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Doc. No. :
RP-ETS-PIP-GS-0001-01-2021

Page No. : 1 / 31

GENERAL SPECIFICATION

GENERAL NOTES PIPING MATERIAL SPECIFICATION

ENGINEERING TECHNICAL STANDARDS & PROCEDURES PT KILANG PERTAMINA INTERNASIONAL DIREKTORAT PROYEK INFRASTRUKTUR

Rev.	Description	Date	Prepared by	Checked by	Verified by	Validated by	Approved By
01	Issued For Record	12/21	 ARM/NDA/YN	 MA	 ASR	 JS	 BAP
00	Issued For Record	11/18	AS/DI/ARM	SF	GNR	PH	IMS

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TABLE OF CONTENTS*DAFTAR ISI*

1. SCOPE	5
<i>LINGKUP</i>	
2. CONFLICTS AND DEVIATIONS	5
<i>KONFLIK DAN DEVIASI</i>	
3. DEFINITIONS	5
<i>DEFINISI</i>	
4. CODES AND STANDARDS	6
<i>KODE DAN STANDAR</i>	
5. DESIGN CONSIDERATIONS	10
<i>PERTIMBANGAN DESAIN</i>	
6. VALVES	11
<i>VALVE</i>	
7. PIPES (INCLUDING PIPE NIPPLES)	13
<i>PIPA (TERMASUK PIPA NIPPLE)</i>	
8. FITTINGS	14
<i>FITTING</i>	
9. MITERS	14
<i>MITERS</i>	
10. FLANGES, BLINDS & BLEED RINGS	14
<i>FLANGE, BLIND & BLEED RING</i>	
11. ORIFICE FLANGES	17
<i>ORIFICE FLANGE</i>	
12. BOLTING	17
<i>BAUT</i>	
13. GASKETS	18
<i>GASKET</i>	
14. THREAD COMPOUND ON PIPE THREADS	19
<i>SENYAWA YANG BERULIR PADA ULIRAN PIPA</i>	
15. PIPING ASSEMBLIES	19
<i>RAKITAN PERPIPAAN</i>	



Engineering Technical
Standards & Procedures

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MATERIAL SPECIFICATION**

Doc. No. :
RP-ETS-PIP-GS-0001-00-2021

Page No. : 4 / 31

16. FABRICATION AND INSTALLATION REQUIREMENTS.....	20
<i>PERSYARATAN FABRIKASI DAN INSTALASI</i>	
17. CORROSION ALLOWANCE.....	20
<i>KELONGGARAN KOROSI</i>	
18. BRANCHES.....	20
<i>CABANG</i>	
19. LINE REDUCTIONS	21
<i>LINE REDUCTION</i>	
20. PURCHASE DESCRIPTIONS	21
<i>DESKRIPSI PEMBELIAN</i>	
21. SERVICE CLASS INDEX	21
<i>INDEKS KELAS SERVIS</i>	

Dokumen sesuai dengan aslinya, dicetak pada tanggal 11/06/2026 17:24:40 oleh

1. SCOPE

1.1 This specification defines the requirements for the service class of materials for pipes, fittings, flanges, valves and other piping components to be used in the Engineering and Construction of the OWNER for process and utility piping systems.

Service class of materials for oil and gas transmission pipeline systems are outside the scope of this Specification.

2. CONFLICTS AND DEVIATIONS

2.1 Any conflicts between this standard and other applicable Engineering Technical Standards & Procedures (ETSP), or OWNER standard, codes, and forms shall be resolved in writing by OWNER.

2.2 All direct requests to deviate from this standard (ETSP) in writing to OWNER, who shall follow internal OWNER procedure and forward such requests to OWNER for approval.

3. DEFINITIONS

3.1 The following words shall have these special meanings when used herein:

OWNER Owner of the Plant is defined as PT Kilang Pertamina Internasional.

**CONTRACTOR/
CONSULTANT** Defined as The Organization to which PT Kilang Pertamina Internasional assign the work.

1. LINGKUP

1.1 Spesifikasi ini mendefinisikan persyaratan untuk kelas servis *material* untuk pipa, *fitting*, *flange*, *valve*, dan komponen perpipaan lainnya yang akan digunakan dalam *Engineering* dan Konstruksi dari PEMILIK untuk proses serta kegunaan dari perpipaan.

Kelas servis *material* untuk sistem saluran pipa transmisi minyak dan gas berada di luar lingkup spesifikasi ini.

2. KONFLIK DAN DEVIASI

2.1 Apabila terdapat konflik antara standar ini dengan *Engineering Technical Standards & Procedures* (ETSP) yang berlaku lainnya, atau standar PEMILIK, *codes* dan formulir, maka harus diselesaikan secara tertulis oleh PEMILIK.

2.2 Semua permintaan penggunaan standar yang berbeda dari standar ini (ETSP), harus diajukan kepada PEMILIK secara tertulis dengan mengikuti prosedur internal PEMILIK untuk mendapatkan persetujuan.

3. DEFINISI

3.1 Penggunaan kata-kata berikut harus memiliki arti khusus sebagai berikut:

PEMILIK Pemilik Kilang didefinisikan sebagai PT Kilang Pertamina Internasional.

**KONTRAKTOR/
KONSULTAN** Didefinisikan sebagai Organisasi yang ditunjuk oleh di PT Kilang Pertamina Internasional untuk melakukan suatu pekerjaan.

shall	Indicates that the statement is mandatory	<i>shall</i>	Menunjukkan bahwa pernyataan itu wajib
should	Indicates a recommendation	<i>should</i>	Menunjukkan rekomendasi
VENDOR	Defined as the company selected to supply the equipment and service detailed in this specification.	<i>VENDOR</i>	Didefinisikan sebagai perusahaan yang dipilih untuk memasok peralatan dan servis yang dirinci dalam spesifikasi ini.

4. CODES AND STANDARDS

The following Codes, Standard and Specifications apply to this specification. When an edition date is not indicated for a code or standard or any update in codes and standards in this specification document, the latest edition and addendum in force at the time of purchase shall apply. Material & equipment shall be as a specification or an equal approved by OWNER.

4.1 American National Standard Code for Pressure Piping:

ASME B31.3 Process Piping

4.2 The ASME Boiler and Pressure Vessel Code:

Section I Rules for the Construction of Power Boilers

Section II Material Specifications

SEC VIII-1 Rules for Construction of Pressure Vessels

SEC IX Qualification Standard for Welding

4. KODE DAN STANDAR

Kode, standar, dan spesifikasi berikut berlaku untuk spesifikasi ini. Kode dan standar harus menggunakan edisi yang terbaru atau edisi yang berlaku pada saat pembelian. *Material* & peralatan harus sesuai spesifikasi atau setara dengan yang disetujui oleh PEMILIK.

4.1 *American National Standard Code for Pressure Piping:*

ASME B31.3 *Process Piping*

4.2 *The ASME Boiler and Pressure Vessel Code:*

Section I Rules for the Construction of Power Boilers

Section II Material Specifications

SEC VIII-1 Rules for Construction of Pressure Vessels

SEC IX Qualification Standard for Welding and

and Brazing
Procedures, Welders,
Brazers, and Welding
and Brazing
Operators.

*Brazing Procedures,
Welders, Brazers, and
Welding and Brazing
Operators.*

4.3 Standards:

ASME B1.1 Unified Screw
Threads

ASME B1.2 Gages and Gauging
for Unified Screw
Threads

ASME B1.20.1 Pipe Threads,
general purpose
(inch)

ASME B2.1 Pipe Threads (Except
Dry seal)

ASME B16.5 Pipe Flanges and
Flanged Fittings

ASME B16.9 Factory Made
Wrought Steel Butt-
welding

ASME B16.10 Face to Face and
End to End
Dimensions of Valves

ASME B16.11 Forged Steel Fittings,
Socket-Welding and
Threaded

ASME B16.20 Metallic Gaskets for
Pipe Flanges – Ring-
Joint, Spiral-Wound,
and Jacketed

ASME B16.21 Non-metallic Gaskets
for Pipe Flanges

ASME B16.24 Bronze pipe Flanges
and Flanged Fittings

ASME B16.25 Butt Welding Ends

ASME B16.34 Steel Valves

4.3 Standar:

ASME B1.1 *Unified Screw Threads*

ASME B1.2 *Gages and Gauging for
Unified Screw Threads*

ASME B1.20.1 *Pipe Threads, general
purpose (inch)*

ASME B2.1 *Pipe Threads (Except
Dry seal)*

ASME B16.5 *Pipe Flanges and
Flanged Fittings*

ASME B16.9 *Factory Made Wrought
Steel Butt-welding*

ASME B16.10 *Face to Face and End
to End Dimensions of
Valves*

ASME B16.11 *Forged Steel Fittings,
Socket-Welding and
Threaded*

ASME B16.20 *Metallic Gaskets for
Pipe Flanges – Ring-
Joint, Spiral-Wound,
and Jacketed*

