

Metal Bellows Expansion Joints

Instructions For Storage, Handling, Installation and Inspection



General

- If proper care is not taken during storage, handling, installation and inspection then the cyclic life and the pressure capacity of the bellows assembly may be reduced. This could result in premature failure of the bellows assembly or damage to the piping system.
- The following instructions show how to avoid the most common errors that can occur during storage, handling, installation and inspection. If there is any doubt after referring to these recommendations then further advice should be sought from the manufacturer.
- The manufacturers warranty may be void if improper installation procedures have been used.



Do



Don't



BROCKINGTON



MAXcomp





Storage & Handling

- Handle and store the bellows assembly so as to avoid any damage to its end fittings and to protect the convolutions from accidental mechanical damage.
- The bellows assembly should be stored in a clean and dry area and if necessary be placed on chocks to be clear of the floor.
- If space is limited and no alternative exists then bellows should only be stacked in such a manner to avoid any damage to the bellows, or any risk of the stack falling over.
- Do not use cleaning agents that contain chlorides and avoid the use of abrasive materials. Protect from salt.
- Do not use slings directly on the convolutions or convolution cover and lift only at designated lifting points or as specified by the piping designer.
- In storage, prevent any foreign matter from becoming lodged in either the inside or outside of the convolutions or internal flow sleeve.
- Do not roll any bellows assembly on its convolutions.

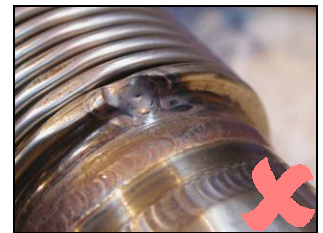


Installation & Inspection

- The bellows assembly should be inspected prior to installation for any damage.



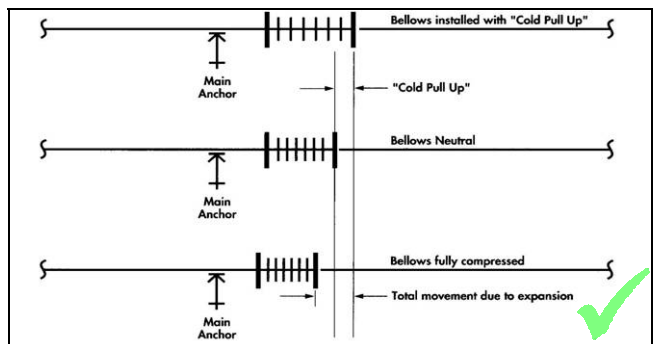
- Care should be taken to prevent damage to the thin wall bellows section, such as dents, scores, welding arc strikes and weld spatter.



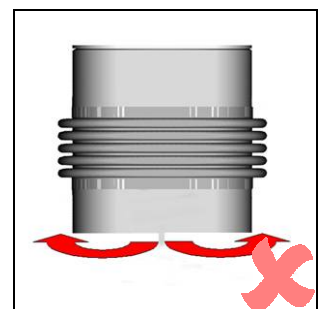
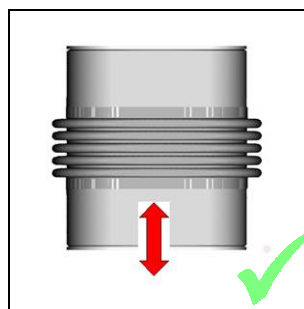
- No misalignment should be applied to the expansion joint which has not been allowed for in its design capability.



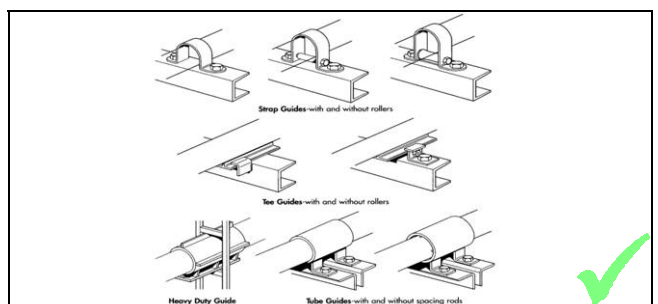
- Always check if the expansion joint has been supplied in a preset condition or if presetting is required at the installation stage by either using pre-tensioning devices if fitted or as specified by the piping designer.



- Ensure that the expansion joint will not be subject to any torsional movement either at the installation stage or in its service condition. This can have an adverse effect in its fatigue life capability as well as pressure capacity and stability and any resultant forces imposed on adjacent equipment may exceed their design limits.



