ONYX VALVE CO Expansion Joints
Installation & Maintenance

STORAGE

Correct storage extends expansion joint life. The rubber sleeve is perishable. Ideal storage conditions are 50˚F and 60% relative humidity.

1. Keep expansion joints as cool as possible. They can be stored in an unheated area, but allow maximum ventilation in storage areas subject to high ambient summer temperatures. Truck trailers and storage sheds become incredibly hot during summer months. Avoid such locations.

2. Avoid ozone. DO NOT STORE expansion joints near active electrical equipment. For long term storage, coat the face and inside the sleeve with silicone spray or liquid.

INTRODUCTION

It can be stated generally that the proper location of rubber expansion joints is close to a main anchoring point. Following the joint in the line, a pipe guide or guides, should be installed to keep the pipe in line and prevent undue displacement of this line. This is the simplest application of a joint, namely, to absorb the expansion and contraction of a pipeline between fixed anchor points.

A. ANCHORING AND GUIDING THE PIPING SYSTEM:

A.1. Anchors are required: Figure 1 illustrates a simple piping system. In all cases, solid anchoring is provided wherever the pipeline changes direction and the expansion joints in that line are located as close as possible to those anchor points. In addition, following the expansion joints, and again as close as is practical, pipe guides are employed to prevent displacement of the pipeline. It should be pointed out that the elbows adjacent to the pump are securely supported by the pump base so that no piping forces are transmitted to the flanges of the pump itself. Anchors shown at the 90° and the 45° bend in the pipeline must be solid anchors designed to withstand the thrust developed in the line together with any other forces imposed on the system. at this point.

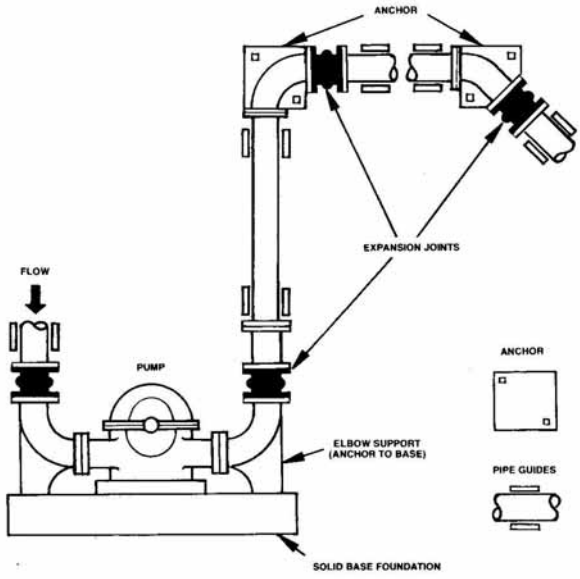
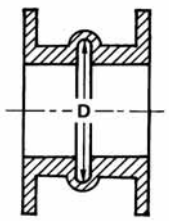


Figure 1

A.2. Calculation of Thrust: When expansion joints are installed in the pipeline the static portion of the thrust is calculated as a product of the area of the I.D.of the arch of the expansion joint times the maximum pressure (design or test) that will occur within the line. The result is a force expressed in pounds.



$$Thrust\left(lb_f\right)=\left(\frac{D}{2}\right)^2 * \Pi * Press\left(psi\right)$$

A.3. Branch Connection Anchors: Figure 2 is another illustration of the proper anchoring that should be provided in a line with a branch connection. The anchor shown at the Tee and elbow connections must be designed to withstand both the thrust

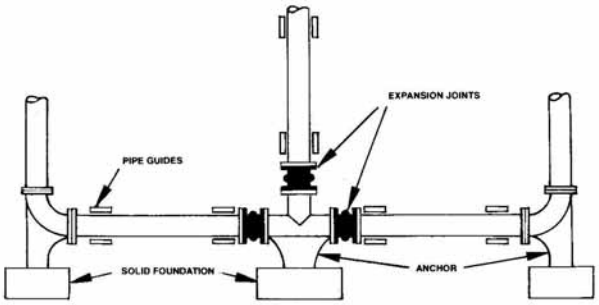


Figure 2

and any other forces imposed on the system at these points. Again, emphasis is placed on the relative location of the joints, their anchoring points and the pipe guides.

