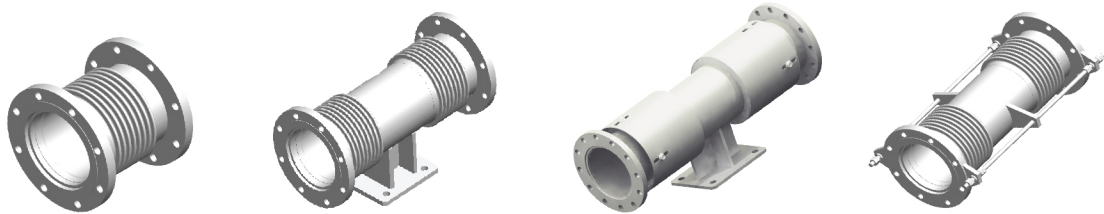


# **STAINLESS STEEL EXPANSION JOINT**

## **INSTALLATION OPERATION AND MAINTENANCE MANUAL**



## GENERAL

Handling and installation of expansion joints need particular care and shall be carried out by experienced staff. Damage to expansion joints, especially the bellows, shall be avoided, in order that the full pressure reliability and service life is achieved. The manufacturer's authorization shall be obtained before any repairs are carried out.

## REFERENCES AND STANDARDS


- EJMA (Standards Of The Expansion Joints Manufacture Association, Inc)
- DIN EN 14917 (Metal Bellow Expansion For Pressure Application)

## PACKAGING AND STORAGE


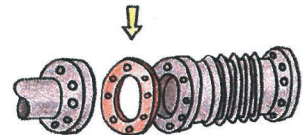
Suitable packaging shall be provided for expansion joints, to ensure that there is protection during transport and storage from the effects caused by dirt or aggressive atmospheres. Transport safety devices or pretension or shipping bars shall not be removed before installation.

## GUIDE FOR STORAGE AND INSTALLATION

### DO'S

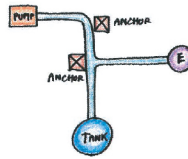
-  Inspect for damage during shipping, i.e., dents, broken hardware, water marks on carton, etc.
- Store in clean dry area where it will not be exposed to heavy traffic or damaging environment.



- Use only designed lifting lugs.
- Make the piping system fit the expansion joint. By stretching, compressing, or offsetting the joint to fit the piping, it may be overstressed when the system is in the service.
- It is good practice to leave one flange loose until the expansion joints has been fitted into position. Make necessary adjustment of loose flange before welding.
- Install joint with arrow pointing in the direction of flow. (see arrow mark)  with fluid flow.
- Install single Van Stone liners pointing in the direction of flow. Be sure to install a gasket between the liner and Van Stone flange as well as between the mating flange and liner. 
- With telescoping Van Stone liners, install the smallest I.D. liner pointing in the direction of flow.
- Remove all shipping devices after the installation is complete and before any pressure test of the fully installed system.



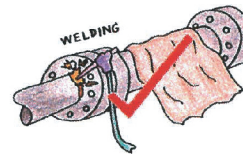
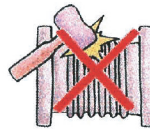
- Check for adequate anchor and guide support for the system



- Remove any foreign material that may have become lodged between the convolutions.
- Refer EJMA standards for proper guide spacing and anchor recommendations.

## DON'T

- Do not drop or strike carton.



- Do not remove shipping bars until installation is complete.
- Do not remove any moisture-absorbing desiccant bags or protective coating until ready for installation.
- Do not use hanger lugs as lifting lugs without approval of manufacturer.
- Do not chains or any lifting device directly on the bellows. Protect with wet chloride-free insulation.
- Do not use cleaning agent that contain chlorides.



- Do not use steel wool or wire brushed on bellows.
- Do not force-rotate one end of an expansion joint for alignment of bolt holes. Ordinary bellows are not capable of absorbing torque.
- Do not hydrostatic pressure test or evacuate the system before installation of all guides and anchors.
- Pipe hangers are not adequate guides.
- Do not exceed a pressure test of 1.5 times the rated working pressure of the expansion joint.



- Do not use shipping bars to retain thrust if tested prior to installation.

- **UNRESTRAINED EXPANSION JOINTS**

Unrestrained expansion joints under pressure will exert a considerable axial force on the pipeline, i.e. anchor. It is essential that checks are carried out when the expansion joint is first pressurized to ensure that there is no unforeseen stretching of the bellows. If unforeseen movement is apparent, then the pipe guides or anchors shall be examined to ensure that they have been installed correctly and sufficiently designed for the duty. Only axial pipe guides or anchors shall be used adjacent to an unrestrained expansion joint.