- Anchors, guides and pipe supports shall be installed in strict accordance with the piping system drawings. Any field variances from planned installation may affect proper functioning of the expansion joint and must be brought to the attention of a competent design authority.





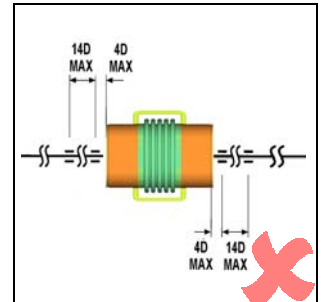
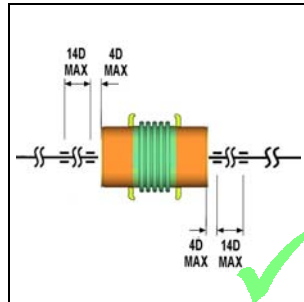
Installation & Inspection (continued)



- The expansion joint, if provided with internal sleeves, shall be installed with the proper orientation with respect to flow direction.



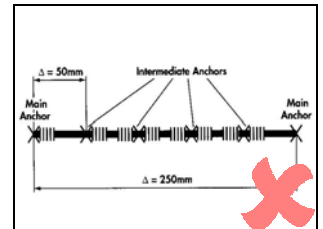
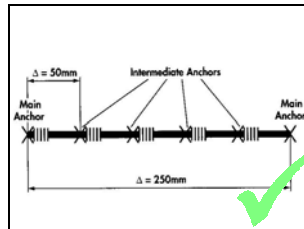
- Once the pipeline anchors or other fixed points are in place, the piping is properly supported and guided and the expansion joint installed, the shipping devices and any temporary protection covers should be removed in order to allow the expansion joint to compensate for changes in ambient temperature during the remainder of the construction phase.



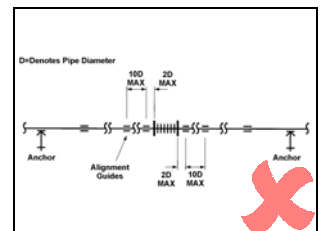
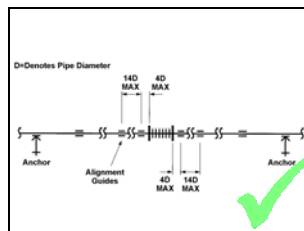
- Ensure that the maximum design and test pressure for the expansion joint is not exceeded in pressure testing the piping system and that main anchors are designed to withstand the resultant pressure end load.



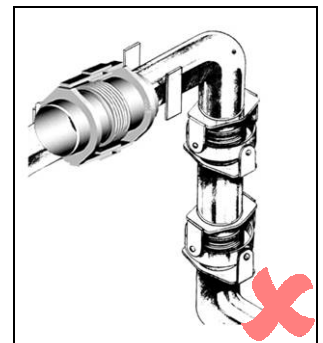
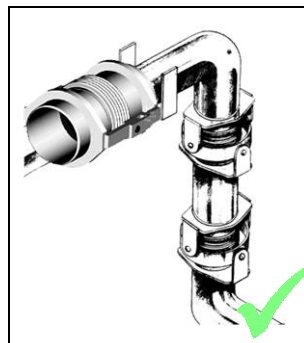
- Not more than one axial expansion joint should be installed between any two main anchors without the addition of intermediate anchors.



- Ensure that the first pipeline guide is located within a distance of four pipe-diameters from the expansion joint and the second within fourteen pipe-diameters from the first guide.



- Hinge units should be positioned to ensure pivot pins are in the correct plane.





Post Installation Inspection Prior To System Pressure

- | | No | N/A | YES |
|--|--------------------------|--------------------------|--------------------------|
| • Are anchors, guides and supports installed in accordance with the system drawings? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • Is the correct expansion joint installed in the correct location? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • Are the expansion joints' flow direction and pre positioning correct?
If the expansion joint is fitted with internal flow sleeves it shall be marked with a flow direction arrow to assist correct installation. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • Have all of the expansion joints' shipping devices been removed?
Do not use shipping devices to contain pressure thrust. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • If the system has been designed for gas and is to be tested with water, has provision been made for proper support of the additional dead weight load on the piping and expansion joint? Some water may remain in the bellows convolutions after the test. If this is detrimental to the bellows or system operation, means shall be provided to remove such water. The test media used must be approved by the piping designer and should be compatible with the materials used in the construction of the expansion joint. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • Are all guides, pipe supports and the expansion joints free to permit pipe movement? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • Confirm that no expansion joint has been damaged during handling and installation? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • Confirm that the expansion joint is not misaligned? This can be determined by measuring the joint overall length, inspection of the convolution geometry and by checking clearances at critical points on the expansion joint and at other points in the system. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • Are the bellows and other moveable portions of the expansion joint free of foreign material? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |



