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شرکت ملی گاز ایران  
مدیریت پژوهش و فناوری  
امور تدوین استانداردها

# IGS

مشخصات فنی خرید

فلنج مهار

Anchor Flange



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دفتر مدیرعامل



## ابلاغ مصوبه هیأت مدیره

مدیر محترم پژوهش و فناوری

باسلام،

به استحضار می‌رساند در جلسه ۱۹۲۷ مورخ ۱۴۰۰/۰۳/۲۳ هیأت مدیره، نامه شماره گ/۰۰۰/۳۲۸۰۷ مورخ ۱۴۰۰/۰۳/۱۷ آن مدیریت درمورد تصویب نهایی مقررات فنی شرکت ملی گاز ایران به شرح زیر مطرح و مورد تصویب قرار گرفت.

۱- مشخصات فنی کنتور گاز آلتراسونیک چند مسیره IGS-M-IN-104(3)

۲- دستور العمل عمل کننده هیدرولیکی شیرآلات IGS-M-IN-304(2)

۳- مشخصات فنی کیفیت سامانه قطع گاز در ایستگاه های TBS/DRS در مقابل زلزله IGS-M-IN-306(1)

۴- مشخصات فنی فلنج های مهار (Anchor Flang) IGS-M-PL-027(1)

این مصوبه در حکم مصوبه مجمع عمومی شرکت های تابعه محسوب و برای کلیه شرکت های تابعه لازم الاجرا می باشد .

الهام ملکی

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## Foreword

This standard specification is intended to be mainly used by N.I.G.C. and contractors , and has been prepared base on interpretation of recognized standards and technical documents, as well as knowledge, backgrounds and experiences in gas industries at national and international levels.

Iranian Gas Specification (IGS) are prepared, reviewed and amended by technical standard committees within NIGC standardization division of research and technology management and submitted to "the standards council of NIGC" for approval.

IGSs are subjected to revision, amendment or withdrawal, if required, and thus the latest edition of IGS shall be checked / inquired by NIGC'S users.

This standard must not be modified or altered by NIGC employees or its contractors. Any deviation or conflicts between this specification and other applicable standards, codes, procedure or well-known manufacturer's specifications must be resolved in writing by the user or its representative through Manager, Engineering Department or standardization division of NIGC.

The technical standard committee welcomes comments and feedbacks from concerned or interested corporate and individuals about this standard, and may revise this document accordingly based on the received feedbacks.

## General Definitions

Throughout this standard the following definitions, where applicable, should be followed:

- 1- "STANDARDIZATION DIV." is organized to deal with all aspects of industry standards in NIGC. Therefore, all enquiries for clarification or amendments are requested to be directed to mentioned division.
- 2- "COMPANY": refers to National Iranian Gas Company (NIGC).
- 3- "SUPPLIER": refers to a firm who will supply the service, equipment or material to IGS specification whether as the prime producer or manufacturer or a trading firm.
- 4- "SHALL ": is used where a provision is mandatory.
- 5- "SHOULD": is used where a provision is advised only.
- 6- "MAY": is used where a provision is completely discretionary.

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## 1. Scope

This specification covers minimum NIGC's requirements of design, material, manufacturing, inspection and testing of forged carbon steel anchor flange suitable for welding into natural gas transmission pipeline and associated distribution systems with pressure rating classes 150, 300 and 600 in sizes NPS 6 through NPS 56 used in non – sour gas service which generally conform to ASME B 31.8 with service temperature range from -29 °C to +60 °C.

The anchor flange is intended to be girth welded between two underground pipeline sections embedded in reinforced concrete blocks on site

## 2.0. References:

Throughout this standard specification the following standard and codes are referred to. The applicability of changes in standards and codes that occur after the date of this standard that referred shall be mutually agreed upon by the purchaser and supplier and / or manufacturer.

