RECOMMENDATION FOR ELIMINATION OF LEAD FILLING IN TARGET FLANGES

TECHNICAL REPORT TR1201

Association of Well Head Equipment Manufacturers
Post Office Box 1166
Bellaire, Texas 77401

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AWHEM

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ELIMINATION OF LEAD FILLING

IN TARGET FLANGES

ISSUED BY:

ASSOCIATION OF WELL HEAD
EQUIPMENT MANUFACTURERS
POST OFFICE BOX 1166 · BELLAIRE, TEXAS 77401

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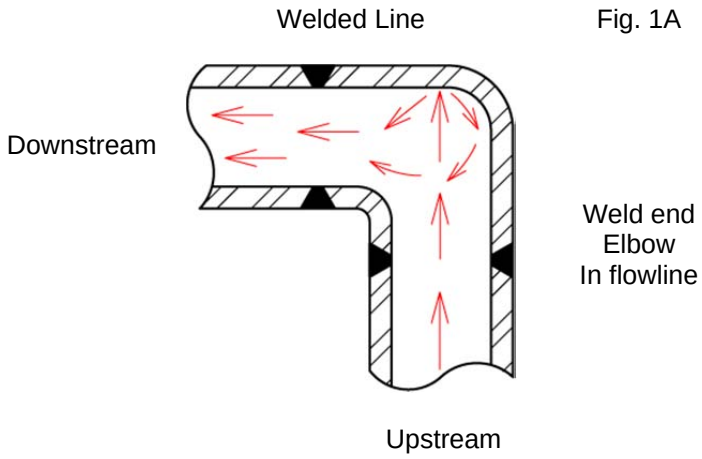
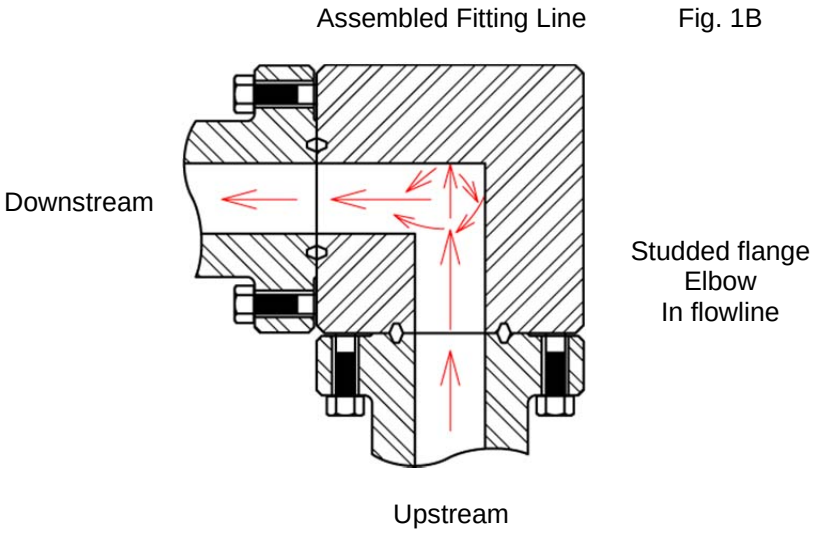
1. Purpose

   This document shall demonstrate the absence of need for lead filled Target Flanges used in high-pressure manifold systems.

2. Example of Worst Case

   When manifolding containing flowing fluid under pressure makes an abrupt 90° elbow turn, the downstream wall of the turn presents a “target” to the fluid flow. High speed, high pressure fluid will erode the downstream wall of the elbow as it “blasts” against the wall. Such an elbow can experience complete wash-out through this wall. See illustrations below:



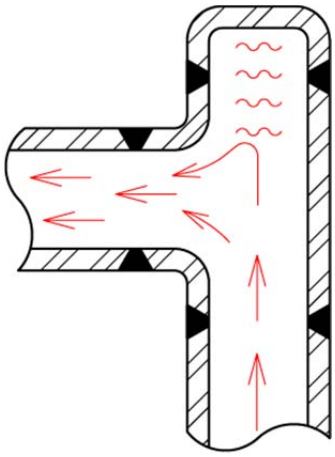


3. Example of Pressure Lines with Cushions, but no Target Flanges

Designers of piping and manifold systems may reduce the likelihood of erosion in such 90° turns by providing a cushion where the fluid blast would normally encounter the wall.