ASME B16.21 *Non-metallic Gaskets
for Pipe Flanges*

ASME B16.24 *Bronze pipe Flanges
and Flanged Fittings*

ASME B16.25 *Butt Welding Ends*

ASME B16.34 *Steel Valves*

ASME B16.36	Steel Orifice Flanges	ASME B16.36	<i>Steel Orifice Flanges</i>
ASME B16.47	Large diameter steel flanges NPS 26 through NPS 60	ASME B16.47	<i>Large diameter steel flanges NPS 26 through NPS 60</i>
ASME B16.48	Steel Line Blanks	ASME B16.48	<i>Steel Line Blanks</i>
ASME B18.2.1	Square and Hexagonal Bolts and Screws	ASME B18.2.1	<i>Square and Hexagonal Bolts and Screws</i>
ASME B18.2.2	Square and Hexagonal Nuts	ASME B18.2.2	<i>Square and Hexagonal Nuts</i>
ASME B36.10M	Welded and Seamless Wrought Steel Pipe	ASME B36.10M	<i>Welded and Seamless Wrought Steel Pipe</i>
ASME B36.19M	Stainless Steel Pipe	ASME B36.19M	<i>Stainless Steel Pipe</i>
ASME B46.1	Surface Texture	ASME B46.1	<i>Surface Texture</i>
MSS SP 6	Standard Finishes for Contact Faces of Pipe Flanges and Connecting-Ends Flanges of Valves and Fittings	MSS SP 6	<i>Standard Finishes for Contact Faces of Pipe Flanges and Connecting-Ends Flanges of Valves and Fittings</i>
MSS SP 9	Spot Facing for Bronze, Iron and Steel Flanges	MSS SP 9	<i>Spot Facing for Bronze, Iron and Steel Flanges</i>
MSS SP 25	Standard Marking System for Valves, Fittings, Flanges and Unions	MSS SP 25	<i>Standard Marking System for Valves, Fittings, Flanges and Unions</i>
MSS SP 42	Corrosion Resistant Gate, Globe, Angle and Check Valves with Flanged and Butt weld Ends	MSS SP 42	<i>Corrosion Resistant Gate, Globe, Angle and Check Valves with Flanged and Butt weld Ends</i>
MSS SP 43	Wrought Stainless Steel Butt-Welding Fittings	MSS SP 43	<i>Wrought Stainless Steel Butt-Welding Fittings</i>
MSS SP 45	By-pass and Drain Connection Standard	MSS SP 45	<i>By-pass and Drain Connection Standard</i>

MSS SP 61	Pressure testing of Steel Valves	MSS SP 61	<i>Pressure testing of Steel Valves</i>
MSS SP 70	Cast Iron Gate Valves, Flanged and Threaded Ends	MSS SP 70	<i>Cast Iron Gate Valves, Flanged and Threaded Ends</i>
MSS SP 72	Ball Valves with Flanged or Butt-Welding Ends for General Service	MSS SP 72	<i>Ball Valves with Flanged or Butt-Welding Ends for General Service</i>
MSS SP 75	High Test Wrought Welding Fittings	MSS SP 75	<i>High Test Wrought Welding Fittings</i>
MSS SP 80	Bronze Gate, Globe, Angle and Check Valves	MSS SP 80	<i>Bronze Gate, Globe, Angle and Check Valves</i>
MSS SP 97	Integrally reinforced forged branch outlet fittings – Socket welding, threaded and butt welding end	MSS SP 97	<i>Integrally reinforced forged branch outlet fittings – Socket welding, threaded and butt welding end</i>
NACE MR0175 / ISO 15156	Materials for Use in H2S-containing Environments in Oil and Gas Production	NACE MR0175 / ISO 15156	<i>Materials for Use in H2S-containing Environments in Oil and Gas Production</i>
ISO 10497	Testing of valves – Fire type-testing requirements	ISO 10497	<i>Testing of valves – Fire type-testing requirements</i>

4.4 References:

API SPEC 5L	Line Pipe
API SPEC 6FA	Fire test for Valves
API STD 594	Wafer-Type Check Valves
API STD 598	Valves Inspection and Test
API STD 600	Steel Gate Valves Flanged or Butt-welding Ends
API STD 602	Compact Steel Gate

4.4 Referensi:

API SPEC 5L	<i>Line Pipe</i>
API SPEC 6FA	<i>Fire test for Valves</i>
API STD 594	<i>Wafer-Type Check Valves</i>
API STD 598	<i>Valves Inspection and Test</i>
API STD 600	<i>Steel Gate Valves Flanged or Butt-welding Ends</i>
API STD 602	<i>Compact Steel Gate</i>

	Valves		Valves
API STD 605	Large Diameter Carbon Steel Flanges	API STD 605	Large Diameter Carbon Steel Flanges
API STD 607	Fire Test for Soft-Seated Quarter-Turn Valves	API STD 607	Fire Test for Soft-Seated Quarter-Turn Valves
API STD 609	Butterfly Valves Double Flanged, Lug-type and Water-type	API STD 609	Butterfly Valves Double Flanged, Lug-type and Water-type

5. DESIGN CONSIDERATIONS

- 5.1 Pressures and temperatures referred to in the service classes are design conditions. Each service class shall be used only within the pressure temperature range specified.
- 5.2 Unless otherwise noted in the individual service classes, the following specifications shall dictate the design conditions as followed:
- Pressure-Temperature ratings for service classes with steel flanges NPS 24 and smaller are based on ASME B16.5.
 - Pressure-Temperature ratings for service classes with steel flanges NPS 26 and larger are based on ASME B16.47.
 - Pressure-Temperature ratings for service classes with ductile iron flanged valves are based on ASME B16.42.
 - Pressure-Temperature ratings for service classes with cast iron flanged valves are based on ASME B16.1.
- 5.3 Piping listed with more than one option will have walls calculated to meet specific Design.

5. PERTIMBANGAN DESAIN

- 5.1 Tekanan dan suhu yang disebut dalam kelas servis merupakan kondisi desain. Setiap kelas servis harus digunakan hanya dalam *range*/jangkauan suhu tekanan yang ditentukan.
- 5.2 Kecuali ditentukan lain dalam kelas servis *individual*, spesifikasi berikut harus menentukan kondisi desain sebagai berikut:
- Rating*/ peringkat suhu tekanan untuk kelas servis pada *steel flange* NPS 24 dengan yang lebih kecil didasarkan pada ASME B16.5.
 - Rating*/ peringkat suhu tekanan untuk kelas servis pada *steel flange* NPS 26 dengan yang lebih besar didasarkan pada ASME B16.47.
 - Rating*/ peringkat suhu tekanan untuk kelas servis pada *ductile iron flanged valve* didasarkan pada ASME B16.42.
 - Rating*/ peringkat suhu tekanan untuk kelas servis pada *cast iron flanged valve* didasarkan pada ASME B16.1.
- 5.3 Pipa yang terdaftar dengan lebih dari satu pilihan akan memiliki dinding yang dihitung untuk memenuhi desain yang spesifik.

6. VALVES

- 6.1 When valves other than those specified in the individual service classes (i.e. non-slam check, drilled disc check, et.) are required, they shall be indicated on the P&ID's and addressed as Specialty Item (SP) valves.
- 6.2 Metal seated ball valves shall be used in high temperature applications or where abrasive particles (e.g. catalyst, sand, etc.) in incoming lines would cause erosion of valve seats.
- 6.3 Flanged valves shall be used in lieu of socket welded valves in erosive and corrosive services.
- 6.4 Check valves shall be installed as per designated notes in the individual service class. Check valves shall not be installed in vertical down flow conditions. Check valves that are required in the vertical down position are special and shall be addressed as SP Items.
- 6.5 Check valves selection (i.e. non-slam check) for the reciprocating compressors (suction / discharge lines) and other pulsating gas or liquid service equipment will be specified by Project Engineering during the Detailed Engineering Phase.
- 6.6 Globe valves larger than NPS 8 should be avoided due to concerns with flow dynamics, opening/closing, and throttling in the larger sizes, except where specific process requirements dictate otherwise (subject to OWNER approval). Globe valves above NPS 6 shall be addressed as SP items.
- 6.7 Standard Globe Valves are not designed to withstand continuous throttling at less than 20% open. Severe vibration could

6. VALVE

- 6.1 Ketika *valve* yang berbeda dari yang ditentukan dalam kelas servis *individual* (yaitu, *non-slam check*, *drilled disc check*, dll) diperlukan, *valve* tersebut harus ditunjukkan pada P&ID dan ditempatkan sebagai *valve Specialty Item* (SP).
- 6.2 *Metal seated ball valve* harus digunakan dalam aplikasi suhu tinggi atau bila partikel kasar (misalnya, katalis, pasir, dll.) pada saluran yang masuk yang akan menyebabkan erosi pada *valve seat*/dudukan *valve*.
- 6.3 *Flange valve* harus digunakan sebagai pengganti *socket welded valve* dalam servis erosi dan korosif.
- 6.4 *Check valve* harus di instalasi sesuai dengan catatan yang ditentukan di kelas servis *individual*. *Check valve* seharusnya tidak diinstal dalam kondisi aliran turun vertikal. *Check valve* yang diperlukan dalam posisi turun adalah khusus dan harus ditujukan sebagai item SP.
- 6.5 Pemilihan *check valve* (yaitu, *non-slam check*) untuk kompresor *reciprocating* (*suction / discharge lines*) dan *pulsating gas* lainnya atau peralatan servis cairan akan ditentukan oleh Tim *Engineering* Proyek selama fase *Detailed Engineering*.
- 6.6 *Globe valve* yang lebih besar dari NPS 8 harus dihindari karena berkaitan dengan dinamika aliran, pembukaan/ penutupan, dan *throttling* dalam ukuran yang lebih besar, kecuali jika persyaratan proses tertentu menentukan sebaliknya (tunduk pada persetujuan PEMILIK). *Globe valve* di atas NPS 6 harus ditempatkan sebagai item SP.
- 6.7 Standar *globe valve* tidak didesain untuk menahan *throttling* secara kontinu pada pembukaan kurang dari 20%. Getaran yang

occur over time causing the valve to fail prematurely. Valves requiring continuous throttling at less than 20% open shall be identified on the P&ID. These globe valves shall be body-guided non-rotating disc design, Y-pattern design or other suitable design (refer to API RP 615 for additional considerations).

