

# Gas Industry Standard

GIS/P16:2020

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Specification for

## The Dimensions and Applications of Standard Weld End Preparations for Steel Pipe Fittings and Valves

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## Contents

Foreword	ii
Mandatory and non-mandatory requirements	ii
Disclaimer	ii
Brief history	iii
1. Scope	1
2. Normative references	1
3. Terms and Definitions	1
4. Conformance	1
5. Dimensions and Applications	1
6. Precautions for the use of Transition Pieces	3
7. Other Applications	3

## Foreword

Gas Industry Standards (GIS) are revised, when necessary, by the issue of new editions. Users should ensure that they are in possession of the latest edition. Contractors and other users external to Gas Transporters should direct their requests for copies of a GIS to the department or group responsible for the initial issue of their contract documentation.

Comments and queries regarding the technical content of this document should be directed in the first instance to the contract department of the Gas Transporter responsible for the initial issue of their contract documentation.

This standard calls for the use of procedures that may be injurious to health if adequate precautions are not taken. It refers only to technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage.

Compliance with this engineering document does not confer immunity from prosecution for breach of statutory or other legal obligations.

## Mandatory and non-mandatory requirements

For the purposes of a GIS the following auxiliary verbs have the meanings indicated:

**can** indicates a physical possibility;

**may** indicates an option that is not mandatory;

**shall** indicates a GIS requirement;

**should** indicates best practice and is the preferred option. If an alternative method is used then a suitable and sufficient risk assessment needs to be completed to show that the alternative method delivers the same, or better, level of protection.

## Disclaimer

This engineering document is provided for use by Gas Transporters and such of their contractors as are obliged by the terms of their contracts to comply with this engineering document. Where this engineering document is used by any other party, it is the responsibility of that party to ensure that the engineering document is correctly applied.

## Brief history

<p>First published as BGC/PS/P16</p> <p>Second update published</p> <p>Third update</p> <p>Fourth update</p> <p>Editorial update to reflect demerger</p> <p>November 2000</p> <p>Editorial update to reflect Safety case version 3 taking into account issues as detailed in comments below</p> <p>Additionally, compliance with mandatory terms along with removal of no specific normative phrases.</p> <p>Editorial update to comply with GRM</p> <p>Editorial update for National Grid re-branding</p> <p>Fifth update published</p> <p>Minor Editorial</p> <p>Reviewed, updated and published as a Gas Industry Standard</p>	<p>July 1985</p> <p>January 1995</p> <p>February 1995</p> <p>June 1995</p> <p>June 2001</p> <p>August 2004</p> <p>September 2004</p> <p>October 2005</p> <p>November 2010</p> <p>August 2011</p> <p>April 2020</p>	<p>EPSSG/AO4/10159</p>
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## 1. Scope

This Gas Industry Standard specifies the minimum requirements for standard weld end preparations for steel pipe, valves, fittings and pipe pups.

This standard does not preclude the use of other weld end preparations for specific situations if permitted by the codes and standards which are applicable at the time.

## 2. Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

### 2.1 British and European standards

BS 499-1, *Welding terms and symbols Part 1 – Glossary for welding, brazing, and thermal cutting*:

### 2.2 The American Society of Mechanical Engineers

ASME B 16.5, *Pipe Flanges and Flanged fittings*:

ASME B 31.3, *Process Piping*:

ASME B 31.8, *Gas Transmission and Distribution Piping systems*:

### 2.3 Manufacturers Standardization Society of the valve and Fittings industry, Inc.

MSS SP-44, *Steel Pipe line flanges*:

MSS SP-75, *Specification for High Test Wrought welds and Fittings*:

## NOTE

Where no date is shown, the latest edition of each standard and specification shall apply.

## 3. Terms and Definitions

For the purposes of this document, the definitions given in BS 499- 1 apply.

### 3.1 Contractor

The person, firm or company with whom a Gas Transporter enters into a contract to which this Standard applies, including the Contractor's personal representatives, successors and permitted assigns.

