

SJT series

METAL EXPANSION JOINT

FEATURES

- Bellows Expansion Joints are employed in piping systems to absorb differential thermal expansion while containing the system pressure.
- Size is available from 25A (1") to 4000A (160").
- Typical working pressure varies from full vacuum to 1000 psig (66 bar) and temperature from -420°F (-215°C) to 1800°F (982°C) that refer from EJMA Organization.
- Standard design of movement and material maximizes the productivity while the custom design maximizes the suitability for special applications.
- Computer designed bellows element complies with EJMA criteria.
- All products are tested before delivery according to relevant code or ISO quality control system.

APPLICATION

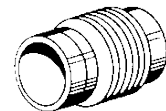
- Bellows type metal Expansion Joints are successfully utilized in refineries, chemical plants, fossil and nuclear power systems, heating and cooling system, and cryogenic plants.

DEFINITION & TYPE OF EXPANSION JOINT

EXPANSION JOINT is any device containing one or more bellows used to absorb dimensional changes, such as those caused by thermal expansion or contraction of a pipeline, duct or vessel.

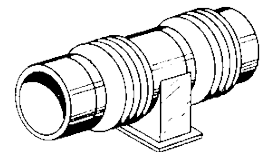
SINGLE EXPANSION JOINT

The simplest form of Expansion Joint, of single bellows construction, for the purpose of absorbing any combination of the three basic movements of the pipe section in which it is installed.



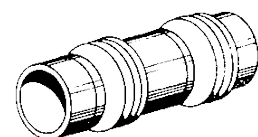
DOUBLE EXPANSION JOINT

A double Expansion Joint consists of two bellows joined by a common connector which is anchored to some rigid part of the installation by means of an anchor base. The anchor base may be attached to the common connector either at installation or at time of manufacture. Each bellows acts as a single Expansion Joint and absorbs the movement of the pipe section in which it is installed independently of the other bellows. Double Expansion Joints should not be confused with universal Expansion Joints.



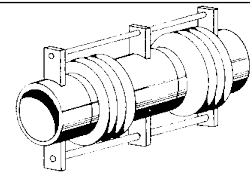
UNIVERSAL EXPANSION JOINT

A universal Expansion Joint is one containing two bellows joined by a common connector for the purpose of absorbing any combination of the three basic movements: axial movement, lateral deflection and angular rotation. Universal Expansion Joints are usually furnished with control rods to distribute the movement between the two bellows of the Expansion Joint and stabilize the common connector. This definition does not imply that only a universal Expansion Joint can absorb combined movement.



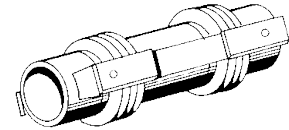
UNIVERSAL TIED EXPANSION JOINT

The tied universal Expansion Joints are used when it is necessary for the assembly to eliminate pressure thrust forces from the piping system. In this case the Expansion Joint will absorb lateral movement and will not absorb any axial movement external to the tied length.



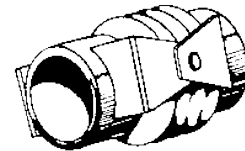
SWING EXPANSION JOINT

A swing Expansion Joint is one containing two bellows joined by a common connector designed to absorb lateral deflection and/or angular rotation in one plane. Pressure thrust and extraneous forces are restrained by the use of a pair of swing bars, each of which is pinned to the Expansion Joint ends.



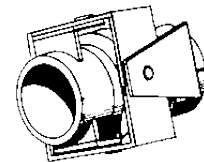
HINGED EXPANSION JOINT

A hinged Expansion Joint contains one bellows and is designed to permit angular rotation in one plane only by the use of a pair of pins through hinge plates attached to the Expansion Joint ends. The hinges and hinge pins must be designed to restrain the thrust of the Expansion Joint due to internal pressure and extraneous forces, where applicable. Hinged Expansion Joints should be used in sets of two or three to function properly.