**ASME B16.5 (2013)** “Pipe Flanges and Flanged Fittings”

**ASME B31.8 (2012)** “Gas Transmission and Distribution Piping Systems”

**ASME sec V (2013)** “Nondestructive Examination”

**ASME sec VIII (2013)** “Division 1: Rules for Construction of Pressure Vessels”

**ASME sec IX (2013)** “Qualification Standard for Welding and Brazing Procedures  
Welders, Brazers and Welding and Brazing Operators”

**ASTM A 105.(2012)** “Standard Specification for Carbon Steel Forgings for Piping Application”

**ASTM A 370 (2012)** “Standard Test Method and Definitions for Mechanical Testing of Steel Products”

**ASTM A 694.(2003)** “Standard Specification for Forgings, Carbon and Alloy Steel for Pipe Flanges, Fittings, Valves and Parts for High Pressure Transmission Service”

**ASTM E23, 2002** " Standard test methods for notched bar impact testing of metallic

**API-5L.(2012)** “Specification for Line Pipe”

**API-1104.(2013)** “Welding of Pipe Lines and Related Facilities”

**MSS –SP-25(2013)** "Standard marking system for valves, fittings ,flanges & unions material.

**MSS –SP-44(2010)"** Steel Pipeline Flanges

**ISO 8501-1 (2007)** “Preparation of Steel Substrates before Application of Paints and Related Products-Visual Assessment of Surface Cleanliness”

**ISO TS 29001 (2007)** “Petroleum, Petrochemical and Natural Gas Industries-Sector Specific Requirements-Requirements for Product and Service Supply Organization”

**BS EN 10204 (2004)** “Metallic Products-Types of Inspection Documents”

**IGS-M-TP-027(2013) “External Liquid Epoxy Coating for Rehabilitation and Repair of Buried Steel Pipe Line, Bends, Field Joints, Valves and Fittings”**

### **3. Symbols and Definitions**

#### **NPS**

Nominal Pipe Size

#### **PSL**

Product Specification Level

#### **Pup piece**

A transition piece of pipe, API 5L grade, with specified nominal wall thickness used for fabricating of anchor flange, with welded end preparation suitable for adjoining pipe as specified in the purchase order. No additional girth weld (jointer) or helical weld is permitted along to the pup piece

#### **Purchaser /End user**

National Iranian Gas Company or subsidiaries or its approved representative that buys the insulating joint

#### **HFW Pipe**

EW pipe produced with a welding current frequency equal to or greater than 100 kHz.

#### **SAWL Pipe**

Tubular product having one longitudinal / straight seam produced by double submerged-arc welding

#### **SMLS Pipe**

Pipe without any weld seam, produced by a hot-forming process, which can be followed by cold sizing or cold finishing to produce the desired shape, dimension and properties

#### **SAWH Pipe**

Tubular product having one Helical / Spiral seam produced by double submerged-arc welding

### **4. Design and Fabrication**

**4.1.1** Permissible design stresses shall not exceed those specified by the ASME section VIII. Div 1, compatible with ASME B31.8.

**4.1.2** The manufacturer or supplier shall furnish the purchaser with drawings and calculations.

**4.1.3.** Pup pieces on each side shall be PSL2 pipes, SMLS or SAWL according to API 5. Note: SAWH or HFW Pipes are not acceptable.

**4.1.4.** Pup pieces shall be shop welded to the hubs. The entire assembly shall be stress relieved and then all girth welds shall be tested by radio graphy.

**4.1.5.** Any of the following processes may be used. Before fabrication, the welding process shall be approved by Purchaser.

- a) Shielded metal arc welding (SMAW)
- b) Gas tungsten-arc welding (GTAW)
- c) Gas metal-arc welding (GMAW)
- d) Submerged arc welding (SAW)
- e) Combinations of above processes.

Electrodes, filler wires and fluxes shall conform to AWS A5. Through AWS A5.30 as applicable.

**4.1.6.** All joints shall be butt welded and have full penetration.

**4.1.7.** Welding procedure, welder's qualification, weld repair and NDT examination shall be in accordance with ASME sec. IX and ASME sec. V respectively and approved by purchaser prior fabrication.

**4.1.8.** The minimum overall length of each pup piece shall be 0.5 meter.

**4.1.9.** Anchor flange(s) shall be free of injurious defect specified on Para. 14.5.2 of MSS-SP-75 and the other defects shall be removed according to Para. 14.5.3 of MSS-SP-75.

**4.1.10.** Heat-treatment for anchor flange(s) shall be performed according to ASME VIII, Division I and the recorded charts shall be submitted to purchaser.