## 4. Conformance

### 4.1 Units of measurement

In this standard, for data expressed in both SI and USC units, a dot (on the line) is used as the decimal separator, and no comma or space is used as the thousands separator, in order to be consistent with other Gas Transporter specifications.

## 5. Dimensions and Applications

### 5.1 General

The dimensions of standard weld end preparations are given in Tables 1, 2, 3 and 4 and Figures 1, 2, 3 and 4. The applications of standard weld end preparations are given in clauses 5.2, 5.3, 5.4

and 5.6. A selection of standard weld end preparations is given in Table 5.

## **5.2 Normal weld end preparations**

**5.2.1** The dimensions for normal weld end preparations are given in Table 1 and Figures 1 a) and 1 b).

**5.2.2** Weld end preparations are for use on pipe, fittings or unpupped valves which are to be welded to pipe, fittings or valves of the same or greater nominal wall thickness, i.e.:

- a) for use on both sides of the joint where the nominal wall thicknesses to be joined are equal;
- b) for use on the thinner side of the joint where the nominal wall thicknesses to be joined are unequal.

## **5.3 Transition weld end preparations - pipe 250 mm nominal size and below for pigging**

**5.3.1** The dimensions for transition weld end preparations for pipe for pigging are given in Table 2 and Figure 2.

**5.3.2** The transition weld end preparations specified in this clause are for use on pipe which is to be welded to pipe with a smaller nominal wall thickness;

- a) for use on the thicker side of the joint where the pipes to be joined are of equal strengths;
- b) for use on the thicker and stronger side of the joint where the pipes to be joined have different strengths.

These weld end preparations apply only where the resultant pipeline is 250 mm nominal size and below and is subject to pigging operations.

These weld end preparations do not apply to fittings.

## **5.4 Transition weld end preparations for fittings, valves and pipe - equal outside diameter**

**5.4.1** The dimensions for transition weld end preparations for fittings and valves, and pipe not covered by 5.3, for welding to components of equal outside diameter, are given in Table 3 and Figures 3 a) and 3 b).

**5.4.2** The transition weld end preparations specified in this clause are for use on:

- a) pipe which is to be welded to pipe with a smaller nominal wall thickness and a greater specified minimum yield stress (i.e. for use on the thicker and weaker side of the joint).
- b) pipe which is to be welded to pipe with a smaller nominal wall thickness where the resultant pipeline or pipework, 250 mm nominal size and below, will not be subject to pigging operations (i.e. for use on the thicker side of the joint).
- c) fittings or unpupped valves which are to be welded to pipe with a smaller nominal wall thickness and the same outside diameter (i.e. for use on the thicker side of the joint).

## **5.5 Transition weld end preparations for fittings and valves - different outside diameters**

**5.5.1** The dimensions for transition weld end preparations for fittings and valves, for welding to components of smaller outside diameter, are given in Table 4 and Figures 4 a) and 4 b).



**5.5.2** The transition weld end preparations specified in this clause are for use on fittings or unpipped valves which are to be welded to pipe with a smaller nominal wall thickness and a smaller outside diameter (i.e. for use on the thicker side of the joint).

## **6. Precautions for the use of Transition Pieces**

**6.1** All welding fittings and valves are manufactured to match pipe of specific dimensions and material grade. Fittings should not be welded directly to pipe (including pipe pups) of dimensions and material other than those for which the fitting was designed.

**6.2** Where the line pipe to be installed on one side of a fitting is of different dimensions or material grade to that to be installed on the other side, the following should apply:

- a) A transition piece of pipe which matches the fitting should be welded to the fitting.
- b) The transition in pipe size should be made at the opposite end of the transition piece to the fitting.
- c) The transition should not be made at the fitting (see Figure 5).

**6.3** The weld end preparation given in Figure 2 should not be used on a fitting. The 6° internal taper should run for a considerable distance beyond the immediate weld end preparation area and, on some types of fitting, this is not possible without damaging the fitting. To avoid this problem, a transition pup piece should be used to facilitate the requirements in Figure 2. The length of the transition piece should be greater than that required to complete the 6° taper on the inside surface.