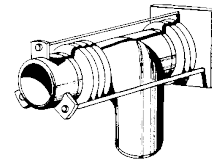
GIMBAL EXPANSION JOINT

A gimbal Expansion Joint is designed to permit angular rotation in any plane by the use of two pairs of hinges affixed to a common floating gimbal ring. The gimbal ring, hinges and pins must be designed to restrain the thrust of the Expansion Joint due to internal pressure and extraneous forces, where applicable.



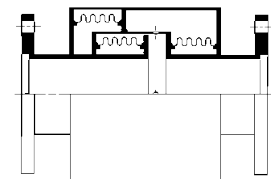
PRESSURE BALANCED EXPANSION JOINT

A pressure balanced Expansion Joint is designed to absorb axial movement and/or lateral deflection while restraining the pressure thrust by means of tie devices interconnecting the flow bellows with an opposed bellows also subjected to line pressure.



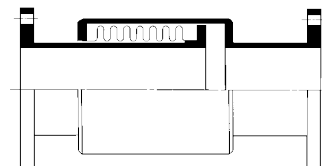
IN-LINE PRESSURE BALANCED EXPANSION JOINT

An in-line pressure balanced Expansion Joint is designed to absorb axial movement and/or lateral deflection while restraining the pressure thrust by means of tie devices interconnecting the line bellows with outboard compensating bellows also subjected to line pressure. Each bellows set is designed to absorb the axial movement and usually the line bellows will absorb the lateral deflection. This type of Expansion Joint is used in a straight run of piping.



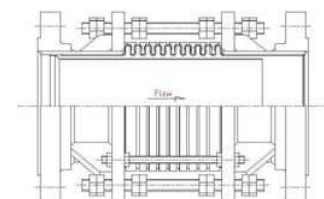
EXTERNAL PRESSURIZED EXPANSION JOINT

The external pressurized Expansion Joint is designed so that the pressure is external to the bellows whilst the inside is at atmospheric pressure and it has many convolutions to allow a large amount of axial movement. But under external pressure the bellows will retain its shape completely stable. Besides external pressurized bellows is protected from external damage by a heavy wall shroud and is isolated from flow impingement by an internal sleeve.

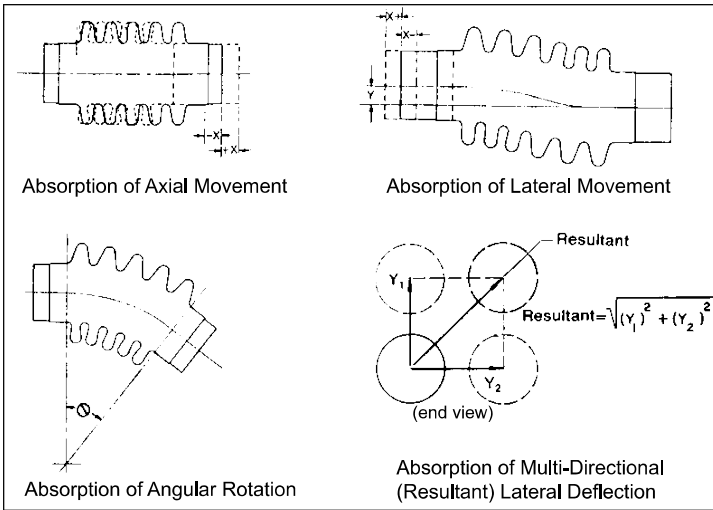


EXPANSION JOINT WITH REINFORCING RING

Devices used on some expansion joints fitting snugly in the roots of the convolutions. The primary purpose of these devices is to reinforce the bellows against internal pressure. Equalizing rings are made of cast iron, steel, stainless steel or other suitable alloys and are approximately "T" shaped in cross section. Reinforcing or roots rings are fabricated from tubing or solid round bars of carbon steel, stainless steel or other suitable alloys.