- 6.8 In general, Ball valves should be used for on/off type isolation. Ball valves should not be used for flow modulation. Ball valves with non-metallic seats and seals have lower design temperatures than metallic valves and selection of these valves should be structured based on this design limitation.
- 6.9 Butterfly valves have a preferred pressure end (typically shaft side) in order to prevent high pressure build-up pushing the valve's disc off the seat. This feature does not make the valve unidirectional sealing. However, for piping isolation philosophies this should be considered. These valves will be clearly marked to indicate the Preferred Pressure End (PPE). The PPE and direction shall be clearly marked on the appropriate side of each valve on the P&IDs which required isolation preference.
- 6.10 Valves to be installed into an underground valve "box" or "pit" with the valve operator positioned aboveground shall have the specific height bonnet extension defined by piping design during the Detailed Engineering Phase.

paling buruk dapat terjadi dari waktu ke waktu yang menyebabkan *valve* gagal sebelum waktunya. *Valve* yang membutuhkan *throttling* secara kontinu pada pembukaan kurang dari 20% harus diidentifikasi pada P&ID. *Globe valve* ini harus dengan desain *body-guided non-rotating disc*, desain *Y-pattern*, atau desain lain yang sesuai (lihat API RP 615 untuk pertimbangan tambahan).

- 6.8 Secara umum, *Ball valve* harus digunakan untuk isolasi tipe *on/ off*. *Ball valve* tidak boleh digunakan untuk *flow/* aliran modulasi. *Ball valve* dengan *non-metallic seat/* dudukan non-logam dan *seal/* penyekat yang memiliki suhu desain yang lebih rendah daripada *metallic valve*, dan pemilihan *valve* ini harus disusun berdasarkan batasan desain.
- 6.9 *Butterfly valve* memiliki tekanan akhir yang lebih dipilih (biasanya sisi *shaft/* poros) untuk mencegah timbulnya tekanan tinggi yang mendorong *valve disc off* dari dudukannya. Fitur ini tidak membuat *valve unidirectional sealing/* penyekat searah. Namun, untuk filosofi isolasi perpipaan hal ini harus dipertimbangkan. *Valve* ini akan ditandai dengan jelas untuk menunjukkan *Preferred Pressure End (PPE)*. PPE dan arahnya harus ditandai dengan jelas pada sisi yang sesuai dari setiap *valve* pada P&ID yang memerlukan pilihan isolasi.
- 6.10 *Valve* yang akan diinstalasi ke bawah tanah "kotak" atau "lubang" *valve* dengan *operator valve* yang diposisikan di atas tanah harus memiliki perpanjangan tinggi *bonnet* yang spesifik yang ditentukan oleh desain perpipaan selama fase *Detailed Engineering*.

6.11 Ball valve design shall be reduced port unless noted otherwise on P&ID's as Full Port, "FP".

6.11 Desain *ball valve* harus dikurangi *port/* sisi kiri kecuali dinyatakan lain pada P&ID sebagai *Full Port*, "FP."

7. PIPES (INCLUDING PIPE NIPPLES)

7. PIPA (TERMASUK PIPA NIPPLE)

7.1 The minimum wall thickness for carbon steel pipe NPS 2 and smaller shall be Extra Strong. The minimum wall thickness for carbon steel pipe nipples NPS 2 and smaller shall be schedule 160.

7.1 Ketebalan *minimum* dinding untuk pipa *carbon steel* NPS 2 dan yang lebih kecil harus ekstra kuat. Ketebalan *minimum* dinding untuk pipa *nipple carbon steel* NPS 2 dan yang lebih kecil harus *schedule* 160.

7.2 The minimum wall thickness for stainless steel pipe NPS 2 and smaller shall be schedule 80S. The minimum wall thickness for stainless steel pipe nipples NPS 2 and smaller shall be schedule 80S.

7.2 Ketebalan *minimum* dinding untuk pipa *stainless steel* NPS 2 dan yang lebih kecil harus *schedule* 80S. Ketebalan *minimum* dinding untuk pipa *nipple stainless steel* NPS 2 dan yang lebih kecil harus *schedule* 80S.

7.3 Plain end pipe may be threaded in the field and used in lieu of threaded pipe and nipples (maximum NPS 1-1/2 pipe).

7.3 Pipa *plain end/* ujung yang polos yang dapat diulir di lapangan dan digunakan sebagai pengganti pipa dan *nipple* berulir (maksimum pipa NPS 1-1/2).

7.4 All NPS 2 and larger piping shall be butt-weld and flanged construction and NPS 1-1/2 and smaller shall be socket weld, except where threaded or butt-weld joints are specifically permitted or required in the individual service classes. Internal Lined pipe, PVC pipe, GRE pipe, and ductile iron pipe is excluded from these requirements.

7.4 Semua pipa NPS 2 dan yang lebih besar harus *butt-weld* (lasan butt) dan konstruksi *flange* dan NPS 1-1/2 dan yang lebih kecil harus berupa *socket weld* (sambungan lasan soket), kecuali jika sambungan berulir atau *butt-weld* (lasan butt) secara khusus diizinkan atau yang diperlukan dalam kelas servis *individual*. Pipa saluran *internal*, pipa PVC, pipa GRE, dan pipa *ductile iron* dikecualikan dari persyaratan ini.

7.5 Short nipples or "close" nipples shall not be used.

7.5 *Nipple* pendek atau *nipple* "tertutup" tidak boleh digunakan.

7.6 Pipe sizes NPS 1-1/4, NPS 2-1/2, NPS 3-1/2, and NPS 5 shall not be used without prior OWNER approval.

7.6 Ukuran pipa NPS 1-1/4, NPS 2-1/2, NPS 3-1/2, dan NPS 5 tidak boleh digunakan tanpa persetujuan PEMILIK sebelumnya.

7.7 Line sizes smaller than NPS ½ are not covered by this Project Specification and shall be treated as instrumentation tubing.

7.7 Ukuran saluran yang lebih kecil daripada NPS ½ tidak tercakup dalam spesifikasi proyek ini dan harus diperlakukan sebagai *tubing* instrumentasi.

8. FITTINGS

- 8.1 Metallic elbows shall be the long radius type. Short radius, reducing elbows, and bends may be used only where required, because of space limitations and with prior OWNER approval. Non-metallic elbows shall be manufacturer's standard.
- 8.2 Threaded carbon steel swage nipples shall be minimum schedule 160.
- 8.3 The following types of fittings shall not be used:
- Street Elbows
 - Reducing on-the-run tees
 - Unions in socket weld pipe construction
 - Bar stock machined fittings (except for plugs)
- 8.4 Reducing or expander flanges shall not be used if space is available for pipe reducers. Reducing elbows, straight crosses, and reducing outlet crosses shall not be used except where Licensor design details allow for catalyst service.

9. MITERS

- 9.1 Miters shall not be used, unless specified in the individual service class, or with prior OWNER approval.

10. FLANGES, BLINDS & BLEED RINGS

- 10.1 Unless specified otherwise, carbon steel, low alloy, stainless steel, and high alloy non-ferrous flanges NPS 24 and smaller

8. FITTING

- 8.1 *Metallic elbow* harus tipe *radius* yang panjang. *Radius* pendek, *reducing elbow*, dan bengkokan/ tekukan hanya dapat digunakan jika diperlukan karena keterbatasan ruang dan dengan persetujuan PEMILIK sebelumnya. *Non-metallic elbow* harus menjadi standar pembuat.
- 8.2 *Threaded carbon steel swage nipple* harus memiliki *minimum schedule* 160.
- 8.3 Jenis-jenis *fitting* berikut yang tidak boleh digunakan:
- Street Elbow*
 - Reducing on-the-run tee*
 - Union* di konstruksi pipa sambungan lasan soket
 - Bar stock machined fitting* (kecuali untuk *plug*)
- 8.4 *Reducing* atau *expander flange* tidak boleh digunakan jika tersedia ruang untuk pipa *reducer*. *Reducing elbow*, *straight crosses*, dan *reducing outlet crosses* tidak boleh digunakan kecuali jika *detail* desain *Licensor* memungkinkan untuk servis katalis.

9. MITERS

- 9.1 *Miters* tidak boleh digunakan, kecuali ditentukan dalam kelas servis *individual*, atau dengan persetujuan PEMILIK sebelumnya.

