the BRD and rub it between your fingers. You will feel there is a textured or fabric side and there is a smooth side. The fabric side is the "dry" side in operation. The smooth side is the "wet" side in operation. You may have to cut a hole in the Bellofram as they are usually supplied without the hole. Simply copy the recently removed bellofram and make the hole the same size.

2. Installation Procedure

1. Disassemble the triaxial cell to remove the BRD. Refer to the assembly drawing to help you do this. You will see that the flange of the BRD is clamped between mechanical components. You will also see that the top of the BRD is clamped to the piston head by a retainer plate. Undo the fixings holding these components in place. Remove the old BRD and use it as a pattern for punching holes in the new BRD. Alternatively, you could use the retainer plate as a pattern.

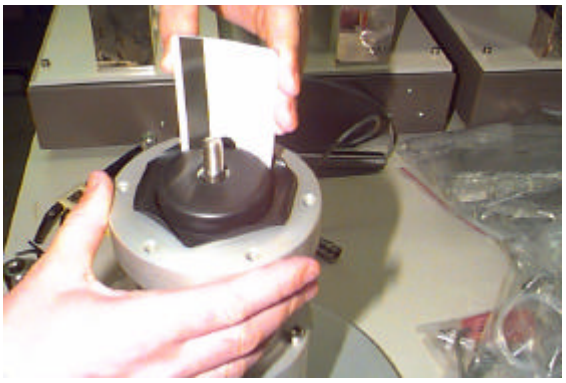
2. Raise the piston as far as you can above the bearing housing. Turn the BRD inside-out! Now sit the BRD on the piston so that the fabric side corresponds to the dry side or piston side. The smooth side now corresponds to the wet side facing into the pressure chamber i.e. the retainer plate is clamped to this side.

3. Fix the retainer plate in place on the head of the piston.

4. Slowly and by small amounts tuck the convolute down into the gap between the piston and cylinder (see photographs 1a and 1b). To help you do this use a thin strip of plastic sheet. A credit card cut longitudinally into say 3-4 strips is ideal! Make sure there no sharp edges.

5. Be patient and do not give up! Eventually the diaphragm will feed into the slot and the flange will rest flush against the bearing housing. Do not apply any more than gentle force!

6. Reassemble and test the cell. Use GDS Helpsheet #5 to refill the lower chamber of the cell. At GDS we use a car tyre foot pump to pressurise the cell with air. You may find this more convenient than using water in the cell for actuating the piston. Alternatively, you might use your lab compressed air source - if so do not exceed 100kPa. Remember only move the piston by pressure difference only!



Photographs 1a and 1b above shows the top bellofram being changed.