**4.1.11.** The steel parts and butt welds shall have a maximum hardness of 280 HV10.

**4.1.12.** The end connections shall be beveled for welding in accordance with ASME B31.8 and ultrasonically tested for lamination.

**4.1.13.** For 100 mm distance of the ends, the internal diameter shall not deviate by more than:

- a)  $\pm 3$  mm for  $NPS \leq 24$
- b)  $\pm 4$  mm for  $NPS > 24$

**4.1.14.** The height of internal weld beads shall not be more than 2 mm.

## 4.2 Hub Design

**4.2.1** When the minimum yield strength of the flange is equal to or higher than the pipe to be matched, the hub dimensions may be the same as those of ASM B 16.5 (for NPS 24 and smaller) or are designed in accordance with Appendix 2 of ASME Section VIII (for larger sizes).

**4.2.2** In addition, when the minimum yield strength of the flange is less than that specified for the pipe to be matched, the minimum thickness of the hub at the welding end shall be such that the product of its thickness times its yield strength (at welding



end) shall at Least equal the product of the specified nominal wall thickness and minimum specified yield strength of the pipe be matched.

**4.2,3** When the hub thickness at the welding end is greater than the adjoining pipe, the joint design shall be as shown in any of the three sketches in Figure 1

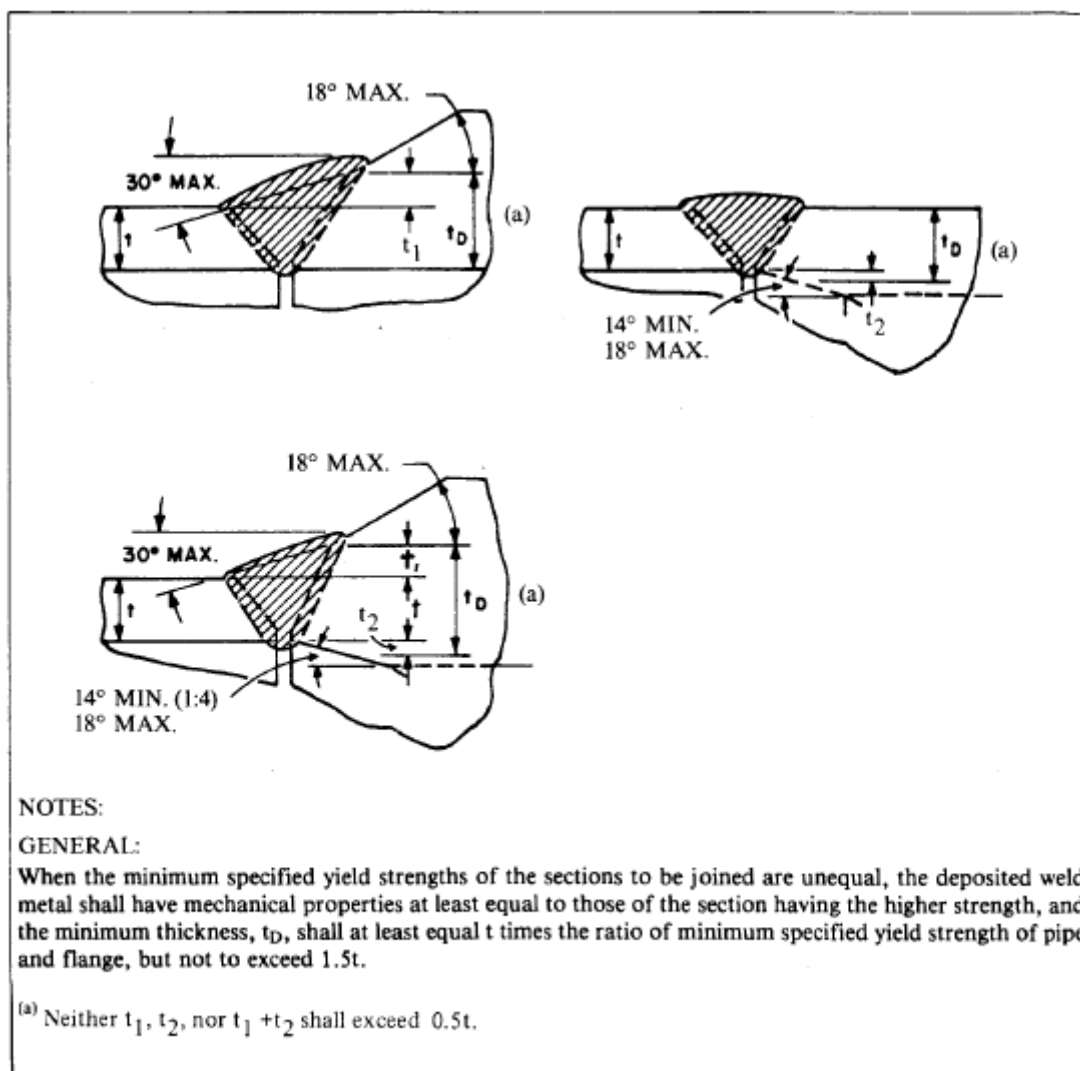


FIGURE 1 — ACCEPTABLE DESIGNS FOR UNEQUAL WALL THICKNESS<sup>(1)</sup>

## 5. Materials

**5.1.** Material quality of the flange shall be compatible with the pup pieces which connected to in accordance with the Table1.



**Table1-Forged parts and Pups materials**

Pups Material	Forged Material
API 5L B	ASTM A 105 N(normalized) / A350 LF2
API 5L × 42	ASTM A 694 F 42/F52
API 5L × 52	ASTM A 694 F 52/ F 60
API 5L × 60	ASTM A 694 F 60/ F 65
API 5L × 65	ASTM A 694 F 65/ F 70
API 5L × 70	ASTM A 694 F 70

**5.2** The steel used for flange and pup pieces shall have:

- a) The maximum carbon content shall not exceed 0.23%.
- b) Carbon equivalent shall not exceed 0.43%. when calculated with the following formula:

$$CE=C+ (Mn/6)+((Cr+Mo+V)/5)+((Ni+Cu)/15)$$

**5.3.** Pup pieces shall have mill test certificates,

## 6. Welding

The shop welding shall conform to the relevant part of ASME code. Section VIII & IX as summarized as follows:

- 6.1.** Welder performance test shall conform to the ASME code section IX .