10. FLANGE, BLIND & BLEED RING

- 10.1 Kecuali ditentukan lain, *carbon steel*, *low alloy*, *stainless steel*, dan *high alloy non-ferrous flanges* NPS 24 dan yang lebih kecil

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| <p>shall be furnished raised faced in accordance with ASME B16.5.</p> <p>10.2 Carbon steel, low alloy, stainless steel, and high alloy non-ferrous flanges NPS 26 thru NPS 60 shall be furnished raised faced in accordance with ASME B16.47 Series "A" or Series "B".</p> <p>10.3 Flanges on in-line piping SP items, control valves, instrumentation, equipment packages/skids, vessels, etc., shall follow the requirements stated above in section 8.1 and 8.2.</p> <p>10.4 Flange sizes outside of the scope of sections 8.1, 8.2, or 8.3 above shall be addressed as SP items. SP item scope shall include mating flanges, all required bolts to proper length, and a kammprofile gasket or equal (spare gaskets are recommended for construction needs).</p> <p>10.5 Unless specified otherwise, ductile iron flanges to be furnished flat faced in accordance with ASME B16.42.</p> <p>10.6 Cast Iron flanges shall not be used in-line.</p> <p>10.7 Class 150 flat face flanges (per ASME B16.5 or ASME B16.42) with full face gasket shall be used to mate with ASME B16.1 Class 125 flat face flanged valves and ASME B16.42 Class 150 flat face flanged valves.</p> <p>10.8 Class 300 raised face flanges (per ASME B16.5 or ASME B16.42) with flat ring gasket shall be used to mate with ASME B16.1 Class 250 raised face flanged valves.</p> <p>10.9 Flanges and flanged valves with a resilient (rubber, Teflon, or other) liner encapsulating the internal bore and extended out over the seating area on the</p> | <p>harus dilengkapi dengan <i>raised faced</i> sesuai dengan ASME B16.5.</p> <p>10.2 <i>Carbon steel, low alloy, stainless steel, dan high alloy non-ferrous flanges</i> NPS 26 sampai NPS 60 harus dilengkapi dengan <i>raised faced</i> sesuai dengan ASME B16.47 Seri "A" atau Seri "B".</p> <p>10.3 <i>Flange</i> yang terdapat pada item pipa SP, <i>control valve</i>, instrumentasi, paket peralatan/ <i>skid</i>, <i>vessel</i>, dll, harus mengikuti persyaratan yang disebutkan di atas dalam bagian 8.1 dan 8.2.</p> <p>10.4 Ukuran <i>flange</i> di luar lingkup dari bagian 8.1, 8.2, atau 8.3 di atas harus dianggap sebagai item SP. Lingkup <i>item</i> SP harus mencakup <i>flange</i> yang berpasangan, semua baut yang diperlukan dengan panjang yang tepat, dan <i>kammprofile gasket</i> atau sama dengan (<i>spare gasket</i> direkomendasikan untuk kebutuhan konstruksi).</p> <p>10.5 Kecuali ditentukan lain, <i>ductile iron flange</i> harus dilengkapi dengan <i>flat faced</i> sesuai dengan ASME B16.42.</p> <p>10.6 <i>Cast Iron flange</i> tidak boleh digunakan <i>in-line</i>.</p> <p>10.7 <i>Flat face flange</i> kelas 150 (per ASME B16.5 atau ASME B16.42) dengan <i>full face gasket</i> harus digunakan untuk dipasangkan dengan ASME B16.1 <i>flat face flange valve</i> kelas 125 dan ASME B16.42 <i>flat face flange valve</i> kelas 150.</p> <p>10.8 <i>Raised face flange</i> kelas 300 (per ASME B16.5 atau ASME B16.42) dengan <i>flat ring gasket</i> harus digunakan untuk dipasangkan dengan ASME B16.1 <i>raised face flange valve</i> kelas 250.</p> <p>10.9 <i>Flange dan flanged valve</i> dengan <i>resilient/ elastis</i> (karet, <i>Teflon</i>, atau lainnya) yang membungkus/ melapisi lubang internalnya dan memanjang di atas area dudukannya</p> |
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flanged ends do not require the use of a gasket for seating performance.

pada ujung *flange* yang tidak memerlukan penggunaan *gasket* untuk kinerja dudukannya.

10.10 Flanges in Fiberglass Reinforced Plastic (FRP/GRE), High Density Polyethylene (HDPE) or Chlorinated Polyvinyl Chloride (CPVC) service classes shall be flat face. The use of a flange adaptor with a backing flange is an acceptable alternative to a hub flange with a flat face. Where metallic flanges are bolted to non-metallic flanges, both flange faces shall be flat faced.

10.10 *Flange* dalam kelas servis *Fiberglass Reinforced Plastic (FRP/GRE)*, *High Density Polyethylene (HDPE)* atau *Chlorinated Polyvinyl Chloride (CPVC)* harus *flat face*. Penggunaan dari *flange adaptor* dengan *backing flange* merupakan alternatif yang dapat diterima untuk *hub flange* dengan *flat face*. Jika *flange* logam dibaut ke *flange* non-logam, kedua permukaan *flange* harus *flat faced*.

10.11 Weld neck flanges shall generally be used for process piping. Slips on flanges are not acceptable for any service.

10.11 *Weld neck flanges* umumnya harus digunakan untuk proses perpipaan. *Slip* pada *flange* tidak dapat diterima untuk servis apa pun.

10.12 The bore of weld neck flanges shall be the same as the ID of the pipe to which it is to be welded. Mismatch will be allowed only as permitted by the applicable piping code.

10.12 Lubang *weld neck flange* harus sama dengan ID pipa yang akan dilas. Ketidakcocokan tersebut akan diizinkan oleh kode pipa yang berlaku.

10.13 Thickness of line blanks (i.e. Figure-8 blanks, Paddle blanks, and Paddle Spacers) in sizes NPS ½ to NPS 24 shall be per ASME B16.48. Larger than NPS 24 shall be calculated per B31.3 and addressed as SP items.

10.13 Ketebalan *line blank* (yaitu, gambar-8 *blank*, *paddle blank*, dan *paddle spacer*) dalam ukuran NPS ½ sampai NPS 24 harus sesuai dengan ASME B16.48. Lebih besar dari NPS 24 harus dihitung per B31.3 dan ditunjukkan sebagai item SP.

10.14 Figure 8 Blanks (Spectacle Blank) shall not be installed in insulated piping systems were they can become heat sinks for the line.


10.14 Gambar 8 *Blank (Spectacle Blank)* tidak boleh diinstal pada sistem insulasi perpipaan jika mereka dapat menjadi *heatsink* untuk saluran tersebut.

10.15 In general, maximum size of Figure-8 blank (spectacle blank) shall be used as follows:

10.15 Secara umum, ukuran maksimum pada gambar-8 *blank (spectacle blank)* harus digunakan sebagai berikut:

Flange Pressure Class	Maximum Size
150	NPS 12
300	NPS 12
600	NPS 8

Kelas <i>Flange Pressure</i>	Ukuran Maksimum
150	NPS 12
300	NPS 12
600	NPS 8

 Engineering Technical Standards & Procedures	SUBHOLDING REFINING & PETROCHEMICAL	Doc. No. : RP-ETS-PIP-GS-0001-00-2021
	GENERAL SPECIFICATION GENERAL NOTES PIPING MATERIAL SPECIFICATION	Page No. : 17 / 31

Flange Pressure Class	Maximum Size
900 thru 2500	NPS 6

Kelas <i>Flange</i> <i>Pressure</i>	Ukuran Maksimum
900 sampai 2500	NPS 6

10.16 Bleed rings shall not be used in sizes larger than NPS 12 or for pressure ratings greater than ASME Class 600 without OWNER approval.

10.16 *Bleed ring* tidak boleh digunakan dalam ukuran yang lebih besar dari NPS 12 atau pada peringkat tekanan yang lebih besar dari ASME kelas 600 tanpa persetujuan PEMILIK.

10.17 Unless specified otherwise bleed ring taps shall be NPS $\frac{3}{4}$ minimum and shall be either socket weld connection or for butt-weld, full penetration connection depending on piping class.

10.17 Kecuali ditentukan lain *bleed ring tap* harus *minimum* NPS $\frac{3}{4}$ dan harus berupa koneksi/ sambungan lasan soket atau untuk *butt weld* (lasan *butt*), koneksi penetrasi penuh tergantung pada kelas perpipaan.

11. ORIFICE FLANGES

11. ORIFICE FLANGE

11.1 Orifice weld neck flanges shall be as specified in OWNER General Specification RP-ETS-PIP-GS-0009-00-2021.

11.1 *Orifice weld neck flange* harus seperti yang ditentukan oleh PEMILIK *General Specification* RP-ETS-PIP-GS-0009-00-2021.

12. BOLTING

12. BAUT

12.1 Bolting shall be as specified in OWNER General Specification RP-ETS-PIP-GS-0009-00-2021.

12.1 Baut harus seperti yang ditentukan oleh PEMILIK *General Specification* RP-ETS-PIP-GS-0009-00-2021.

12.2 Special length bolts shall be used to join the non-metallic flanges and valves, lined flanges and lined valves, and line blanks.

12.2 Baut panjang yang khusus harus digunakan untuk menyambung *flange* dan *valve* non-logam, *lined flange* dan *lined valve*, serta *line blank*.

12.3 Bolts used on flange sizes outside of the scope of sections 8.1, 8.2, or 8.3 above shall be addressed as SP items. Refer to 8.4 above.