MOTION

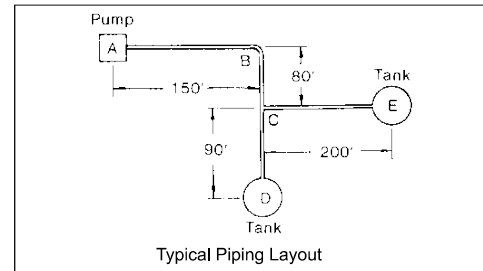


Note : Expansion Joint is not suitable for torsion or twisting movement, because such movement produces extremely high shear stresses in the bellows.

SYSTEM PREPARATION

1) Simplify the system

Survey piping system and major equipment such as turbines, pumps, compressors, fan, etc. Check the length of piping which will expand to the system.



2) Calculating thermal growth

Determining thermal movement.

$\beta\Delta t$ (Unit : mm)

Temperature changes °C	Carbon Steel SGP, STPG, STPT, STPY, STPA22 less than 3CrMo	Alloy Steel 5 CrMo to 9 CrMo	Austenitic Stainless Steel 18Cr8Ni	Copper (CuZn)	Aluminium
-198	-1.782	-1.675	-2.905	-2.922	-3.530
-180	-1.651	-1.553	-2.668	-2.675	-3.267
-160	-1.496	-1.410	-2.398	-2.397	-2.965
-140	-1.334	-1.259	-2.122	-2.111	-2.646
-120	-1.165	-1.100	-1.840	-1.824	-2.312
-100	-0.991	-0.937	-1.549	-1.532	-1.965
-80	-0.808	-0.762	-1.254	-1.249	-1.608
-60	-0.617	-0.581	-0.953	-0.954	-1.234
-40	-0.419	-0.394	-0.642	-0.647	-0.839
-20	-0.212	-0.200	-0.323	-0.327	-0.426
0	0.000	0.000	0.000	0.000	0.000
20	0.218	0.206	0.328	0.336	0.441
40	0.442	0.418	0.660	0.679	0.894
60	0.673	0.637	0.997	1.032	1.363
80	0.909	0.862	1.338	1.394	1.846
100	1.153	1.091	1.684	1.762	2.332
120	1.400	1.321	2.032	2.124	2.832
140	1.653	1.554	2.381	2.510	3.333
160	1.917	1.792	2.734	2.894	3.843
180	2.178	2.034	3.091	3.280	4.361
200	2.448	2.278	3.450	3.676	4.886
220	2.724	2.528	3.810	4.077	5.421
240	3.002	2.784	4.174	4.486	5.959
260	3.286	3.042	4.540	4.901	6.505
280	3.576	3.304	4.911	5.317	7.062
300	3.870	3.573	5.286	5.742	7.626
320	4.173	3.843	5.661	6.170	8.179

$\Delta X = L \times \beta\Delta t$

ΔX = Axial Movement (mm)

L = Length of piping (metre)

