

KLM Technology Group Project Engineering Standard	 www.klmtechgroup.com	Page : 1 of 16
		Rev: 01
		June 2011
KLM Technology Group #03-12 Block Aronia, Jalan Sri Perkasa 2 Taman Tampoi Utama 81200 Johor Bahru Malaysia	MATERIAL STANDARD FOR STEEL PIPE FLANGES AND ORIFICE FLANGES (PROJECT STANDARDS AND SPECIFICATIONS)	

TABLE OF CONTENT

SCOPE	2
REFERENCES	2
DEFINITIONS AND TERMINOLOGY	3
SYMBOLS AND ABBREVIATIONS	4
UNITS	4
STEEL FLANGES IN SIZES DN 15 (NPS ½) TO DN 600 (NPS 24)	4
Material	5
Rating class	5
Thread identification	5
Omission of marking	5
Material	5
Insulating Flange	9
Inspection and Defects	9
STEEL FLANGES IN SIZE DN 650 (NPS 26) TO DN 1500 (NPS 60)	10
Flange Ring Design	10
Bolt Holes	10
Flange Thickness	10
ORIFICE FLANGES	11
Bolting	11
Plugs	11
Flange Facing Finish	11
APPENDIX A	12

KLM Technology Group Project Engineering Standard	MATERIAL STANDARD FOR STEEL PIPE FLANGES AND ORIFICE FLANGES (PROJECT STANDARDS AND SPECIFICATIONS)	Page 2 of 16
		Rev: 01
		June 2011

SCOPE

This Project Standard and Specification covers minimum requirements for the procurement of steel flanges in sizes DN 15 (NPS ½) through DN 1500 (NPS 60) and also orifice flanges. The flanges shall be manufactured according to the following standards except for supplement thereof.

- Flanges DN 15 (NPS ½) to DN 600 (NPS 24) as per ASME/ANSI B 16.5.
- Flanges DN 650 (NPS 26) to DN 1500 (NPS 60) as per MSS-SP-44.
- Orifice flanges as per ASME/ANSI 16.36-1988.

Cast iron and bronze flanges are not covered by this Standard.

REFERENCES

Throughout this Standard the following dated and undated standards/codes are referred to. These referenced documents shall, to the extent specified herein, form a part of this standard. For dated references, the edition cited applies. The applicability of changes in dated references that occur after the cited date shall be mutually agreed upon by the Company and the Vendor. For undated references, the latest edition of the referenced documents (including any supplements and amendments) applies.

1. API (American Petroleum Institute)
 - API Standard 601 "Metallic Gaskets for Raised-Face Pipe Flanges and Flanged Connections (Double-Jacketed Corrugated and Spiral Wound)"
 - API Spec. 6A "Specification for Valves and Wellhead Equipment"
2. ASME (American Society Of Mechanical Engineers)
 - Section VIII division 1 "BPV Code for Pressure Vessel"
3. ASME / (American Society Of Mechanical Engineers / ANSI American National Standard Institute)
 - B 1.20.1 "Pipe Threads, General Purpose"
 - ANSI - B 16.1 "Cast Iron Pipe Flanges and Flanged Fitting, Class 25, 125, 250, and 800"
 - B 16.5 "Pipe Flanges and Flanged Fittings"
 - ANSI - B 16.11 "Forged Steel Fittings, Socket-Welding and Threaded"
 - B 16.20 "Ring Joint Gaskets and Grooves for Steel Pipe Flanges"
 - B 16.21 "Non-Metallic Flat Gaskets for Pipe Flanges"
 - B 16.36 "Orifice Flanges"

KLM Technology Group Project Engineering Standard	MATERIAL STANDARD FOR STEEL PIPE FLANGES AND ORIFICE FLANGES (PROJECT STANDARDS AND SPECIFICATIONS)	Page 3 of 16
		Rev: 01
		June 2011