12.3 Baut yang digunakan pada ukuran luar *flange* dari lingkup bagian 8.1, 8.2, atau 8.3 diatas harus ditempatkan sebagai item SP. Merujuk ke 8.4.

12.4 Bolt Tensioning & Bolt-Up requirements shall be as specified in Project Specification (to be developed during Detail Design).

12.4 Persyaratan *bolt tensioning & bolt-up* harus seperti yang ditentukan pada spesifikasi proyek (akan dikembangkan selama *detail* desain).

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| <p>12.5 Bolting materials shall be color coded in accordance with the requirements in Project Specification MP2-ETS-PIP-GS-0004-00-2018.</p> <p>12.6 Stud Bolts with 2 nuts (on each end) shall be used instead of hex head cap screws when required at certain types of valves as specified in Project Specification (to be developed during Detail Design).</p> <p>12.7 Stud bolts, jackscrews and cap screws shall be threaded full length, threads shall be UNC for 1" (25mm) and smaller diameters and 8UN for larger diameters, class 2 fit, in accordance with ASME B1.1.</p> <p>12.8 Bolts shall be specified as imperial diameter by metric length.</p> <p>13. GASKETS</p> <p>13.1 Gaskets shall be as specified in Section 8.0 above and in the contained service classes.</p> <p>13.2 Gaskets on in-line piping SP items, control valves, instrumentation, equipment packages/skids, vessels, etc., shall follow the requirements stated above in section 11.1.</p> <p>13.3 Gasket sizes outside of the scope of sections 11.1 or 11.2 above shall be addressed as SP items. Refer to 8.4 above.</p> <p>13.4 Full face gasket shall be used to mate with ASME B16.1 Class 125 flat face flanged valves and ASME B16.42 Class 150 flat face flanged valves.</p> <p>13.5 Flat ring gasket shall be used to mate with ASME B16.1 Class 250 raised face flanged valves.</p> | <p>12.5 <i>Material</i> baut harus diberi kode warna sesuai dengan persyaratan dalam <i>Project Specification</i> RP-ETS-PIP-GS-0004-00-2021.</p> <p>12.6 <i>Stud bolt</i> (baut <i>stud</i>) dengan 2 (dua) mur (pada setiap ujungnya) harus digunakan sebagai pengganti <i>hex head cap screw</i> bila diperlukan pada tipe <i>valve</i> tertentu seperti yang ditentukan dalam spesifikasi proyek (akan dikembangkan selama <i>detail</i> desain).</p> <p>12.7 <i>Stud bolt</i> (baut <i>stud</i>), <i>jackscrew</i> dan <i>cap screw</i> harus di ulir dengan panjang yang penuh, ulir harus UNC untuk diameter 1" (25mm) dan yang lebih kecil dengan 8UN untuk diameter yang lebih besar, kelas 2 <i>fit</i>, sesuai dengan ASME B1.1.</p> <p>12.8 Baut harus ditentukan sebagai <i>imperial diameter</i> dengan <i>metric length</i>.</p> <p>13. GASKET</p> <p>13.1 <i>Gasket</i> harus seperti yang ditentukan dalam bagian 8.0 di atas dan di dalam kelas servis.</p> <p>13.2 <i>Gasket</i> pada item SP perpipaan <i>in-line</i>, <i>control valve</i>, instrumentasi, paket peralatan/<i>skid</i>, <i>vessel</i>, dll, harus mengikuti persyaratan yang disebutkan di atas dalam bagian 11.1.</p> <p>13.3 Ukuran <i>gasket</i> di luar lingkup bagian 11.1 atau 11.2 di atas harus disebut sebagai item SP. Lihat 8.4 di atas.</p> <p>13.4 <i>Full face gasket</i> harus digunakan untuk dipasangkan dengan ASME B16.1 <i>flat face flange valve</i> kelas 125 dan ASME B16.42 <i>flat face flange valve</i> kelas 150.</p> <p>13.5 <i>Flat ring gasket</i> harus digunakan untuk dipasangkan dengan ASME B16.1 <i>raised face flange valve</i> kelas 250.</p> |
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| <p>13.6 Flanges and flanged valves with a resilient (rubber, Teflon, or other) liner encapsulating the internal bore and extended out over the seating area on the flanged ends do not require the use of a gasket for seating performance.</p> <p>13.7 Full face gasket shall be used to mate with flat face flanges in Fiberglass Reinforced Plastic (FRP/GRE), High Density Polyethylene (HDPE) or Chlorinated Polyvinyl Chloride (CPVC) service classes.</p> <p>14. THREAD COMPOUND ON PIPE THREADS</p> <p>14.1 Threaded joints shall use a joint compound that is appropriate for both operating temperature range and service. Proper joint compound will be done by Engineering during the Detailed Engineering Phase.</p> <p>14.2 Unless approved by OWNER, no teflon thread joint tape shall be used on threaded joint construction due to potential for tape to ingress into the system and obstruct instrumentation and small valves.</p> <p>14.3 No thread compound shall be used on joints to be seal welded. All seal welding requires prior engineering approval, except where specified in individual pipe classes to weld plugs after hydrotest.</p> <p>15. PIPING ASSEMBLIES</p> <p>15.1 Unless otherwise detailed on piping drawings, primary connections shall be made in accordance with the following</p> | <p>13.6 <i>Flange dan flanged valve dengan resilient (karet, Teflon, atau lainnya) yang membungkus/ melapisi lubang internalnya dan memanjang di atas area dudukannya pada ujung flange yang tidak memerlukan penggunaan gasket untuk kinerja dudukannya.</i></p> <p>13.7 <i>Full face gasket harus digunakan untuk dipasangkan dengan flat face flanges di kelas servis Fiberglass Reinforced Plastic (FRP/GRE), High Density Polyethylene (HDPE) atau Chlorinated Polyvinyl Chloride (CPVC).</i></p> <p>14. SENYAWA YANG BERULIR PADA ULIRAN PIPA</p> <p>14.1 Sambungan berulir harus menggunakan senyawa sambungan yang sesuai untuk tingkat suhu pengoperasian dan servis. Senyawa sambungan yang tepat akan dilakukan oleh <i>Engineering</i> selama fase <i>Detailed Engineering</i>.</p> <p>14.2 Kecuali disetujui oleh PEMILIK, pita sambungan ulir <i>teflon</i> tidak boleh digunakan pada konstruksi sambungan ulir karena potensi pita untuk masuk ke dalam sistem dan menghalangi instrumentasi dan <i>valve</i> kecil.</p> <p>14.3 Tidak ada senyawa ulir yang boleh digunakan pada sambungan yang akan dilas <i>seal</i>. Semua pengelasan <i>seal</i> memerlukan persetujuan <i>engineering</i> sebelumnya, kecuali jika ditentukan dalam kelas pipa <i>individual</i> untuk mengelas <i>plug</i> (sumbat) setelah uji hidro.</p> <p>15. RAKITAN PERPIPAAN</p> <p>15.1 Kecuali dirinci lain pada gambar perpipaan, koneksi utama harus dibuat sesuai dengan <i>detail</i> perakitan standar proyek berikut,</p> |
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project standard assembly details, which will be issued during Detail Design of the Project.

yang akan diterbitkan selama *detail* desain dari proyek.

15.2 Sample Connections shall be in accordance with the Service and the Project Sample System P&ID's.

15.2 Sambungan *sample* harus sesuai dengan servis dan *Project Sample System* P&ID's.

16. FABRICATION AND INSTALLATION REQUIREMENTS

16. PERSYARATAN FABRIKASI DAN INSTALASI

16.1 Shop fabrication of piping and Welding of pipes shall be furnished in accordance with OWNER General Specification RP-ETS-PIP-GS0012-00-2021.

16.1 *Shop* fabrikasi perpipaan dan pengelasan pipa harus dilengkapi sesuai dengan PEMILIK *General Specification* RP-ETS-PIP-GS0012-00-2021.

16.2 Non-destructive examination (NDE) and post weld heat treatment shall be in accordance with ASME B31.3.

16.2 *Non-destructive examination* (NDE) dan *post weld heat treatment* harus sesuai dengan ASME B31.3.

16.3 Aboveground pipe installation and testing shall be in accordance with OWNER General Specification RP-ETS-PIP-GS-0015-00-2021.

16.3 Instalasi dan pengujian pipa di atas tanah harus sesuai dengan PEMILIK *General Specification* RP-ETS-PIP-GS-0015-00-2021.

16.4 Underground pipe installation and testing shall be in accordance with OWNER General Specification RP-ETS-PIP-GS-0002-00-2021.

16.4 Instalasi dan pengujian pipa bawah tanah harus sesuai dengan PEMILIK *General Specification* RP-ETS-PIP-GS-0002-00-2021.

17. CORROSION ALLOWANCE

17. KELONGGARAN KOROSI

17.1 When the corrosion allowance specified in an individual service class is referred to as nominal, the minimum acceptable corrosion allowance shall be 80 percent of the nominal, rounded off to the nearest one hundredth of an inch. (Example: if nominal is 1.5 mm (0.0625"), the minimum shall be 1.2mm (0.050")).