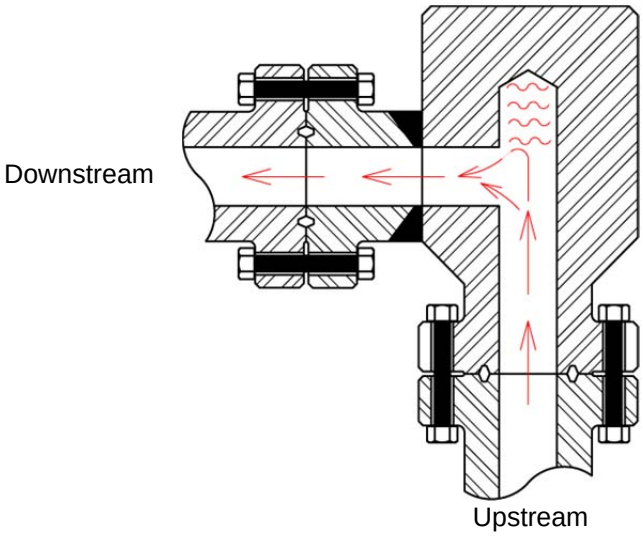
Welded Line

Fig. 2A



Weld end elbow made from a welded tee with one end of the run blanked off, leaving a "cushion" space below the outlet branch-off.

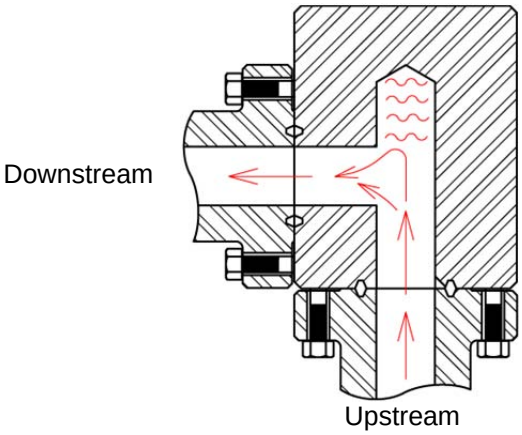
Assembled Fitting Line, Fig. 2B



Flanged elbow in flowline.

The elbow, made with extra length, has a cushion cavity

Assembled Fitting Line, Fig. 2C

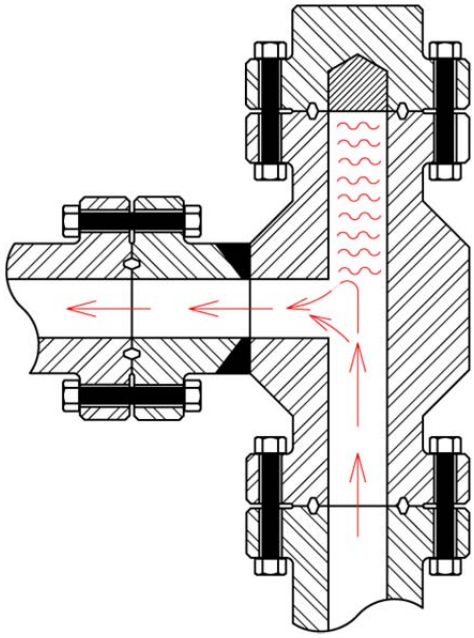


Studded flange elbow in flowline.

The elbow, made with extra length, has a cushion cavity

4. Example of Pressure Line with Lead Filled Target Flanges

Assembled Fitting Line, Fig. 3A

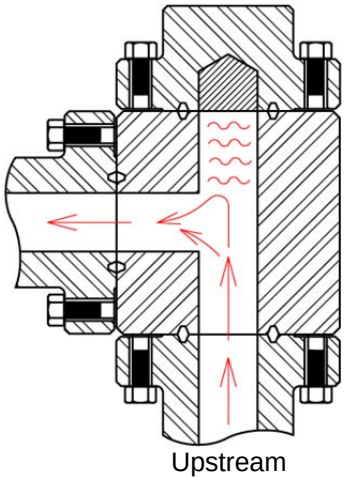


Flanged tee in flowline.

The end of the tee run closed with a lead filled target flange.

(Note the cushion before the target flange)

Assembled Fitting Line, Fig. 3B



Studded flange tee in flowline.

The end of the tee run closed with a lead filled target flange.

(Note the cushion before the target flange)

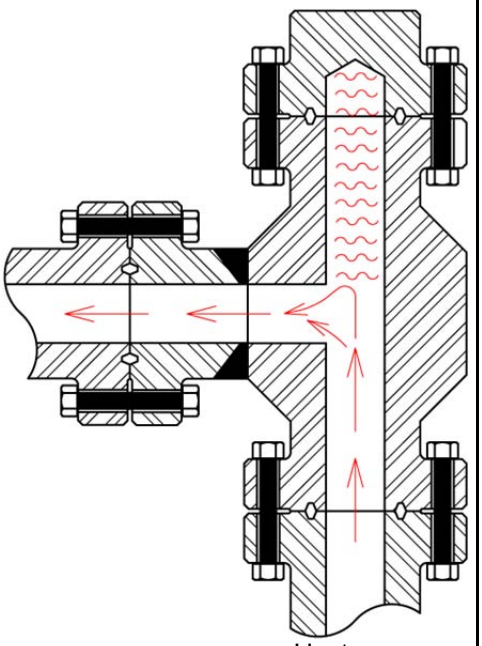
Some believe that lead filling of the cavity (counter bore) of a target flange provides resistance to the cutting force of high velocity abrasive fluid that may pass through a manifold system during a well control event.