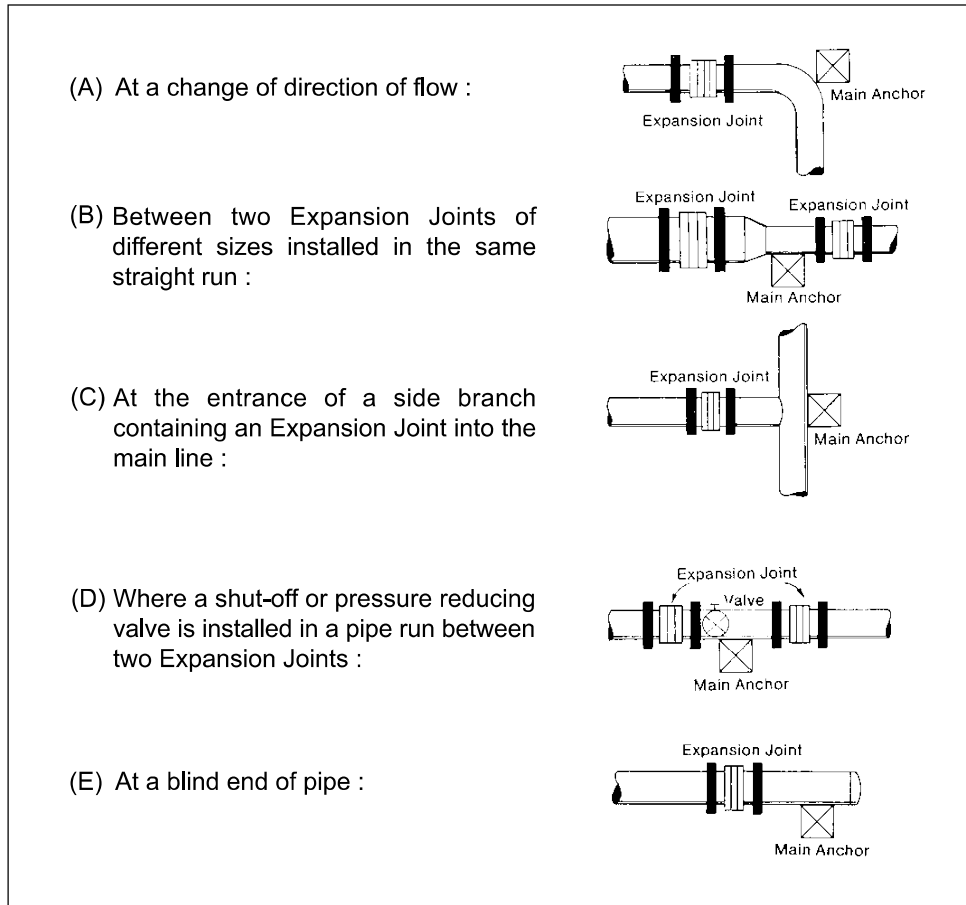
$\beta\Delta t$ = Thermal Expansion by one metre (mm/m)

3) Pipe anchors and forces

Must be designed to withstand all of the forces acting upon them. Two significant forces which are unique of Expansion Joint system are spring force and pressure thrust force.

● **Main Anchors**

Must be designed to withstand the forces and movements imposed upon it by each of the pipe sections to which it is installed. In systems containing Expansion Joint , main anchors are installed at any of the following locations.

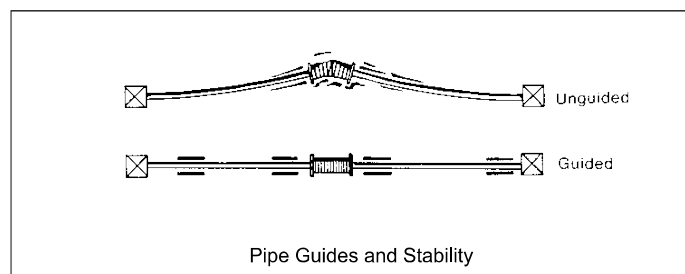


● **Intermediate Anchors**

are not intended to withstand pressure thrust force, but it withstands all of the non-pressure forces such as spring forces and frictional forces in pressure balanced or double Expansion Joint.

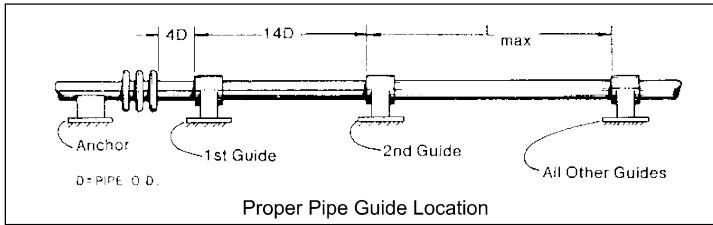
● **Pipe Guide and Support**

Pipe Guides are necessary to insure proper alignment of movement to the Expansion Joint and to prevent buckling of the line.