17.1 Ketika kelonggaran korosi yang ditentukan dalam kelas servis *individual* dirujuk sebagai *nominal*, *minimum* kelonggaran korosi yang dapat diterima harus 80 persen dari *nominal*, dibulatkan ke 1/100 (seperseratus) inci terdekat. (Contoh: jika nominalnya 1,5 mm (0.0625"), minimumnya harus 1,2 mm (0.050)).

18. BRANCHES

18. CABANG

18.1 Ninety-degree branch connections shall be made in accordance with the branch

18.1 Koneksi cabang 90 (sembilan puluh) derajat harus dibuat sesuai dengan tabel cabang

table as specified by each individual service class.

- 18.2 For branch connections other than ninety degrees, "Piping Stress Engineering" shall be consulted.
- 18.3 The use of "stub-in" branch connections can be used only where indicated in the specific service classes. Stub-ins with reinforcing pads calculated in accordance with ASME B31.3 are acceptable for specific applications, including hydrocarbon services.

19. LINE REDUCTIONS

- 19.1 Line reductions in metallic piping shall normally be made in accordance with the following: ASME B31.3 and Boiler Code (ASME Section 1) Piping: for small end NPS 1-1/2 and smaller use swage nipples; for small end NPS 2 and larger - use reducers.

20. PURCHASE DESCRIPTIONS

- 20.1 Complete purchasing descriptions shall develop based on Piping Service Class Index in the Piping Purchase Description Specification.

21. SERVICE CLASS INDEX

Piping components and materials are specified in individual service classes. The Piping Service Class Index summarizes all the service classes to be used on the OWNER Project.

- 21.1 The Piping Line Class Designator System
- a) The Piping Line Class Designator System shall consist of six

sebagaimana ditentukan oleh masing-masing kelas servis *individual*.

- 18.2 Untuk koneksi cabang selain 90 (sembilan puluh) derajat, "*Piping Stress Engineering*" harus dikonsultasikan.
- 18.3 Penggunaan koneksi cabang "*stub-in*" hanya dapat digunakan jika ditunjukkan dalam kelas servis tertentu. *Stub-in* dengan penguat bantalan yang dihitung sesuai dengan ASME B31.3 dapat diterima untuk aplikasi tertentu, termasuk servis hidrokarbon.

19. LINE REDUCTION

- 19.1 *Line reduction* pada pipa logam biasanya harus dilakukan sesuai dengan yang berikut: ASME B31.3 dan *Codes Boiler* (ASME Section 1) Perpipaan: untuk NPS 1-1/2 ujung kecil dan yang lebih kecil gunakan *swage nipple*; untuk NPS 2 ujung kecil dan yang lebih besar - gunakan *reducer*.

20. DESKRIPSI PEMBELIAN

- 20.1 Deskripsi pembelian yang lengkap harus dipakai berdasarkan *Piping Service Class Index* pada deskripsi spesifikasi pembelian pipa.

21. INDEKS KELAS SERVIS

Komponen dan *material* yang ditentukan dalam kelas servis *individual*. Indeks kelas servis perpipaan merangkum semua kelas servis yang akan digunakan pada proyek PEMILIK.

- 21.1 Sistem Penunjuk Kelas Saluran Perpipaan
- a) Sistem penunjuk kelas saluran perpipaan harus terdiri dari enam

alternating, alphanumeric fields containing one or two characters each (maximum of ten characters). The first five fields are mandatory while the sixth is optional.

- b) Each field shall describe various features of a piping line class.

21.2 Field Definitions

- 1) First Field – Pressure Rating, The pressure rating field shall consist of one or two numeric characters in accordance with Table 1.
- 2) Second Field – Piping Material, the second field shall define the nominal pipe material. The nominal pipe material field shall consist of two alphabetic characters in accordance with Table 2.
- 3) Third Field – Corrosion Allowance, the third field shall define the corrosion/erosion allowance. The corrosion/erosion allowance field shall consist of one numeric character in accordance with Table 3.
- 4) Fourth Field – Joint Construction, the fourth field shall define the joint construction/construction type. The joint construction/construction type field shall consist of one alphabetic character in accordance with Table 4.
- 5) Fifth Field – Sequential Number, the fifth field shall define a sequential number for numbering variations of a line class. The sequential number field shall consist of two numeric characters.
- 6) Sixth Field – Owner’s Designation (As Required), to change the designation number if revisions, alterations, and/or additions to a piping line class

alternating, alphanumeric field yang mengandung masing-masing satu atau dua karakter (maksimal sepuluh karakter). Lima *field* pertama adalah wajib sedangkan yang keenam adalah opsional.

- b) Setiap *field* harus menjelaskan berbagai fitur dari kelas saluran perpipaan.

21.2 Definisi *Field*

- 1) *Field* pertama – *rating/* peringkat tekanan, *rating/* peringkat tekanan *field* harus terdiri dari satu atau dua karakter numerik sesuai dengan Tabel 1.
- 2) *Field* kedua – *material* pipa, *field* kedua harus menentukan *nominal material* pipa. *Nominal field material* pipa harus terdiri dari dua karakter alfabet sesuai dengan Tabel 2.
- 3) *Field* ketiga – *allowance/* kelonggaran korosi, *field* ketiga harus menentukan *allowance/* kelonggaran korosi/ erosi. *Allowance/* kelonggaran korosi/ erosi *field* harus terdiri dari satu karakter numerik sesuai dengan Tabel 3.
- 4) *Field* keempat – sambungan konstruksi, *field* keempat harus menentukan tipe konstruksi/ sambungan konstruksi. Tipe *Field* konstruksi/ sambungan konstruksi harus terdiri dari satu karakter alfabet sesuai dengan Tabel 4.
- 5) *Field* kelima – nomor urut, *field* kelima harus menentukan nomor urut untuk variasi penomoran kelas saluran. Nomor urut *field* harus terdiri dari dua karakter numerik.
- 6) *Field* keenam – penandaan/ penamaan Pemilik (sesuai kebutuhan), untuk mengubah nomor penandaan jika diperlukan revisi, alterasi, dan/ atau



Engineering Technical
Standards & Procedures

**SUBHOLDING
REFINING & PETROCHEMICAL**

**GENERAL SPECIFICATION
GENERAL NOTES PIPING
MATERIAL SPECIFICATION**

Doc. No. :
RP-ETS-PIP-GS-0001-00-2021

Page No. : 23 / 31

are required.

21.3 Example Designation

3 CS 1 S 01

Where:

penambahan kelas saluran perpipaan.

21.3 Contoh Penandaan/ Penamaan

3 CS 1 S 01

Dimana:

First Field:	3	ASME Pressure Class 300	<i>Field Pertama:</i>	3	<i>ASME Pressure Class 300</i>
Second Field:	CS	Carbon Steel Base Material Piping System	<i>Field Kedua:</i>	CS	<i>Material dasar carbon steel/ sistem perpipaan</i>
Third Field:	1	Nominal Corrosion Allowance in multiples of 1/16"	<i>Field Ketiga:</i>	1	<i>Nominal kelonggaran korosi dalam kelipatan 1/16"</i>
Fourth Field:	S	Socketweld Small Bore Const and Buttweld and Flanged Large Bore Const	<i>Field Keempat:</i>	S	<i>Socketweld Small Bore Const dan Flanged Large Bore Const</i>
Fifth Field:	01	Sequence Number (first in this piping material/pressure class series)	<i>Field Kelima:</i>	01	<i>Nomor urut (pertama dalam material pipa/ seri kelas tekanan)</i>

The letters and numbers to be used for numbering piping classes are indicated below,

Huruf dan angka yang akan digunakan untuk penomoran kelas perpipaan ditunjukkan di bawah ini,

1ST FIELD - PRESSURE RATING

ASME B16.5 or B16.47 Flange Class	
1	150
3	300
4	400
6	600
9	900

1ST FIELD – PERINGKAT TEKINAN

ASME B16.5 atau B16.47 Flange Class	
1	
3	300
4	400
6	600
9	900

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Engineering Technical
Standards & Procedures

**SUBHOLDING
REFINING & PETROCHEMICAL**

**GENERAL SPECIFICATION
GENERAL NOTES PIPING
MATERIAL SPECIFICATION**

Doc. No. :
RP-ETS-PIP-GS-0001-00-2021

Page No. : 24 / 31

ASME B16.5 or B16.47 Flange Class	
15	1500
25	2500
ASME 16.1 Cast Iron Flange Class	
12	125
13	250
80-99	Reserved for Owner- Specific Rating Designations

ASME B16.5 atau B16.47 <i>Flange Class</i>	
15	1500
25	2500
ASME 16.1 <i>Cast Iron Flange Class</i>	
12	125
13	250
80-99	Dicadangkan untuk penandaan/ penamaan <i>rating</i> / peringkat khusus pemilik

2ND FIELD - LINK MATERIAL

Aluminum Alloys	
AA	Aluminum Alloy 1100, H112 temper
AB	Aluminum Alloy 3003, H112 temper
AC	Aluminum Alloy 5052, H32 temper
AD	Aluminum Alloy 5454, H112 temper
AE	Aluminum Alloy 6061, T6 temper
AF	Aluminum Alloy 6063, T1 temper
AG	Aluminum Alloy 6063, T6 temper
Brass, Bronze, Copper, and Copper Alloys	
BA	Aluminum-Bronze
BB	Red Brass