Caution: A problem can occur if the lead filling in the cavity of a target flange escapes the cavity and moves into the flow bore blocking the flow.

The use of a “Target Flange” assumes a place to put the flange facing the flow of fluid, but the placement of the “Target Flange” requires a fitting with an outlet requiring closure. Such a fitting, by its configuration, will always provide a cushion space within its body. All of the following illustrations will demonstrate this fact.

5. Example of Pressure Lines with Cushion Target Flanges

Assembled Fitting Line, Fig. 4A

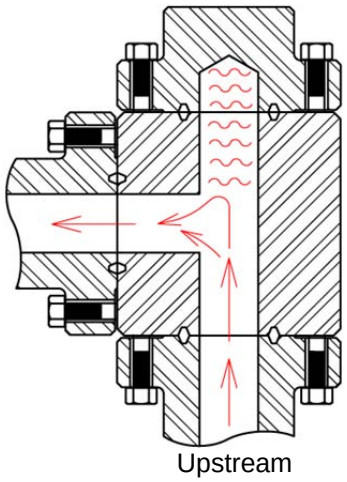


Flanged tee in flowline.

The end of the tee run closed with a cushion flange (flange has a counterbore cavity).

(Note the cushion before the cushion flange)

Assembled Fitting Line, Fig. 4B



Studded flange tee in flowline.

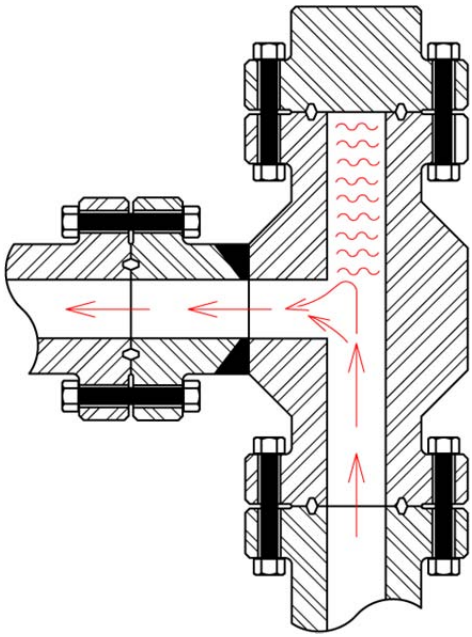
The end of the tee run closed with a cushion flange (flange has a counterbore cavity).

(Note the cushion before the cushion flange)

6. Example of Pressure Lines with Internal Cushion Space and Blind Flanges

Assembled Fitting Line, Fig. 5A

Downstream



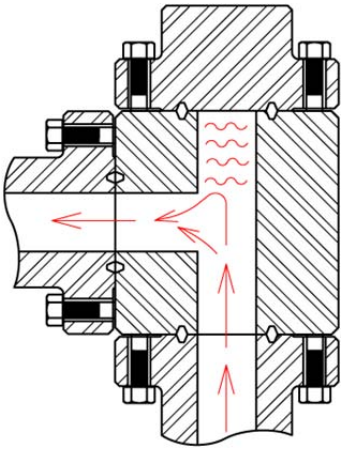
Flanged tee in flowline.

The end of the run closed with a conventional blind flange. The cavity before the blind flange provides a fluid filled cushion below the outlet branch-off.

(Note the cushion before the blind flange)

Assembled Fitting Line, Fig. 5B

Downstream



Studded flange tee in flowline.

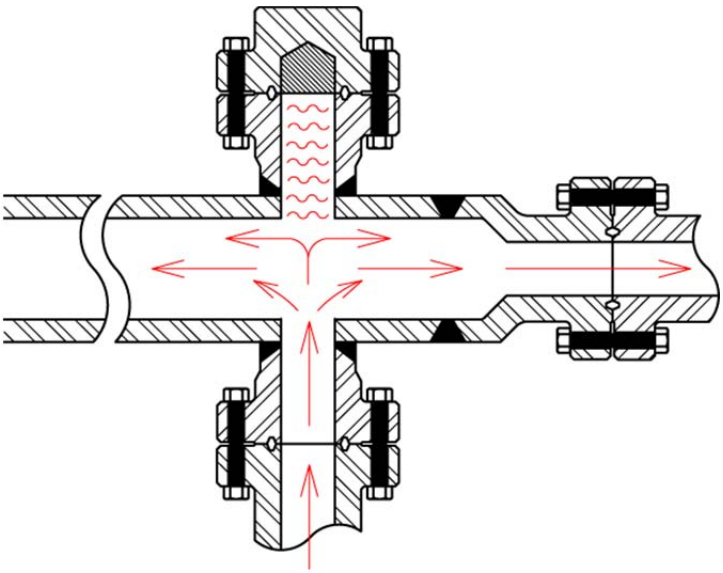
The end of the run closed with a conventional blind flange. The cavity before the blind flange provides a fluid filled cushion below the outlet branch-off.

