

O&M/ INSTALLATION INSTRUCTIONS FOR EXPANSION JOINTS

Always read these instructions before fitting your expansion joints.

These instructions are only a guide and list the most important aspects of using and fitting expansion joints. For a comprehensive checklist see the EA 'Guide to the use of expansion joints'.

A. PRE-INSTALLATION CHECK

1. SELECTION

Check that the expansion joint is suitable for the required duty. Check pressure, temperature, and movement.

The location of an expansion joint in a piping system is important to ensure correct expansion compensation. If site conditions require a re-positioning, this must be checked with a competent design authority. The same applies to anchor points and guide locations.

An expansion joint will not work unless the pipework is correctly guided and anchored. This applies in particular to axial or unrestrained units.

The anchors, guides and building fabric must be strong enough to contain the reactive loads of the expansion joints.

2. UNRESTRAINED EXPANSION JOINTS

2.1 ANCHORS

Unrestrained or axial expansion joints will extend under pressure. (See fig 1) Pipe anchors are therefore required to prevent this. This pressure thrust force (F) is a function of the pressure (P) times the cross sectional area (A) of the bellows. $F=A \times P$. The pressure thrust of axial expansion joints can be very large and it may not be possible to construct anchors of sufficient strength at high level.

For larger diameter pipes the frictional resistance of the guides also needs to be taken into account.

Caution: Never pressurise a system with unrestrained expansion joints unless the anchors are fully secured.

2.2 GUIDES

Guide positioning is crucial with unrestrained expansion joints. The first guide must be no further than 4 pipe diameters from the bellows and the second no more than 14 from the first. (See fig 2) The guides must guide the pipework accurately and prevent it from squirming or lifting (SEE TABLE 1.).

The selection of the correct guides is also important. Munson rings, straps or oversized pipes are generally unsuitable for the first two guides following the bellows. For larger pipes slide guides or rollers and chairs are recommended. Guides should be sufficiently strong to withstand a lateral load of 15% of the total axial load. For further information on guiding see BS6129 or the EA Guide.

2.3 LONG PIPE RUNS

If two or more expansion joints are used in a single pipe run, an anchor point must separate them. (See fig 3)

Caution: The pipe between two anchors must be straight without any offsets.

3. RESTRAINED EXPANSION JOINTS

3.1 LATERAL OR ARTICULATED

These expansion joints must be installed at 90° to the movement. Although anchors and guides are still required to ensure that the movement acts towards the expansion joint, they can be much lighter as the forces are usually lower.

Normal guide spacing and guide design is adequate. Lateral units can move in all lateral planes and therefore tie bar orientation is not important. Articulated or twin hinged expansion joints can only move in one plane and the orientation of the restraints is therefore important. (See fig 4)

3.2 ANGULAR OR HINGED

This type of unit must be used either in pairs or in threes. The orientation of the hinges should be exactly 90° to the movement. The two pairs of hinges must be in line. (See fig 5) The distance between angular expansion joints

determines the movement they can compensate for. The spacing should not be changed from the original design without checking with EA.

Caution: As with all restrained expansion joints guiding is not critical. However the first guide at right angles to the expansion joint must be placed a distance away from the elbow (x) to allow for shortening of the leg (y) (see fig 6), contact EA for a calculation on this distance. Lateral and angular expansion joints need room to move. Ensure that clearance to walls or between pipes allows for the movement of the expansion joints.

B. INSTALLATION

1. COLD PULL

Some bellows require cold pulling on installation. It applies equally to axial and lateral expansion joints. Units with screwed ends are usually pre-cold drawn.

This will be clearly marked. They often have a clip or pin, which should be removed after installation.

Cold pull is usually necessary to utilise the maximum movement capacity of the expansion joint and keeps deflection loads to a minimum.

Unless otherwise instructed coldpull the expansion joint 50% of the calculated expansion. Extreme ambient temperatures at time of installation must be taken into account. The required cold pull can be calculated as follows:

$X_{CP} = (1/2 - (T3 - T1) / (T2 - T1))$ where T1 = minimum temperature, T2 = maximum temperature, T3 = installation temperature. (See fig 7)

2. DIRECTION OF FLOW

Expansion joints fitted with inner sleeves are marked with a direction of flow arrow (In exceptional circumstances unidirectional sleeves are fitted). These units need to be installed in the correct orientation. The labels indicating the direction of flow must not be removed.

3. FLANGES

Mating flanges must be parallel and in line. The orientation of the bolt holes must be exact so that the expansion joint is not exposed to torsion. The correct length bolts are essential to ensure that they do not foul the convolutions. When applying spanners at the back of the flange take care not to dent the fragile convolutions.