2ND FIELD - LINK MATERIAL

<i>Aluminum Alloys</i>	
AA	<i>Aluminum Alloy 1100, H112 temper</i>
AB	<i>Aluminum Alloy 1100, H112 temper</i>
AC	<i>Aluminum Alloy 3003, H112 temper</i>
AD	<i>Aluminum Alloy 5052, H32 temper</i>
AE	<i>Aluminum Alloy 5454, H112 temper</i>
AF	<i>Aluminum Alloy 6061, T6 temper</i>
AG	<i>Aluminum Alloy 6063, T1 temper</i>
<i>Brass, Bronze, Copper, dan Copper Alloys</i>	
BA	<i>Aluminum-Bronze</i>
BB	<i>Red Brass</i>

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Engineering Technical
Standards & Procedures

**SUBHOLDING
REFINING & PETROCHEMICAL**

**GENERAL SPECIFICATION
GENERAL NOTES PIPING
MATERIAL SPECIFICATION**

Doc. No. :
RP-ETS-PIP-GS-0001-00-2021

Page No. : 25 / 31

Brass, Bronze, Copper, and Copper Alloys	
BC	Copper, deoxidized pure
BD	90-10 Cu-Ni
BE	80-20 Cu-Ni
BF	70-30 Cu-Ni
BG	Silicon-Bronze
BT	Cast Leaded Tin Bronze
Carbon and Low-Alloy Steels	
CA	Impact Tested Carbon Steel
CB	Killed Carbon Steel
CC	Low Carbon Steel
CG	Galvanized Carbon Steel
CH	Killed Carbon Steel, PWHT for Process
CJ	1-1/4 Cr -1/2 Mo Alloy Steel
CK	2-1/4 Cr -1 Mo Alloy Steel
CL	5 Cr -1/2 Mo Alloy Steel
CM	9 Cr-1 Mo Alloy Steel
CN	12 Cr Alloy Steel
CS	Carbon Steel
2ND FIELD - LINK MATERIAL	
Iron, Ductile, Malleable, or Cast	
DA	Ductile Iron, Austenitic
DC	Cast Iron, Grey
DF	Ductile Iron, Ferritic
DM	Malleable Iron

<i>Brass, Bronze, Copper, dan Copper Alloys</i>	
BC	<i>Copper, deoxidized pure</i>
BD	<i>90-10 Cu-Ni</i>
BE	<i>80-20 Cu-Ni</i>
BF	<i>70-30 Cu-Ni</i>
BG	<i>Silicon-Bronze</i>
BT	<i>Cast Leaded Tin Bronze</i>
<i>Carbon dan Low-Alloy Steels</i>	
CA	<i>Impact Tested Carbon Steel</i>
CB	<i>Killed Carbon Steel</i>
CC	<i>Low Carbon Steel</i>
CG	<i>Galvanized Carbon Steel</i>
CH	<i>Killed Carbon Steel, PWHT untuk Proses</i>
CJ	<i>1-1/4 Cr -1/2 Mo Alloy Steel</i>
CK	<i>2-1/4 Cr -1 Mo Alloy Steel</i>
CL	<i>5 Cr -1/2 Mo Alloy Steel</i>
CM	<i>9 Cr-1 Mo Alloy Steel</i>
CN	<i>12 Cr Alloy Steel</i>
CS	<i>Carbon Steel</i>
2ND FIELD - LINK MATERIAL	
<i>Iron, Ductile, Malleable, atau Cast</i>	
DA	<i>Ductile Iron, Austenitic</i>
DC	<i>Cast Iron, Grey</i>
DF	<i>Ductile Iron, Ferritic</i>
DM	<i>Malleable Iron</i>

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Engineering Technical
Standards & Procedures

**SUBHOLDING
REFINING & PETROCHEMICAL**

**GENERAL SPECIFICATION
GENERAL NOTES PIPING
MATERIAL SPECIFICATION**

Doc. No. :
RP-ETS-PIP-GS-0001-00-2021

Page No. : 26 / 31

Fiberglass Reinforced Plastics (FRPs) and Resins	
FC	Carbon Fiber Reinforced Furan
FE	Glass Fiber Reinforced Epoxy
FF	Glass Fiber Reinforced Furan
FP	Glass Fiber Reinforced Polyester
FV	Glass Fiber Reinforced Vinyl Ester
Non-Metals/Non-Plastics	
KA	Clay
KB	Concrete
KC	Glass
KD	Ceramic
Lined or Internally Coated Steel/Iron/Etc.	
LA	PFA (Perfluoroalkoxy Alkane polymer)-lined Carbon Steel
LB	Cement-lined Ductile Iron
LC	Cement-lined Carbon Steel
LD	PTFE (Polytetrafluoroethylene)-lined Ductile Iron
LE	Epoxy-Uned Carbon Steel
LF	FEP (Perfluoro Ethylene-Propylene copolymer)-lined Carbon Steel
LG	Glass-lined Carbon Steel
LH	ECTFE (Ethylene-Chlorotrifluoroethylene)-lined Carbon Steel

<i>Fiberglass Reinforced Plastics (FRPs) dan Resins</i>	
FC	<i>Carbon Fiber Reinforced Furan</i>
FE	<i>Glass Fiber Reinforced Epoxy</i>
FF	<i>Glass Fiber Reinforced Furan</i>
FP	<i>Glass Fiber Reinforced Polyester</i>
FV	<i>Glass Fiber Reinforced Vinyl Ester</i>
<i>Non-Metals/Non-Plastics</i>	
KA	<i>Clay</i>
KB	<i>Concrete</i>
KC	<i>Glass</i>
KD	<i>Ceramic</i>
<i>Lined atau Internally Coated Steel/ Iron/ Dll.</i>	
LA	<i>PFA (Perfluoroalkoxy Alkane polymer)-lined Carbon Steel</i>
LB	<i>Cement-lined Ductile Iron</i>
LC	<i>Cement-lined Carbon Steel</i>
LD	<i>PTFE (Polytetrafluoroethylene)-lined Ductile Iron</i>
LE	<i>Epoxy-Uned Carbon Steel</i>
LF	<i>FEP (Perfluoro Ethylene-Propylene copolymer)-lined Carbon Steel</i>
LG	<i>Glass-lined Carbon Steel</i>
LH	<i>ECTFE (Ethylene-Chlorotrifluoroethylene)-lined Carbon Steel</i>

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Lined or Internally Coated Steel/Iron/Etc.		
LJ	PFA (Perfluoroalkoxy Alkane polymer)-lined Ductile Iron	
LK	PVDF (Polyvinylidene Fluoride)-lined Carbon Steel	
LP	PP (Polypropylene)-lined Carbon Steel	
LR	Rubber-lined Carbon Steel	
LS	PVDC (Polyvinylidene Chloride)-lined Carbon Steel	
LT	PTFE (Polytetrafluoroethylene)-lined Carbon Steel	
LV	PVC (Polyvinyl Chloride)-lined Carbon Steel	
2 ND FIELD - LINK MATERIAL		
MI sc. Metals, Not Covered Elsewhere		
MG	Gold	
ML	Lead	
MS	Silver	
MT	Tantalum	
MY	Zirconium + Cb	
MZ	Zirconium	
Nickel and Nickel Alloys		
NA	Alloy C-2000	UNS N06200
NB	Alloy B2	UNS N10665
NC	Alloy C276	UNS N10276
ND	Alloy B	UNS N10001
NE	Alloy C4	UNS N06455
NF	Alloy C22	UNS N06022
NG	Alloy G	UNS N06007

<i>Lined atau Internally Coated Steel/ Iron/ Dll.</i>		
LJ	<i>PFA (Perfluoroalkoxy Alkane polymer)-lined Ductile Iron</i>	
LK	<i>PVDF (Polyvinylidene Fluoride)-lined Carbon Steel</i>	
LP	<i>PP (Polypropylene)-lined Carbon Steel</i>	
LR	<i>Rubber-lined Carbon Steel</i>	
LS	<i>PVDC (Polyvinylidene Chloride)-lined Carbon Steel</i>	
LT	<i>PTFE (Polytetrafluoroethylene)-lined Carbon Steel</i>	
LV	<i>PVC (Polyvinyl Chloride)-lined Carbon Steel</i>	
<i>2ND FIELD - LINK MATERIAL</i>		
<i>MI sc. Metals, Tidak tercakup di tempat lain</i>		
MG	<i>Gold</i>	
ML	<i>Lead</i>	
MS	<i>Silver</i>	
MT	<i>Tantalum</i>	
MY	<i>Zirconium + Cb</i>	
MZ	<i>Zirconium</i>	
<i>Nickel dan Nickel Alloys</i>		
NA	<i>Alloy C-2000</i>	<i>UNS N06200</i>
NB	<i>Alloy B2</i>	<i>UNS N10665</i>
NC	<i>Alloy C276</i>	<i>UNS N10276</i>
ND	<i>Alloy B</i>	<i>UNS N10001</i>
NE	<i>Alloy C4</i>	<i>UNS N06455</i>
NF	<i>Alloy C22</i>	<i>UNS N06022</i>
NG	<i>Alloy G</i>	<i>UNS N06007</i>