**6.4** The 6° taper on the inside surface of the weld end preparations given in Figure 2 should be machined with a floating head cutter and not ground.

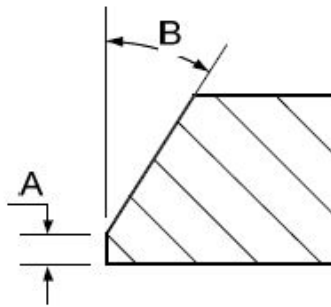
## **7. Other Applications**

Where further details are required for the application of weld end preparations and for situations not covered by clauses 5 and 6, reference should be made to ASME B 16.5, ASME B 31.3, ASME B 31.8 (Appendix H), MSS SP-44 or MSS SP-75.

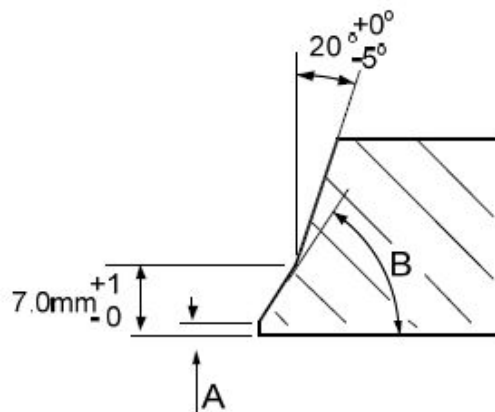
**Table 1 – Dimensions of normal weld end preparations**

Component	Nominal Size mm	Root face A* mm	Bevel angle B
Pipe, Fittings And Valves	600 and above	+1 1.5 -0	+5° 30° -0°
	Below 600	1.5 ± 0.8	

\* a variation in root face dimension exists across various specifications but is considered insignificant



- a) For welding to pipe with a nominal wall thickness below 19.1 mm



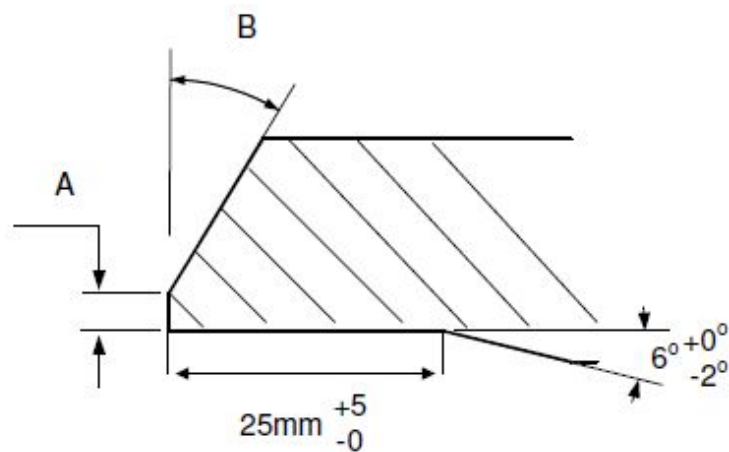
- b) For welding to pipe with a nominal wall thickness 19.1 mm and above

Note – For the applications of these weld end preparations, reference should be made to 5.1, 5.2 and Table 5

**Figure 1 – Normal weld end preparation**

TABLE 2 - Dimensions for transition weld end preparations - pipe for pigging

Nominal Size mm	Root face A mm	Bevel angle B
250 and below	$1.5 \pm 0.8$	$30^{\circ}$ $+5^{\circ}$ $-0^{\circ}$



NOTE - For the applications of these weld end preparations, reference should be made to 5.3 and Table 5.