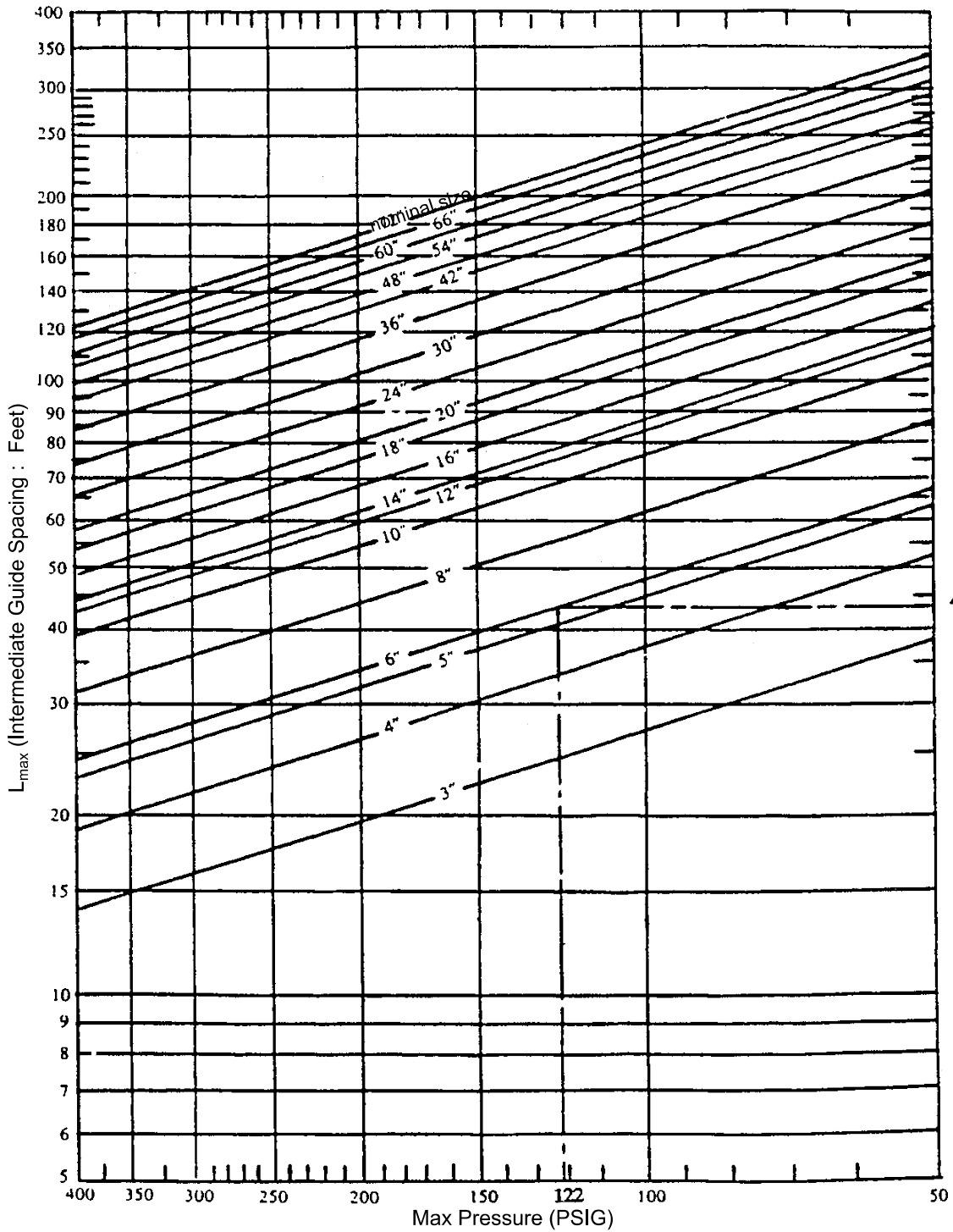
● **Pipe Guide Application**

Generally recommended that the Expansion Joint is located near an anchor, and any other guides should determine the position like below figure.



D = Nominal diameter of pipe

L_{max} = see below graph



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