Engineering Technical
Standards & Procedures

**SUBHOLDING
REFINING & PETROCHEMICAL**

**GENERAL SPECIFICATION
GENERAL NOTES PIPING
MATERIAL SPECIFICATION**

Doc. No. :
RP-ETS-PIP-GS-0001-00-2021

Page No. : 28 / 31

Nickel and Nickel Alloys		
NH	Alloy B3	UNS N10675
NJ	Alloy G3	UNS N06985
NK	Nickel 200	UNS N02200
NL	Nickel 201	UNS N02201
NM	Alloy 400	UNS N04400
NN	Alloy C30	UNS N06030
NP	Alloy 600	UNS N06600
NQ	Alloy 625	UNS N06625
NR	Alloy 800	UNS N08800
NS	Alloy 825	UNS N08825
NT	Alloy 20	UNS N08020
NU	Alloy 20Cb-3	UNS N08020
NV	Alloy 20-Mod	UNS N08320
NW	Alloy 25-6 Moly	UNS N08926
NX	Alloy AL-6XN	UNS N08367
Plastics (other than FRPs)		
PA		
PB	PB (Polybutylene)	
PC	CAB (Cellulose acetate-butyrate)	
PD	HDPE (High Density Polyethylene)	
2ND FIELD - LINK MATERIAL		
Plastics (other than FRPs)		
PD	HDPE (High Density Polyethylene)	
PE	LDPE (Low Density Polyethylene)	

<i>Nickel dan Nickel Alloys</i>		
NH	<i>Alloy B3</i>	UNS N10675
NJ	<i>Alloy G3</i>	UNS N06985
NK	<i>Nickel 200</i>	UNS N02200
NL	<i>Nickel 201</i>	UNS N02201
NM	<i>Alloy 400</i>	UNS N04400
NN	<i>Alloy C30</i>	UNS N06030
NP	<i>Alloy 600</i>	UNS N06600
NQ	<i>Alloy 625</i>	UNS N06625
NR	<i>Alloy 800</i>	UNS N08800
NS	<i>Alloy 825</i>	UNS N08825
NT	<i>Alloy 20</i>	UNS N08020
NU	<i>Alloy 20Cb-3</i>	UNS N08020
NV	<i>Alloy 20-Mod</i>	UNS N08320
NW	<i>Alloy 25-6 Moly</i>	UNS N08926
NX	<i>Alloy AL-6XN</i>	UNS N08367
<i>Plastics (selain FRPs)</i>		
PA		
PB	<i>PB (Polybutylene)</i>	
PC	<i>CAB (Cellulose acetate-butyrate)</i>	
PD	<i>HDPE (High Density Polyethylene)</i>	
2ND FIELD - LINK MATERIAL		
<i>Plastics (selain FRPs)</i>		
PD	<i>HDPE (High Density Polyethylene)</i>	
PE	<i>LDPE (Low Density Polyethylene)</i>	

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Plastics (other than FRPs)	
PF	PFA (Perfluoroalkoxy Alkane copolymer)
PG	FEP (Perfluoro Ethylene-Propylene copolymer)
PK	PVDF (Polyvinylidene Fluoride)
PP	PP (Polypropylene)
PS	PVDC (Polyvinylidene Chloride)
PT	PTFE (Polytetrafluoroethylene)
PU	CPVC (Chlorinated Polyvinyl Chloride)
PV	PVC (Polyvinyl Chloride)
Stainless (High-Alloy) Steels	
SA	Type 304/304L SS
SC	Type 304H SS
SD	Type 316/316L SS
SF	Type 316H SS
SG	Type 317 SS
SH	Type 317L SS
SJ	Type 321 SS
SK	Type 321H SS
SL	Type 347 SS
SM	Type 347H SS
SN	Type 904L SS UNS N08904
SP	2205 Duplex SS UNS S31803
SR	Type 304 SS
SS	Type 304L SS
ST	Type 316 SS

<i>Plastics (selain FRPs)</i>	
PF	PFA (<i>Perfluoroalkoxy Alkane copolymer</i>)
PG	FEP (<i>Perfluoro Ethylene-Propylene copolymer</i>)
PK	PVDF (<i>Polyvinylidene Fluoride</i>)
PP	PP (<i>Polypropylene</i>)
PS	PVDC (<i>Polyvinylidene Chloride</i>)
PT	PTFE (<i>Polytetrafluoroethylene</i>)
PU	CPVC (<i>Chlorinated Polyvinyl Chloride</i>)
PV	PVC (<i>Polyvinyl Chloride</i>)
<i>Stainless (High-Alloy) Steels</i>	
SA	<i>Type 304/304L SS</i>
SC	<i>Type 304H SS</i>
SD	<i>Type 316/316L SS</i>
SF	<i>Type 316H SS</i>
SG	<i>Type 317 SS</i>
SH	<i>Type 317L SS</i>
SJ	<i>Type 321 SS</i>
SK	<i>Type 321H SS</i>
SL	<i>Type 347 SS</i>
SM	<i>Type 347H SS</i>
SN	<i>Type 904L SS UNS N08904</i>
SP	<i>2205 Duplex SS UNS S31803</i>
SR	<i>Type 304 SS</i>
SS	<i>Type 304L SS</i>
ST	<i>Type 316 SS</i>

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Engineering Technical
Standards & Procedures

**SUBHOLDING
REFINING & PETROCHEMICAL**

**GENERAL SPECIFICATION
GENERAL NOTES PIPING
MATERIAL SPECIFICATION**

Doc. No. :
RP-ETS-PIP-GS-0001-00-2021

Page No. : 30 / 31

Stainless (High-Alloy) Steels		<i>Stainless (High-Alloy) Steels</i>	
SU	Type 316L SS	SU	<i>Type 316L SS</i>
SV	254 SMO UNS S31254	SV	<i>254 SMO UNS S31254</i>
Titanium and Titanium Alloys		<i>Titanium dan Titanium Alloys</i>	
TB	Titanium Grade 2	TB	<i>Titanium Grade 2</i>
TC	Titanium Grade 3	TC	<i>Titanium Grade 3</i>
TD	Titanium Grade 7	TD	<i>Titanium Grade 7</i>
IE	Titanium Grade 12	IE	<i>Titanium Grade 12</i>

**3RD FIELD - CORROSION / EROSION
ALLOWANCE**

**3RD FIELD - KELONGGARAN KOROSI /
EROSI**

SYMBOL	ALLOWANCE (NOMINAL)	SIMBOL	KELONGGARAN (NOMINAL)
0	zero corrosion allowance	0	tidak ada kelonggaran korosi
1	0.063" (1/16")	1	0.063" (1/16")
2	0.125" (1/8")	2	0.125" (1/8")
3	0.188" (3/16")	3	0.188" (3/16")
4	0.250" (1/4")	4	0.250" (1/4")
9	Reserved for Owner-Specific Designator	9	Dicadangkan untuk penandaan/ penamaan khusus pemilik

**4TH FIELD - JOINT
CONSTRUCTION/CONSTRUCTION TYPE**

**4TH FIELD - TIPE KONSTRUKSI/
SAMBUNGAN KONSTRUKSI**

SYMBOL	DESCRIPTION	SIMBOL	DESKRIPSI
A	Adhesive or Wrapped RTR (Plastic Pipe Joints) and Flanged	A	<i>Adhesive atau Wrapped RTR (Plastic Pipe Joints) dan Flanged</i>
B	Buttweld Small Bore Construction & Buttweld and Flanged Luge Bore Construction	B	<i>Buttweld Small Bore Construction & Buttweld dan Flanged Luge Bore Construction</i>

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Engineering Technical
Standards & Procedures

**SUBHOLDING
REFINING & PETROCHEMICAL**

**GENERAL SPECIFICATION
GENERAL NOTES PIPING
MATERIAL SPECIFICATION**

Doc. No. :
RP-ETS-PIP-GS-0001-00-2021

Page No. : 31 / 31

SYMBOL	DESCRIPTION	SIMBOL	DESKRIPSI
C	Cement, Solvent (Plastic Pipe Joints) and Flanged	C	<i>Cement, Solvent (Plastic Pipe Joints) dan Flanged</i>
F	Flanged Only	F	<i>Hanya Flanged</i>
G	Grooved Large Bore Construction & Threaded Small Bore Construction	G	<i>Grooved Large Bore Construction & Threaded Small Bore Construction</i>
H	Heat Fusion (Plastic Pipe Joints) and Flanged	H	<i>Heat Fusion (Plastic Pipe Joints) dan Flanged</i>
J	Jacketed Construction	J	<i>Jacketed Construction</i>
L	Compression Fitting Small Bore Const & Butt weld and Flanged Large Bore Const	L	<i>Compression Fitting Small Bore Const & Butt weld dan Flanged Large Bore Const</i>
M	Mechanical Joints	M	<i>Mechanical Joints</i>
P	Push On (Ben and Spigot)	P	<i>Push On (Ben and Spigot)</i>
S	Socket weld Small Bore Const & Butt weld and Flanged Large Bore Const.	S	<i>Socket weld Small Bore Const & Butt weld dan Flanged Large Bore Const.</i>
T	Threaded Small Bore Construction & Butt weld and Flanged Large Bore Construction	T	<i>Threaded Small Bore Construction & Butt weld and Flanged Large Bore Construction</i>
V-Z	Reserved for Owner-Specific Designator	V-Z	<i>Dicadangkan untuk penandaan/ penamaan khusus pemilik</i>

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