B. CONTROL RODS UNIT:

B.1. Definition And Purpose: A control rods unit is a system of two or more control rod (tie rod) assemblies placed across an expansion joint from flange to flange to minimize possible damage to the expansion joint caused by excessive motion of the pipeline. This excessive motion could be caused by the failure of an anchor or some other piece of equipment in the pipeline. Figure 3 shows the proper assembly of an expansion joint with control rods unit details. The control rod assemblies are set at the maximum allowable expansion and/or contraction of the joint and will absorb the static pressure thrust developed at the expansion joint. When used in this manner, they are an additional safety factor, minimizing possible failure of the expansion joint and possible damage to the equipment. Control rods units will adequately protect the joints but the user should be sure that pipe flange strength is sufficient to withstand total force that will be encountered. The term "Control Rods Unit" is synonymous with the term "Tie Rod" as defined by the Standards of the Expansion Joint Manufacturer's Association (EJMA).

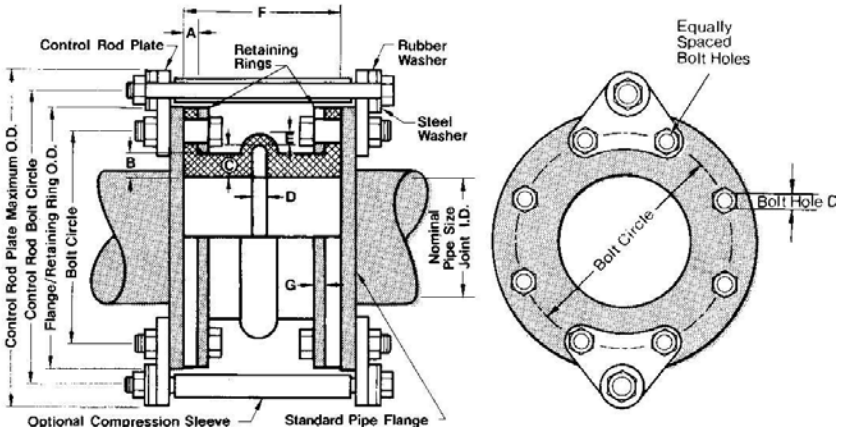


Figure 3

B.2. Use in Restraining the Piping System: Control rods units may be required to compensate for both extension and compression movements.

B.2.A. Extension: Control rods units must be used when it is not feasible in a given structure to provide adequate anchors in the proper locations. In such cases, the static pressure thrust of the system will cause the expansion joint to extend to the limit set by the control rods which will then preclude the possibility of further motion that would tend to lengthen the joint. Despite the limiting action that control rods have on the joint, they must be used when proper anchoring cannot be provided. It cannot be emphasized too strongly that rubber expansion joints, by virtue of their function are not designed to take end thrusts and, in all cases where such are likely to occur, proper anchoring is essential. If this fact is ignored, premature failure of the expansion joint is a foregone conclusion.

8.2.8. Compression: Pipe sleeves can be installed over the control rods. The purpose of these sleeves is to prevent excessive compression in the expansion joint. The length of this pipe sleeve should be such that the expansion joint cannot be compressed beyond the maximum allowable compression figure stated by the manufacturer.