4. ASTM (American Society for Testing And Materials)

A 105	"Specification for Forgings, Carbon Steel, for Piping Components"
A 181	"Specification for Forgings, Carbon Steel, for General-Purpose Piping"
A 182	"Specification for Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Services"
A 350	"Specification for Forgings Carbon and Low Alloy Steel, Requiring Notch Toughness Testing for Piping Components"
A 387	"Specification for Pressure Vessel Plates, Alloy Steel Chromium Molybdenum"
A 694	"Specification for Forgings, Carbon and Alloy Steel, for Pipe Flanges, Fittings, Valves, and Parts for High-Pressure Transmission Services"

5. MSS (Manufacturers Standardization Society)

SP-6	"Standard Finishes for Contact Faces of Pipe Flanges and Connecting- End Flanges of Valves and Fittings"
SP-44	"Steel Pipeline Flanges"

DEFINITIONS AND TERMINOLOGY

Contact Surface - That part of a flange facing upon which the gasket is actually compressed. In the case of flanges of PN 20 (class 150) and PN 50 (class 300) having 1.6 mm high raised facing, and in all nominal pressures (classes) having female and groove facings, the contact surface is coincident with the flange edge as defined above. "Contact Surface" is not applicable to ring-joint facing.

Flange Edge - The reference plane, coincident with the front of a flange, from which the height of any type of flange facing and also the minimum flange thickness is measured.

Flange Facing - The profile of the connecting end of a flange. It is beyond the flange edge, except for a flange of PN 20 (class 150) or PN 50 (class 300) having a 1.6 mm high raised facing, in which case the raised facing is formed by cutting into the minimum flange thickness.

Flange Thickness - The distance from the flange edge to the back face of a flange or, if the bolt holes are spot-faced, from the flange edge to the spot-facing.

KLM Technology Group Project Engineering Standard	MATERIAL STANDARD FOR STEEL PIPE FLANGES AND ORIFICE FLANGES (PROJECT STANDARDS AND SPECIFICATIONS)	Page 4 of 16
		Rev: 01
		June 2011

Full-Faced - Applies only to female, groove and ring-joint facings and defines the resultant profile when the raised portion of such facing is extended to the full diameter of the flange.

SYMBOLS AND ABBREVIATIONS

<u>SYMBOL/ABBREVIATION</u>	<u>DESCRIPTION</u>
AARH	Arithmetical Average Roughness Height
CAF	Compressed Asbestos Fibre
NB	Nominal Bore
PTFE	Poly Tetra Fluoro Ethylene
RF	Raised Face
RMS	Root Mean Square
RTJ	Ring Type Joint
SW	Spiral Wound

UNITS

This Standard is based on International System of Units (SI) except where otherwise specified.

STEEL FLANGES IN SIZES DN 15 (NPS ½) TO DN 600 (NPS 24)

This Section is supplement to reference standard ASME/ANSI B 16.5 "Pipe Flanges and Flanged Fittings".

1. Those flanges which are not covered by ASME/ANSI B.16.5 shall be calculated in accordance with ASME Section VIII Division 1.
2. Pipe flanges of the following nominal diameters are specified:
DN 15 (NPS ½), DN 20 (NPS ¾), DN 25 (NPS 1), DN 32 (NPS 1¼), DN 40 (NPS 1½), DN 50 (NPS 2), DN 65 (NPS 2½), DN 80 (NPS 3), DN 90 (NPS 3½), DN 100 (NPS 4), DN 125 (NPS 5), DN 150 (NPS 6), DN 200 (NPS 8), DN 250 (NPS 10), DN 300 (NPS 12), DN 350 (NPS 14), DN 400 (NPS 16), DN 450 (NPS 18), DN 500 (NPS 20) and DN 600 (NPS 24).

Note:

The DN 90 (NPS 3½) not specified for Nominal Pressures PN 150 (class 900), PN 250 (class 1500) and PN 420 (class 2500) sizes over DN 300 (NPS 12) are not specified for PN 420 (class 2500) .

KLM Technology Group Project Engineering Standard	MATERIAL STANDARD FOR STEEL PIPE FLANGES AND ORIFICE FLANGES (PROJECT STANDARDS AND SPECIFICATIONS)	Page 5 of 16
		Rev: 01
		June 2011

3. The use of sizes DN 32 (NPS 1¼), DN 65 (NPS 2½), DN 90 (NPS 3½) and DN 125 (NPS 5) should be avoided where possible.

Material

When the minimum yield strength of the hub portion of flange is less than that specified for matching pipe, the marking shall also include the grade of the material of the pipe to be matched with the flange.