(Note the cushion before the blind flange)

7. Example of Lead Filled Target Flange and Cushion Flange closing a Manifold Buffer Chamber

Target flange opposite the fluid blast on a Buffer Chamber

Assembled Buffer Chamber, Fig. 6A

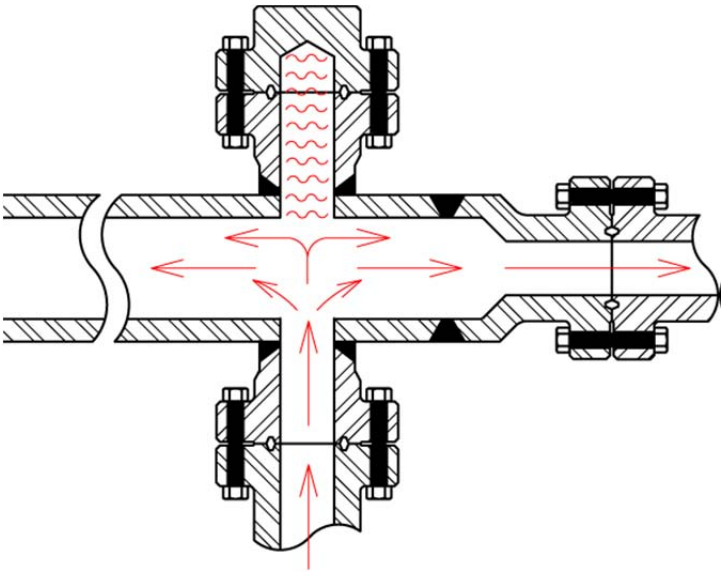


Discharge line to "Gas Buster", pit, etc.

Incoming line from choke
(Note the cushion before the target flange)

Target flange opposite the fluid blast on a Buffer Chamber

Assembled Buffer Chamber, Fig. 6B



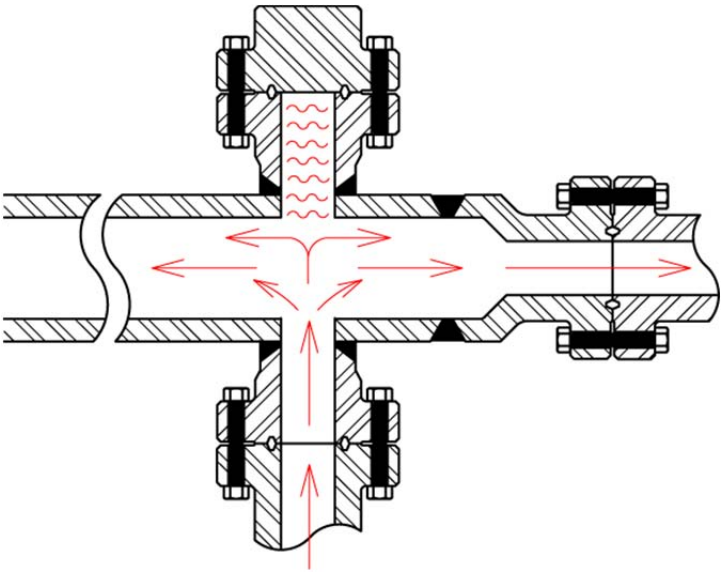
Discharge line to "Gas Buster", pit, etc.

Incoming line from choke
(Note the cushion before the cushion flange)

8. Examples of Internal Cushion Space and Blind Flange closing Manifold Buffer Chamber

Target flange opposite the fluid blast on a Buffer Chamber

Assembled Buffer Chamber, Fig. 7A



Discharge line to "Gas Buster", pit, etc.

Incoming line from choke
(Note the cushion before the blind flange)

9. Conclusion and Recommendation

An empty fluid cushion cavity in a manifold system appears to work just as well as a cavity filled with lead. When the system designer has provided a fluid cushion below the turn, we have never observed erosion on used flanges with or without a cavity and with or without lead filling.

In the examples shown above, of studded face and open face connected equipment, conventional blind flanges will work as well as cushion flanges or lead filled target flanges.

In the interest of health and safety in the short run, and avoidance of introducing excessive lead into our future steel scrap pool, AWHEM recommends discontinuance of lead filling of flange cavities and relying instead on the common practice of having a "cushion" cavity below (or in the direct path of the fluid blast) for all 90° abrupt turns in high pressure manifold systems.