**FIGURE 2 - Transition weld end preparations - pipe 250 mm nominal size and below for pigging**

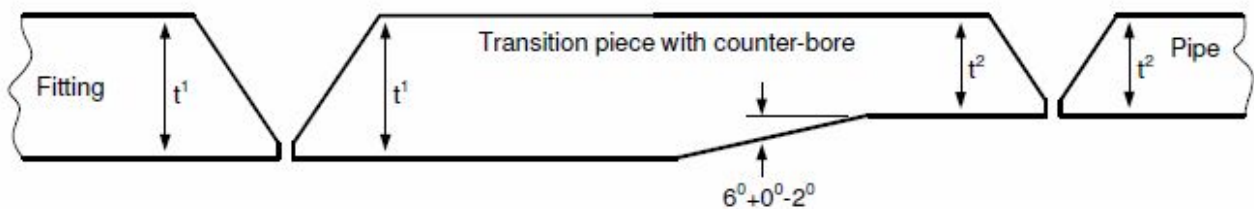
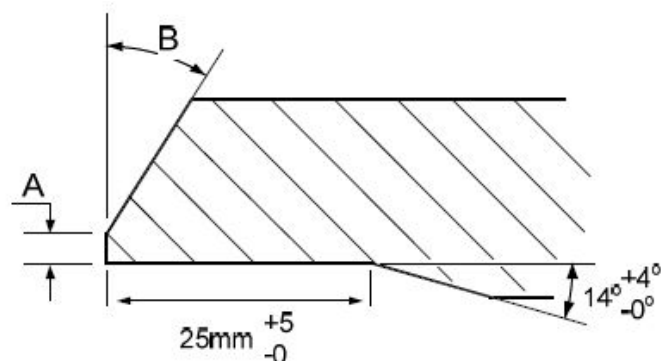
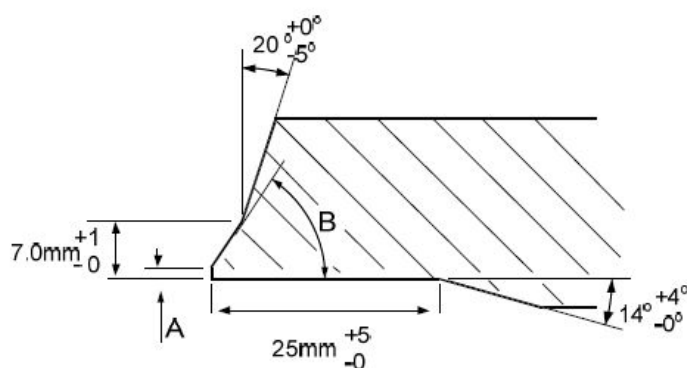


Figure 2a Typical Transition pup arrangement

**TABLE 3 - Dimensions for transition weld end preparations for fittings, valves and pipe – equal outside diameters**

Component	Nominal Size	Root face A	Bevel angle B	Design thickness of fitting valve or pipe with thicker wall C
	mm	mm		
Pipe, fitting and valves	Below 600	$1.5 \pm 0.8$	$30^{\circ}$ $+5^{\circ}$ $-0^{\circ}$	$\frac{Y_1 t}{Y_2}$  Providing that C is Not less than t and Not greater than 1.5 t
	600 and above	$1.5$ $+1$ $-0$		

$Y_1$  = specified minimum yield stress of the pipe with thinner wall  
 $Y_2$  = specified minimum yield stress of fitting, valve or pipe with thicker wall  
t = nominal wall thickness of pipe with thinner wall

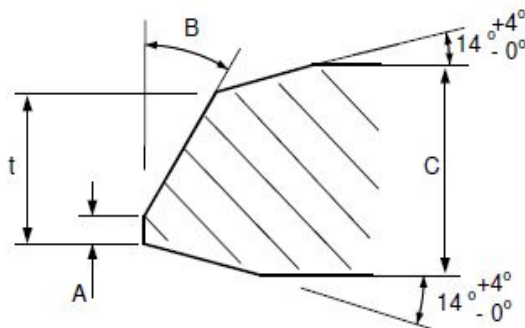
**a) For welding to pipe with a nominal wall thickness below 19.1 mm****b) For welding to pipe with a nominal wall thickness 19.1 mm and above**

NOTE - For the applications of these weld end preparations, reference should be made to 5.4 and Table 5.