Rating class

The marking shall include the both applicable nominal pressure and pressure rating class PN 20 (150), PN 50 (300), PN 68 (400), PN 100 (600), PN 150 (900), PN 250 (1500) and PN 420 (2500).

Thread identification

When flanges are not screwed to ANSI/ASME B 1.20.1 they shall be marked to indicate the type of thread used. The marking shall be cast or stamped on the flanges.

Omission of marking

On flanges of such size as will not permit full marking, the marking may be omitted, with the approval of the Purchaser, to the degree which conditions require in the following sequence:

- Material
- Grade of matching pipe
- Size
- Class rating
- Thread identification
- Standard designation
- Manufacturers name or trade mark

Material

1. General

Flanges shall be forged in accordance with material specifications ASTM A 105, A 181, A 182, A 350, A 387, A 694 and nickel base alloys. Forging to other standards may be used only subject to the approval of the Purchaser. Slip-on flanges made from plate shall not be used except for low pressure

KLM Technology Group Project Engineering Standard	MATERIAL STANDARD FOR STEEL PIPE FLANGES AND ORIFICE FLANGES (PROJECT STANDARDS AND SPECIFICATIONS)	Page 6 of 16
		Rev: 01
		June 2011

duties and for reducing flanges and then only subject to the approval of the Purchaser. These materials are listed in Table 1A.

Note:

Columns related to castings in Table 1A shall be omitted.

Flange material with yield strengths 331 mPa (48 ksi) and higher shall be killed steel (A 350 gr LF-1 or gr LF-2).

All flanges shall be furnished in a heat-treated condition. Heat treatment shall consist of normalizing, normalizing and tempering, or quenching and tempering.

2. Gaskets

Different material used for supply of gaskets and joint rings for use with bolted flanged joints, primarily in piping systems and for connections of piping to equipment is covered in this section.

a. Health, safety and environmental requirements

- In this respect, consideration shall be given to important information given in page IV of API Std 601 edition 1988.
- Material safety data sheets shall be available for all jointing materials.
- The supplier shall provide details of any necessary protective equipment to be used when handling jointing materials.
- Any jointing Containing Compressed Asbestos Fibre (CAF) shall be suitably Packaged and labeled both on the packaging and gasket materials "Contains Asbestos".

b. Non-metallic flat gaskets

- Non-metallic flat gaskets for flanges covered in this Standard shall be in accordance with ANSI B.16.21.
- Non-metallic flat gaskets for raised face flanges shall be either self-centering within the flange bolts or full face type.
- Gaskets with outside diameter matching the raised face of flanges should not be used.
- Full face gaskets are recommended for raised face flanges smaller than DN 50 (2 inch nominal Bore) to avoid potential problems of incorrect size gaskets being fitted. For DN 50 (2 inch NB) and above self-centering gaskets shall be used for raised face flanges.
- Non-metallic flat gaskets for use with flat face flanges should be full face.

KLM Technology Group Project Engineering Standard	MATERIAL STANDARD FOR STEEL PIPE FLANGES AND ORIFICE FLANGES (PROJECT STANDARDS AND SPECIFICATIONS)	Page 7 of 16
		Rev: 01
		June 2011

- c. Metallic and semi metallic gasket and joint rings
 - i) Metal jacketed gaskets

Metal jacketed gaskets for flanges covered in this Standard shall be of the double jacket type and shall comply with the requirements and dimensions of API 601.
 - ii) Spiral wound gaskets

Spiral wound gaskets for flanges covered in this Standard shall comply with the requirements and dimensions of API 601.
- d. Solid metal joint rings
 - Solid metal joint rings for wellhead equipment to API 6A shall comply with the requirements of API 6A.
 - When specified, Monel 400 joint rings shall have a maximum Brinell Hardness of 135 and be identified by the material symbol M 400.
 - Solid metal joint rings for piping and pipeline flanges to this Standard shall comply with ANSI B.16.20.
 - The data sheet in the next page covers joint requirements.
 - Appendix "A" serves as a guideline for selection of gasket from view point of "Material and Design".