- **RESTRAINED EXPANSION JOINTS**

Special instructions shall be observed for the installation of hinged expansion joints. It is important that direction of the pipe movement is perpendicular to the axial of the pins.

- **INSTALLATION INSTRUCTION**

#### **Expansion Joint Installation**

The bellows of an Expansion Joint is manufactured from relatively thin material in order to provide the flexibility needed to absorb the specified movement. The life of the Expansion Joint can be shortened if the unit is improperly handled and/or installed. This can arise from direct physical damage to the bellows through stresses imposed during installation, or by other factors. Therefore some basic instructions must be followed having safe and proper installation of Expansion Joints.

#### **Pipework system design**

Tozen strongly recommends that you seek the advice of qualified Pipework engineer on your piping system and Expansion Joint selection. Pipework containing Expansion Joints requires careful anchoring and guiding for the Expansion Joint(s) to operate to their designed capacity.

#### **Pipe anchors**

The function of a pipe anchor is to divide the pipeline into individual expanding sections. Because thermal growth cannot be restrained, it becomes the functions of the anchors to limit and control the amount of movement which Expansion Joints located between these anchors will absorb. Sometimes equipment such as turbines, pump, compressors, heat exchanger, etc. may possibly act as anchors.

#### **Pipe Guides**

Correct alignment of the adjoining Pipework is essential in the proper functioning of an Expansion Joints. Pipe guides are necessary to ensure movement is directed onto the Expansion Joint and also to prevent buckling of the pipeline.

#### **Receiving Inspection**

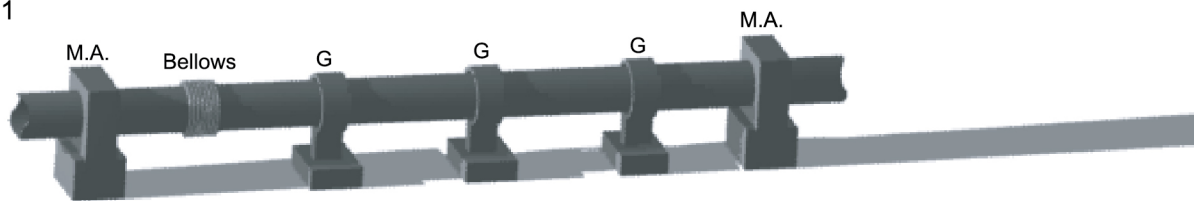
Upon receipt, identify and inspect the Expansion Joints for any damage that may have occurred in transit. We recommend that the Expansion Joints be stored in a safe area in its original packaging until ready for installation. Contact Tozen immediately if any repairs should be required.

#### **Warranty**

Warranty is void if these instructions are not followed

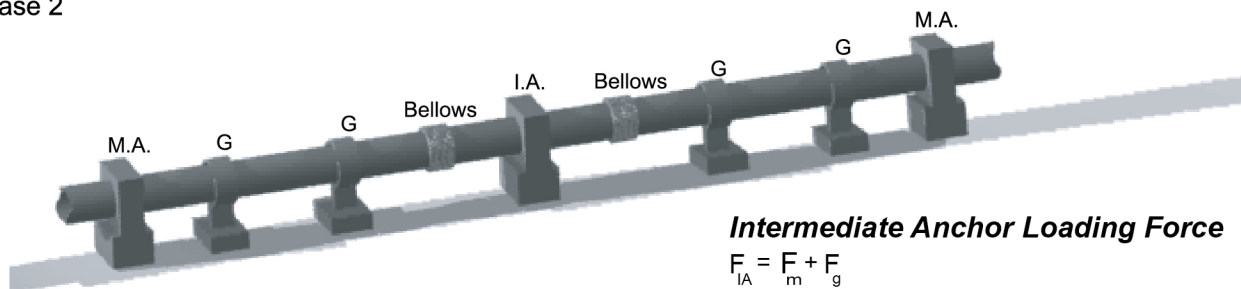
## Case of Installation & Piping System Forces Calculation

Case 1



The basic form of single bellows Expansion Joint in a straight line piping between two Main Anchors (M.A.) with support Guides (G).

Case 2

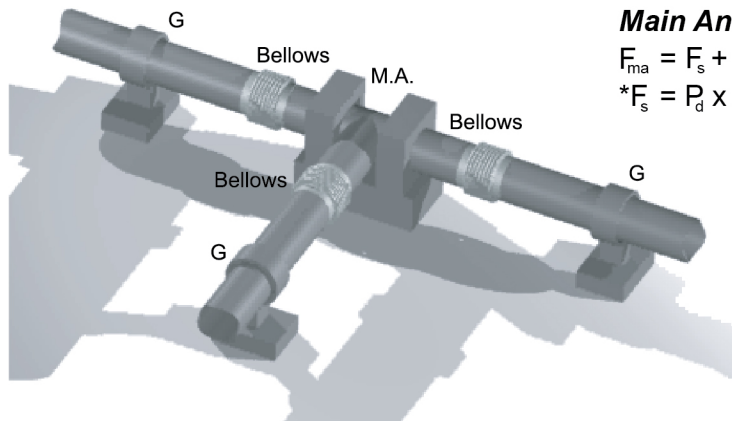


**Intermediate Anchor Loading Force**

$$F_{IA} = F_m + F_g$$

Universal or double bellow Expansion Joint in straight line piping between two Main Anchors and Intermediate Anchors (I.A.) at middle line with support Guides installed.