4. SCREWED AND SOLDERED

When fitting screwed expansion joints great care must be taken not to apply any torsion. Expansion joints are damaged very easily when torqued. Always use a full union at both ends.

Most fluxes are very aggressive to stainless steel. When soldering or braising ensure that the flux does not come into contact with the convolutions either externally or internally.

C. PRESSURE TESTING

1. CHECK

Remove shipping or installation bars before testing if fitted. Before pressure testing ensure that all anchors have been fitted and are fully secured. When testing systems with unrestrained expansion joints the anchor load is usually largest at test pressure. In systems with restrained expansion joints the maximum load on anchor points is not during the pressure test but while the pipe is heating up. When testing only sections at a time ensure that intermediate anchors are sufficiently strong. Several pipes may be fixed to the same anchor. They should be tested together to exert maximum load on the anchor.

2. TEST

EA expansion joints are designed for a pressure test of 1.5 x their maximum rated working pressure unless otherwise stated. If a test at higher pressure is required, check with EA. Increase pressure slowly. Avoid water hammer or high flow velocities. Ensure that the flow through the expansion joint is in the same direction as in service.

Caution: Always pressure test with the expansion joint in place and ensure it is free to move as in service.

3. INSPECTION

Inspect the expansion joint after the pressure test. If the expansion joint looks deformed or it has been stretched it needs to be inspected by a competent person. An anchor may have failed or the pipe was inadequately guided.

Caution: Do not try to re-compress a unit that has been stretched. The inner sleeves may have been damaged.

D. TAKING CARE OF EXPANSION JOINTS

1. HANDLING

Expansion joints are relatively delicate and need to be handled with care. The convolutions of an expansion joint are of a thin wall to give them high degree of flexibility. If they get dented the expansion joint must no longer be used. During construction protect the expansion joint from external damage. Avoid material falling on top of the expansion joint and becoming lodged in the convolutions. Protect stainless parts from cement plaster and concrete mixtures. Prevent ingress of dirt as this may fall into the convolutions.

Do not sling close to convolutions or from tie bars.

2. WELDING AND PAINTING

Do not paint the stainless steel convolutions. Protect them from weld spatter as this can hole the thin bellows.

3. LAGGING

Special precautions need to be taken when lagging expansion joints. The lagging must not restrict the movement. It should not come into contact with the bellows part where it may become lodged in the convolutions. Some lagging materials contain chlorides which when wet may leak onto the bellows and cause pin holing.

Lagging should be removable for inspection purposes.

4. WATER TREATMENT

EA expansion joints use a highly corrosion resistant stainless steel as standard. However chlorine levels should not exceed 400 PPM. Any chemical additives to heating, chilled water or cooling systems should be checked for their compatibility with stainless steel.

5. WEEP HOLE

EA expansion joints are usually a thick walled spiral wrapped multiply construction. A special feature of this type of bellows is a weep hole drilled into a convolution. This hole only penetrates the outer layer. Do not try to block this hole. If water or medium leaks from this hole contact EA. It is generally not required to shut down the system unless the medium leaking out is a hazard.

E. BEST PRACTICE

1. SELECTION

Thick wall spiral wrapped expansion joint technology is the most advanced available. It ensures a long service life and the highest degree of safety.

2. FITTING

Use a stool piece to accurately align pipework and mating flanges.

3. COLD PULL

Use wooden spacer blocks to accurately cold pull the expansion joint.

4. ADVICE

Ask an EA engineer to visit site at an early stage to discuss the best solution for your system. Every installation is different. EA engineers have many years experience and a lot of problems can be prevented.



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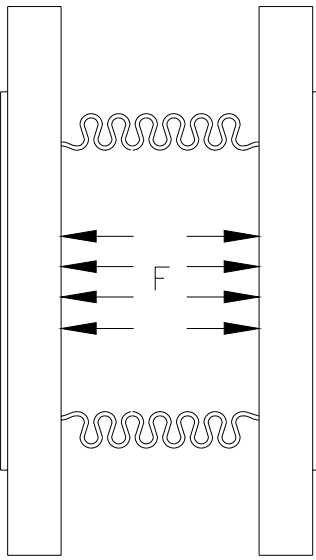