- 6.2.** Shop welding shall be either by manual ARC or automatic or semi- submerged arc or inert gas shielded process
- 6.3.** Pre- heating procedures shall be mentioned in WPS as per ASME code.
- 6.4.** Heat treatment shall conform to the defined procedures of ASME SEC,VIII
- 6.5.** Welding repair is not permitted after the above test ,unless with the prior agreement of the Purchaser.

## 7. Inspection and testing

Inspection & non-destructive testing of flange assembly shall conform to the requirements of ASME code, section IX as summarized hereunder:

- 7.1.** Welds shall be examined either ultrasonically or radiography at full length after hydrostatic testing.
- 7.2.** The flange assembly including transition pieces shall be hydrostatically tested with 1.5 times of the specified design pressure and the procedures shall conform to ASME code.sec.VIII.

The duration of test shall be at least 30 minutes without loss of pressure as specified by end user.

- 7.3.** Test specimens selection

**7.3.1.** Two specimen for tensile test shall be taken from the disc of flange, one having its lengthwise axis directionally normal to flange bore, the second specimen to be taken with its lengthwise axis directionally at right angles to the equivalent axis of the first specimen.

**7.3.2.** three charpy notch impact (CVN) test specimens, each two – third size as specified in ASTM E 23, shall be taken from the hub, with their lengthwise axis tangential to the flange bore and three specimens equally spaced around the hub. Tests shall be carried out at  $-10^{\circ}\text{C}$  and the average obtained value from three tests shall not be less than 2.1 Kgf and no individual test result being less than 1.4 Kgf.

## 8. Coating

After assembling and testing, Anchor flange shall be thoroughly cleaned and blasted to remove rust and impurities. Surface preparation shall comply with Sa 2½ in accordance with the requirements of ISO 8501-1. Following to achieving acceptable criteria in surface preparation, the anchor flange shall be externally coated with phenolic epoxy (Amin cured) in accordance with IGS-M-TP-027 to a minimum DFT of 500 microns. The coating application shall be carried out in strict accordance with the coating material manufacturer's recommendations. Beveled end of pups shall be left uncoated as bellow and subsequently coated with a temporary rust preventive paint.