Case 3



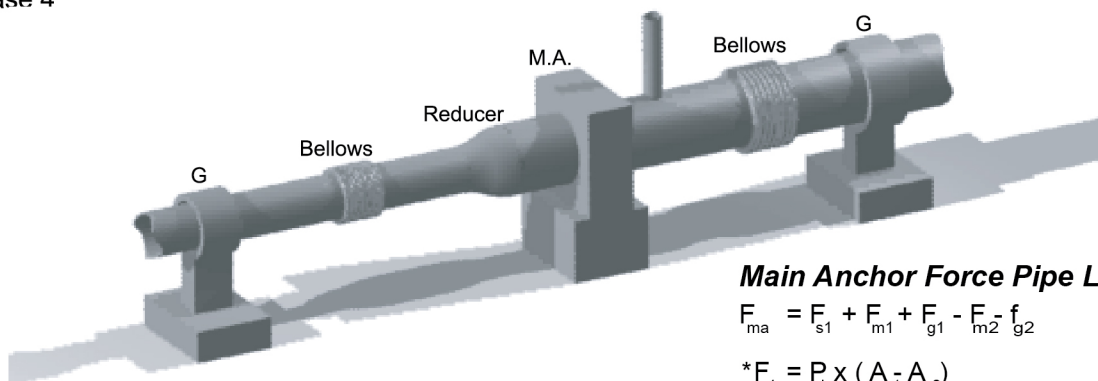
**Main Anchor Loading Force**

$$F_{ma} = F_s + F_m + F_g$$

$$*F_s = P_d \times A_e$$

Case of Installation : Expansion Joint at the entrance of a side branch piping.