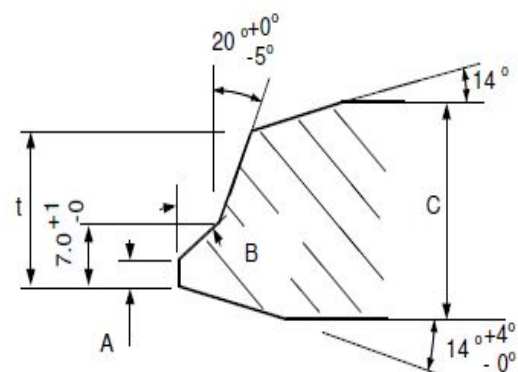
**FIGURE 3 - Transition weld end preparations for fitting, valves and pipe - equal outside diameters**

**TABLE 4 - Dimensions for transition weld end preparations for fittings and valves –different outside diameters**

Component	Nominal Size	Root face A	Bevel angle B	Design thickness of fitting valve or pipe with thicker wall C
	mm	mm		mm
Fitting and valves	Below 600	$1.5 \pm 0.8$	$+5^\circ$ $30^\circ$ $-0^\circ$	$\frac{Y_1 t}{Y_2}$
	600 and above	$+1$ $1.5$ $-0$		Providing that C is Not less than t and Not greater than 1.5 t
<p><math>Y_1</math> = specified minimum yield stress of the pipe with thinner wall</p> <p><math>Y_2</math> = specified minimum yield stress of fitting, valve or pipe with thicker wall</p> <p>t = nominal wall thickness of pipe with thinner wall</p>				



a) For welding to pipe with a nominal wall thickness below 19.1 mm



b) For welding to pipe with a nominal wall thickness 19.1 mm and above

#### Notes

1. Where the fitting or valve is to be welded to pipe of the same inside diameter, the  $14^\circ$  taper on the inside surface is not required.
2. For some fittings, these weld end preparations are modified so that the  $14^\circ$  tapers on the inside and outside surfaces start at a distance of  $2t$  from the root face (i.e. there is a parallel section of pipe wall thickness of  $t$  between the  $14^\circ$  tapers and the rest of the weld end preparation).
3. For the applications of these weld end preparations, reference should be made to 5.5 and Table 5.

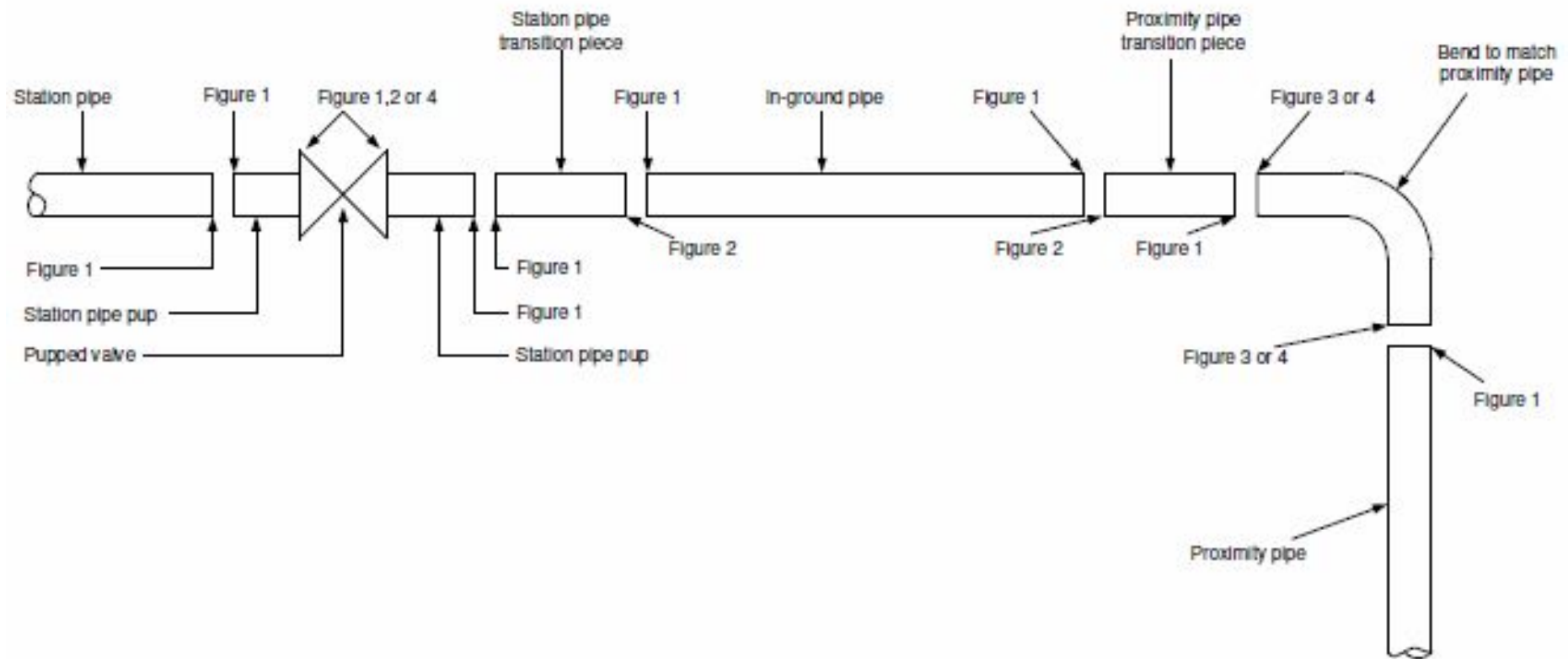
**FIGURE 4 - Transition weld end preparations for fittings and valves - different outside diameters**