8.3. Number of Control Rods: For control rods unit dimensional specifications see Table 1. These specifications

Table 1
Max Surge or Test press, psi

Nominal Joint size	Number of control Rods				
	2	3	4	6	8
1/2	1300				
3/4	1100				
1	950				
1-1/4	800				
1-1/2	500				
2	660				
2-1/2	530				
3	440				
4	310	460	620		
5	235	350	470		
6	185	275	370		
8	160	240	325		
10	160	240	325	485	
12	160	240	320	480	
14	110	165	230	335	
16	113	170	225	340	450
18	90	140	180	280	375
20	75	115	150	235	315
24	74	110	145	220	290
30	70	105	140	210	280
36	65	100	130	205	275

Note: This table refers to control rod requirements only and does not imply that all joints can operate to these limits. Check individual catalogue pages for the actual pressure ratings.

are recommended for standard construction type expansion joints. The exact number of control rods should be selected on the basis of the actual Design/Test pressure the system.

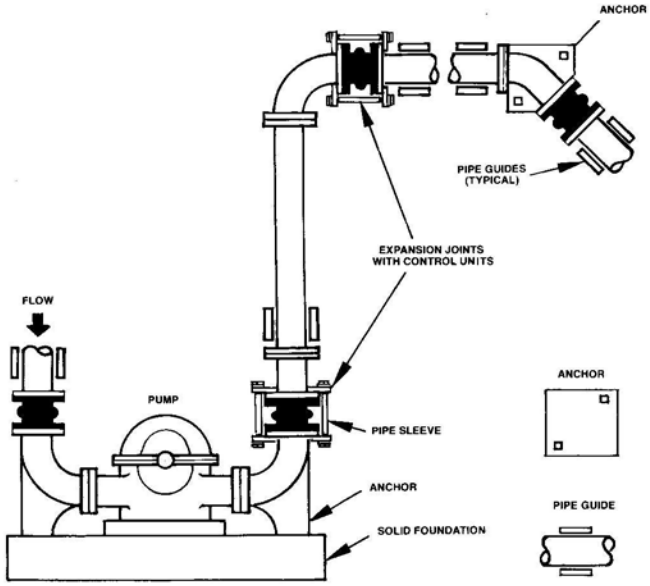


Fig 4

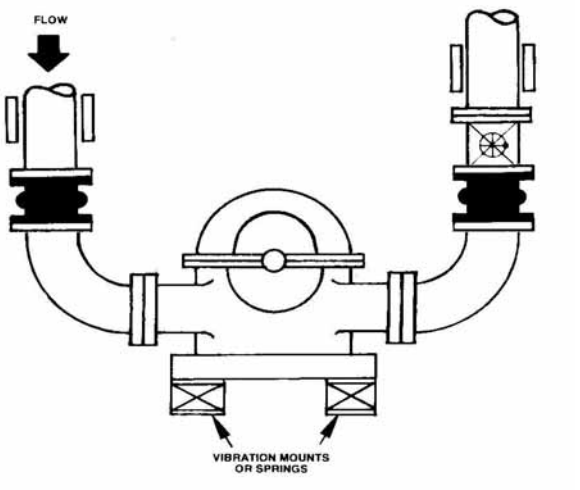


Fig 5

8.4. Illustration of the Use of Control Rods Units. Figure 4 demonstrates the type of piping connections that must be used in the event it is impossible to employ anchoring. The anchor point at the upper 90° elbow in the discharge line has been eliminated. (Compare to Figure 1). In this situation, it is necessary to employ properly designed control rods units with the joints located in this non-anchored line. Without the use of these control rods units, the pipeline between the pump and the anchor at the 45° bend would be severely displaced due to elongation in the flexible rubber expansion joint. This elongation would proceed until the joints rupture. The use of control rods units in this case permits expansion of the pipeline in both the vertical and horizontal direction between the pump and the anchor at the 45° bend. However, it does preclude the possibility of contraction in these respective lines as the further extension of the expansion joint is impossible because of the control rods units.