Case 4



**Main Anchor Force Pipe Line Reduce**

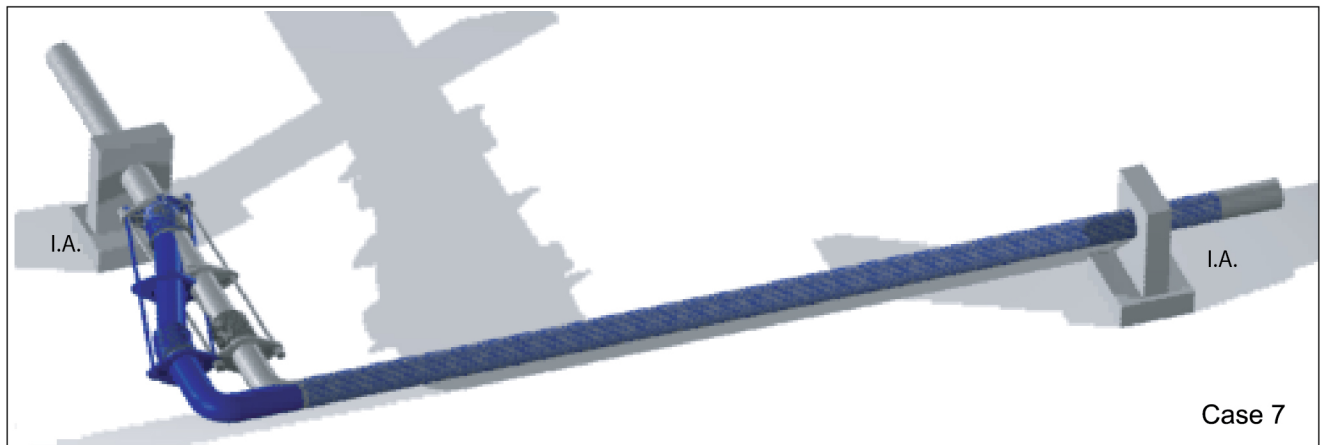
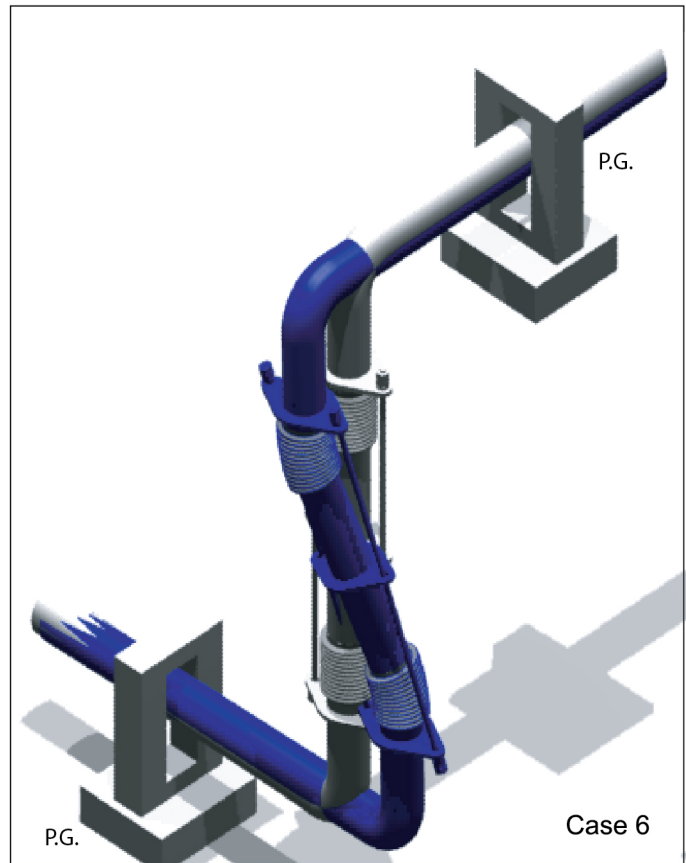
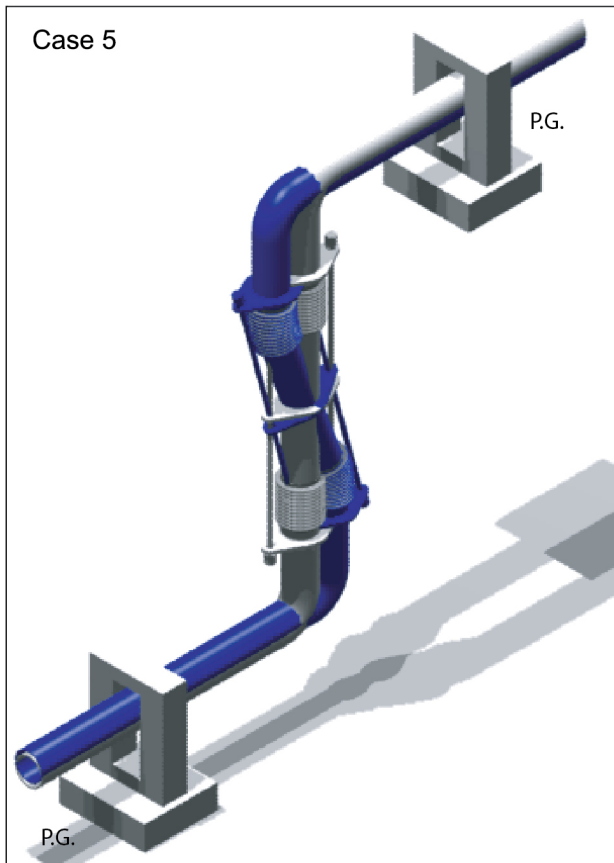
$$F_{ma} = F_{s1} + F_{m1} + F_{g1} - F_{m2} - f_{g2}$$

$$*F_{s1} = P_d \times (A_{e1} - A_{e2})$$

Case of Installation : Expansion Joint between two pipes of different sizes in straight line.



The following system have no main anchor and have free area for displacement.



### Definitions

|          |   |
|----------|---|
| $F_{ma}$ | = Main Anchor Force                                 |
| $F_{IA}$ | = Intermediate Anchor Force                         |
| $F_S$    | = Force due to internal pressure                    |
| $F_m$    | = Force due to Joint deflection                     |
| $F_{m1}$ | = Force due to Joint deflection, large pipe section |
| $F_{m2}$ | = Force due to Joint deflection, small pipe section |
| $F_g$    | = Friction force of pipe guide                      |
| $F_{g1}$ | = Friction force of pipe guide, large pipe section  |
| $F_{g2}$ | = Friction force of pipe guide, small pipe section  |

|          |   |
|----------|---|
| $P_d$    | = Design pressure                               |
| $A_e$    | = Effective area of Bellows                     |
| $A_{e1}$ | = Effective area of Bellows, large pipe section |
| $A_{e2}$ | = Effective area of Bellows, small pipe section |
| I.A.     | = Intermediate Anchor                           |
| M.A.     | = Main Anchor                                   |
| P.G.     | = Planar Pipe Guide                             |
| G        | = Pipe Guide                                    |



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