

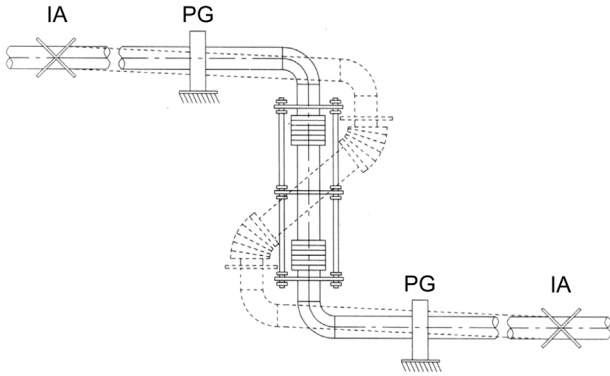
# PREFACE - RESTRAINED BELLOWS EXPANSION JOINTS

## RESTRAINED EXPANSION JOINTS

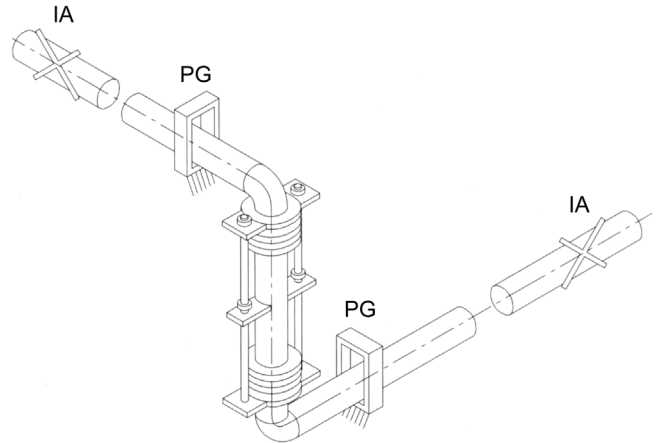
Restrained expansion joints are normally designed to contain the loadings due to end thrust without any change in length by means of tie bars or hinges. Therefore the loads imposed on system anchors are considerably lower than for unrestrained type expansion joints as the internal pressure thrust produced by expansion joints is retained by the integral bracketry.

Consequently, most types of restrained expansion joints are unable to absorb axial movements imposed by the system. Flexibility must therefore be provided by means of angular or lateral deflection. In order to absorb these types of movements it is necessary to take advantage of any changes in direction in the pipe run to position restrained expansion joints at right angles to the direction of movement.

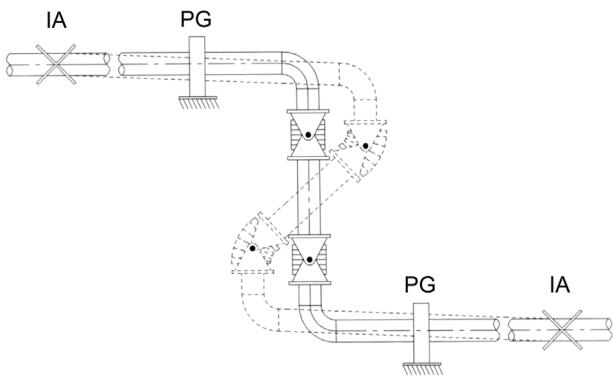
Shown below are typical examples of restrained expansion joint applications. Note the use of *intermediate anchors & planar guiding*.



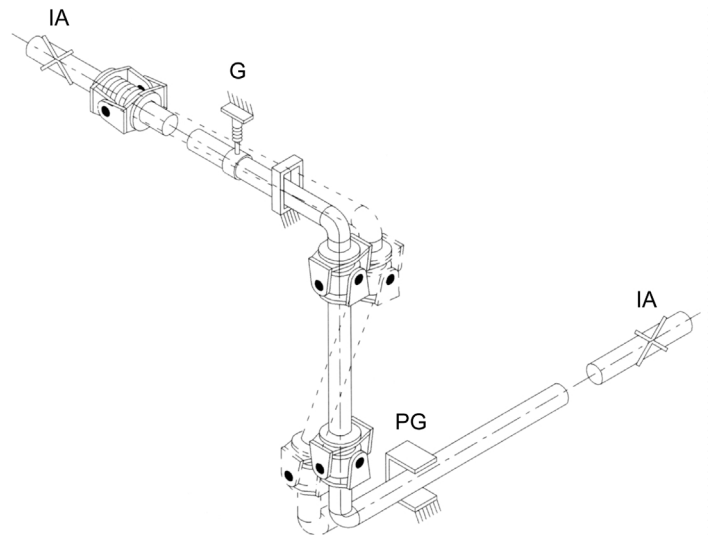
DTF type expansion joint in a single-plane Z bend



DTF type expansion joint in a three-plane Z bend



SHF type two hinge system in a single Z plane



SHF & SGF type 3 pin multi plane system

## DEFINITION OF TERMS

**Intermediate Anchor** One that must withstand the bellows thrust due to flow, spring forces, and all other piping loads, but not the thrust due to pressure.

**Planar Guide** One that permits transverse movement and/or bending of the pipeline in one plane.

## BENEFITS OF USING RESTRAINED EXPANSION JOINTS

Although the initial outlay of restrained joints seems excessive compared to the cost of unrestrained expansion joints, primarily due to more complex design, savings can be seen with the reduced number of bellows, pipe guides and the strength of anchors required with restrained systems. Additionally restrained systems are far safer by design and will allow installations at high level.