**Table 4 - bevel end cut – back length**

Size (NPS)	Uncoated bevel end (mm)
$6 \leq \text{NPS} \leq 12$	50
$16 \leq \text{NPS}$	100

## 9. Order information

The following data shall be specified by purchaser:

- Nominal diameter, grade and wall thickness of matching pipe.
- Pipeline design pressure (PSI).
- Pipeline axial thrust.(N or PSI)
- Pipeline end preparation details (matching pipe).
- Length of transition pieces (if applicable).
- Allowable concrete stress.(MPa)
- Differential temp. (  $\Delta T$  ).  $^{\circ}\text{C}$

## 10 Documentation

The manufacturer / supplier shall submit the following documents to end user, as specified in the purchase order:(three set).

- Certificate of works inspection

- Welding procedure , welder qualification and PQR.
- Certified report provides chemical analysis and physical properties of raw material.
- Stress relieve & heat treatment reports.
- Non – destructive test report .
- Hydrostatic test report.
- As-built drawing.

## 11. Marking

Marking shall conform either to ANSI B16.5 or MSS-SP 25 as specified by end user and shall be included following items on body of flange :

- Design code.(ASME SEC.VIII DIV.1 &2.)
- Design pressure.(PSI).
- Trust force.(N or PSI)
- Manufacturer ,s name.
- Order no.

## 12. Packing

All anchor flanges shall be suitably packed so to prevent damage during shipment. The packing shall be appropriated for storage without cover.

Order No & the specific item No shall be clearly identified on each package.

- Anchor flanges Up to NPS20 shall be packed in wooden box.
- Anchor flanges larger than NPS20shall be packed on the pallet with bevels protector.

## ANCHOR FLANE DATA SHEET

Manufacturer Name and Address:		Tel and Fax:	
Inquiry No.:		Item No.:	
Date:	Project title:	Purchaser:	
DRWG. No.:		Quantity:	
Pup Pieces Outside Diameter (inch):		Pup Pieces Wall Thickness (inch):	
Class Rating: <input type="checkbox"/> 150 <input type="checkbox"/> 300 <input type="checkbox"/> 600		Pipeline Design Code: <input type="checkbox"/> ASME B31.8	
Pipeline axial thrust (N or PSI):		Matching Pipeline:      Grade: Wall Thickness:	
Design Pressure:		Design Temperature:	Design Factor:
Standards	Design: <input type="checkbox"/> ASME B16.5 <input type="checkbox"/> ASME Sec. VIII      Other: .....		
	Welding and NDT: <input type="checkbox"/> ASME Sec. V & IX <input type="checkbox"/> PWHT: Other: .....		
	Class Rating: <input type="checkbox"/> ASME B16.5      Other: .....		
	Allowable concrete stress      12 M.Pa <input type="checkbox"/>		
	Trust Force:		
	Differential temp.      T=45 °C (Max)		

Materials	Forging Parts		ASTM: <input type="checkbox"/> A105 <input type="checkbox"/> A694 <input type="checkbox"/> Other : ..... CE=	
	Pups		API5L (PSL2) <input type="checkbox"/> SMLS <input type="checkbox"/> SAWL      Grade: Other: ..... CE=	
INSP	Routine Tests	Dim.	Overall length:	
			Length of transition pieces (when applicable)	<input type="checkbox"/> Min. 0.5M Other: .....
			<input type="checkbox"/> End Preparation as per ASME B31.8	
		N.D.T	Welds	<input type="checkbox"/> UT      Other: .....
				<input type="checkbox"/> RT      Other: .....
			Bevel Ends	<input type="checkbox"/> UT      Other: .....

		Hydrostatic	$\square 1.5 \times \text{Design Pressure, 30 min}$
		Tensile Test	
		CVN	$- 10^0\text{C, average}\geq 2.1 \text{ Kgf}$
<p>Note:</p> <ul style="list-style-type: none"><li>- The above data sheet shall be filled for each item.</li><li>- Deviation from this specification shall be specified by manufacturer / supplier.</li></ul>			