Fig 1. Extension Under Pressure

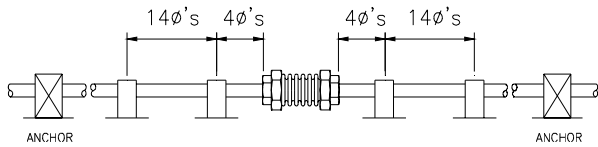


Fig 2. Guide Positioning

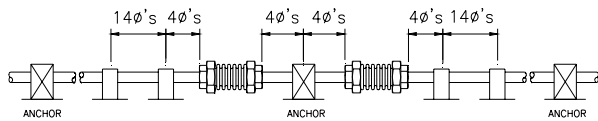


Fig 3. Anchoring for 2 or more joints

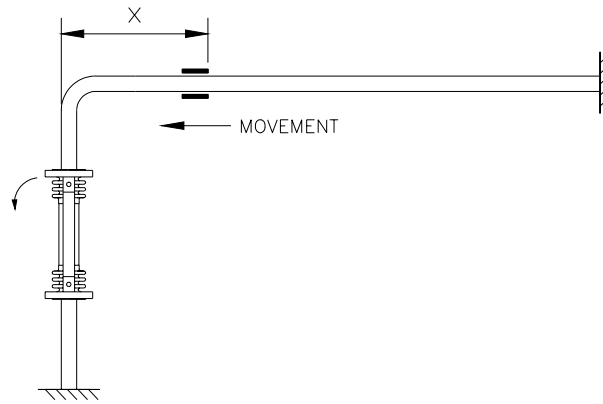


Fig 4. Twin-hinged Units - Move in one plane only

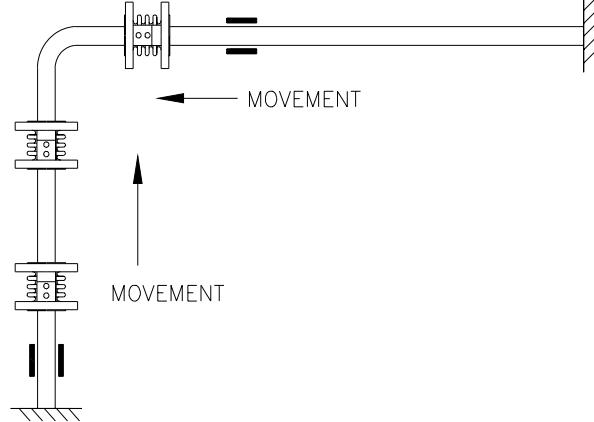


Fig 5. Typical Angular Arrangement (3 pin)

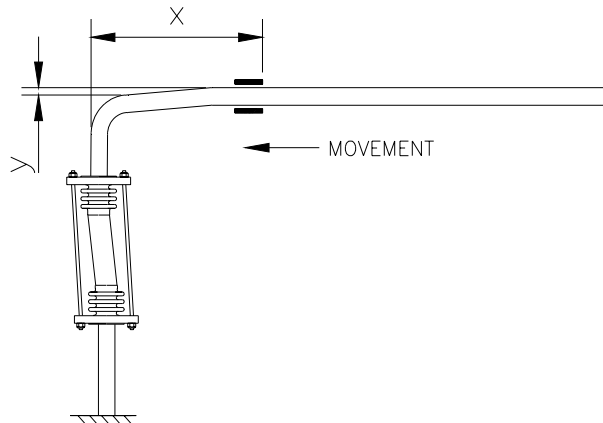
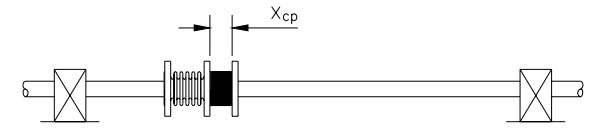
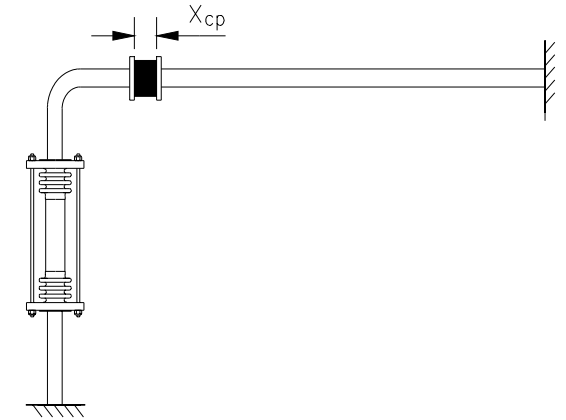


Fig 6. Guide Positioning (for restrained Exp. Joints)



(a) Axial



(b) Lateral

Fig 7. Cold Pull (Guides not shown)
(Also applies to Angular / Twin-Hinged units)

Design Guide:	Guide Clearance	
Nominal bore	≤100mm	>100mm
1 st & 2 nd Guides	1.5mm	3.0mm
Subsequent Guides	3.0mm	6.0mm

Table 1. Guide clearances