OTHER INSTALLATIONS

C.1. Vibration Mounts Under Foundation: Figure 5 shows a very common pump installation. Instead of being mounted on a solid foundation, the pump is supported off the floor on vibration mounts. There is nothing wrong with this type of installation, however, the supplier of the vibration mounts should be made aware of the fact that these mounts must be designed not only to support the weight of the pump with its motor and base, but must also absorb the vertical thrust that occurs in both the suction and discharge lines. It should also be noted that the thrust in the respective pipelines will exert a force on the inlet and outlet flanges of the pump and the pump manufacturer should be contacted to determine whether or not the pump casing is strong enough to withstand this force. If this is not done, it is very possible that this force can be large enough to crack the connecting flanges

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D. INSTALLATION AND MAINTENANCE:

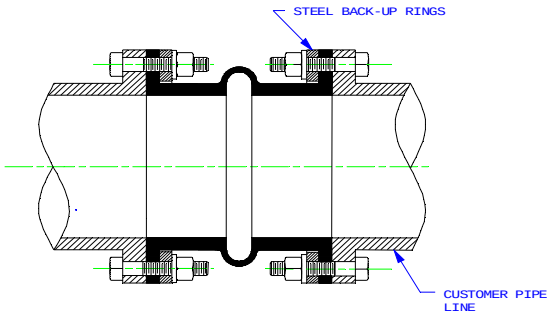
Inspect joint before installation. Report any shipping damage immediately. DO NOT INSTALL AN EXPANSION JOINT KNOWN TO HAVE BEEN DAMAGED IN SHIPMENT.

D.1. Alignment: Pipelines containing standard expansion joints should be lined up accurately before installing the joints. If the joints are to be installed with appreciable initial misalignment, compression or elongation, the amount of these deflections should be deducted from the specified allowable movements of the joint. If the total joint deflection due to initial installation and the movement of the pipeline during system operation exceeds the published maximum allowable movement, then the pipeline should be altered to reduce the initial installation deflections. Alternately the pipe may be anchored in some approved manner to limit the pipe movements that the expansion joint must absorb.

D.2. Excess Temperatures and Pressures: Expansion joints should never be subject to operating conditions beyond the pressure and temperature limits recommended by the manufacturer.

D.3. Care Of Outside Cover: Any damage to the outside protective cover of an expansion joint should be repaired before placing the joint in service. This protective cover is designed to keep harmful materials from penetrating the carcass of the joint.

D.4. Mating Flanges: Be sure that companion flange faces are clean and free from sharp edges. Onyx expansion joints are designed to work with standard ANSI 150# (or 300# optional) **flat face** flanges. No gasket is required; the rubber sleeve *is* the gasket. Be careful when using Victaulic type flanges, as the grooving equipment will sometimes leave a sharp edge on the inside corner of the flange which can cut the rubber sleeve. Grind or file any sharp edges smooth prior to attaching the expansion joint. Expansion joints are designed to work with ANSI standard (NOT heavy) hex head bolts and nuts.



D.5. Flange Face Lubricant: Applying a thin film of graphite, glycerin, or silicone oil to the flange faces will prevent the rubber sleeve from sticking to the mating flange, which will facilitate future removal if required.

D.6. Bolting: Tighten bolts by alternating around the flange in a star pattern. Tighten all bolts equally. The bolts are not considered tight until the outer edge of the expansion joint flange bulges slightly. Check bolt tightness a week after initial installation, as the rubber can take a “set” after sitting under tension for a while, causing the bolts to work loose allowing the flange to leak. Check bolt tightness after substantial temperature changes.

D.7. Insulation: When insulation is used over the pipeline adjacent to a rubber expansion joint, the insulation of the expansion joint is NOT a recommended practice. However, if insulation is required, it should be made removable to

permit easy access to the flanges. This facilitates periodic inspection of the tightness of joint bolting.

D.8. Care When Welding: Welding operations should not be performed in the vicinity of a rubber expansion joint due to the possibility of damage to the joint.

D.9. Underground Installation: When expansion joints are installed underground, contact the manufacturer for proper back fill procedure. An expansion joint protective cover should be used.

Questions?

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