Inspection During And Immediately After System Pressure Tests

WARNING: Extreme care must be exercised while inspecting any pressurised system or component. A visual inspection of the system shall include checking for the following:

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|---|--------------------------|--------------------------|--------------------------|
| • Confirm that there is no evidence of leakage or loss of pressure. | No | N/A | YES |
| | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • Confirm that there is no distortion or yielding of anchors, expansion joint hardware, convolutions and other piping components. | No | N/A | YES |
| | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • Confirm that there is no unanticipated movement of the piping due to pressure. | No | N/A | YES |
| | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • Confirm that there is no evidence of instability (squirm) in the bellows. | No | N/A | YES |
| | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • Confirm that there is no evidence of binding on the guides, expansion joints and other moveable parts of the system. | No | N/A | YES |
| | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • Confirm that any evidence of abnormality or damage shall be reviewed and evaluated by a competent design authority. | No | N/A | YES |
| | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |



Periodic In-Service Inspection

WARNING: Extreme care must be exercised while inspecting any pressurised system or component.

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|---|---|--|--|
| <ul style="list-style-type: none"> • Immediately after placing the system in operation, a visual inspection shall be conducted to ensure that the thermal expansion is being absorbed by the expansion joints in the manner for which they were designed. | <p>No</p> <input type="checkbox"/> | <p>N/A</p> <input type="checkbox"/> | <p>YES</p> <input type="checkbox"/> |
| <ul style="list-style-type: none"> • The bellows shall be inspected for evidence of unanticipated vibration. | <p>No</p> <input type="checkbox"/> | <p>N/A</p> <input type="checkbox"/> | <p>YES</p> <input type="checkbox"/> |
| <ul style="list-style-type: none"> • A programme of periodic inspection shall be planned by the system designer and conducted throughout the operating life of the system. The frequency of these inspections will be determined by the service and environmental conditions involved. | <p>No</p> <input type="checkbox"/> | <p>N/A</p> <input type="checkbox"/> | <p>YES</p> <input type="checkbox"/> |
| <ul style="list-style-type: none"> • The inspections shall include examination for signs of external corrosion, loosening of threaded fasteners and deterioration of anchors, guides and other hardware. | <p>No</p> <input type="checkbox"/> | <p>N/A</p> <input type="checkbox"/> | <p>YES</p> <input type="checkbox"/> |
| <ul style="list-style-type: none"> • Where the critical nature of the system warrants, it may be necessary to devise means for minimising the probability of this type of failure, including periodic preventative replacement of critical system components. | <p>No</p> <input type="checkbox"/> | <p>N/A</p> <input type="checkbox"/> | <p>YES</p> <input type="checkbox"/> |
| <ul style="list-style-type: none"> • When any inspection reveals evidence of malfunction, damage or deterioration, this shall be reviewed by a competent design authority for resolution. | <p>No</p> <input type="checkbox"/> | <p>N/A</p> <input type="checkbox"/> | <p>YES</p> <input type="checkbox"/> |

IT MUST BE UNDERSTOOD THAT THIS INSPECTION PROGRAMME, WITHOUT ANY OTHER BACKUP INFORMATION, CANNOT GIVE EVIDENCE OF DAMAGE DUE TO FATIGUE, STRESS CORROSION OR GENERAL INTERNAL CORROSION. THESE CAN BE THE CAUSE OF SUDDEN FAILURES AND GENERALLY OCCUR WITHOUT ANY VISIBLE OR AUDIBLE WARNING.



System Operation

A record shall be maintained of any changes in system operating conditions (such as pressure, temperature, cycling, etc.) and piping modifications. Any such changes shall be reviewed by a competent design authority to determine its effect on the performance of the anchors, guides and expansion joints.



Maintenance

Metal bellows expansion joints supplied by Teddington Engineered Solutions Limited are maintenance free. Metal bellows expansion joints which have reached the end of their design life must be replaced with new units. It may be possible for a unit to be refurbished by the original manufacturer, however, it is usually more economic to fit a new part.



End Of Life Disposal

All metal bellows expansion joints supplied by Teddington Engineered Solutions Ltd are free from asbestos and materials containing it, chromium compounds, excluding usage in alloys, and cadmium. Before disposal careful consideration must be given to nature of the fluid that flowed through the bellows when it was in service and the nature of any deposits that have built up inside.