**Table 5 – Typical selection of standard weld end preparations from Figures 1,2,3 and 4**

Pipe or Fitting on which weld end preparation will be made  (Note 1)	Pipe or fitting to which prepared weld end will be welded (Note 1)					
	In-ground pipe	Station Pipework	3m proximity / 30% stress pipe	Valves  (Note 4)	Flanges Below 600mm  (Note 5)	Other fittings (and fittings 600mm and above)  (Note 6)
In- ground pipe	Figure 1	Figure 1	Figure 1	Figure 1	Figure 1	Figure 1
Station Pipework	Figure 2 or 3 (Note 2 and 7)	Figure 1	Figure 1	Figure 1	Figure 1	Figure 1
3m proximity / 30% stress pipe	Figure 2 or 3 (Note 2)	Figure 2 or 3 (Note 3)	Figure 1	Figure 1	Figure 1	Figure 1
Valve (Note 4)	Figure 1, 3 or 4	Figure 1, 3 or 4	Figure 1, 3 or 4	-	Figure 1, 3 or 4	-
Flanges below 600mm (Note 5)	Figure 1	Figure 1	Figure 1	Figure 1	-	-
Other fittings (and flanges 600mm and above) (Note 6)	Figure 3 or 4	Figure 3 or 4	Figure 3 or 4	-	-	-

**Notes**

- All reference to pipe in this table includes pipe pups and short transition pieces made from these sizes of line pipe.
- Depends on whether the resultant pipeline will be pigged.
- Depends on whether the resultant pipeline will be pigged, and on the relative specified minimum yield stresses of the two pipes being welded.
- For valves there are several exceptions to the requirements of this standard. Reference should always be made to the relevant valve standard.
- This applies to flanges up to and including 600mm nominal size and to any other fitting where the nominal wall thickness is the same as that of the pipe to which it will be welded.
- This applies to all fittings where the nominal wall thickness is greater than that on the pipe to which it will be welded, including flanges 750mm nominal size and above.
- Station pipework 80mm nominal size and below is the same as in-ground pipe, so for these sizes Figure 1 will apply.
- Where non-standard pipes, fittings or valves are to be used. Direct reference should be made to Figure 1, 2, 3 and 4.



NOTE - This example is for a pipeline which is to be pigged.

**FIGURE 5 - Example of correct use of transition pieces**