

Form No:	 PE&SD	BHARAT HEAVY ELECTRICALS LIMITED	PY 52 239
		PROJECT ENGINEERING & SYSTEMS DIVISION	Rev. No. 00
		TECHNICAL SPECIFICATION	Page 1 of 1
		FOR NACE VALVES (GATE GLOBE CHECK)	

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1.0 GENERAL

These Valves shall confirm to standard material requirement as per latest version of NACE STANDARD **MR 0103** in addition to BHEL specifications as mentioned below for respective items

2.0 APPLICATION:

- 2.1 These valves are intended to use in Hydrogen sulfide (H₂S) bearing fuel gas service. These pipes should provide resistance to sulfide stress cracking (SSC) and for stress corrosion cracking in sour environments.
- 2.2 The supplier shall strictly comply with this standard in all respects. No deviation shall be allowed, unless written permission of BHEL is obtained before finalization of the order.

3.0 APPLICABLE BHEL SPECIFICATIONS:

- 3.1 The following specifications should be followed for the respective materials.
- As per variant table.
 - EIL Specification for Material requirement in Sour Services:6-79-0013-Rev.01

RECORD OF REVISIONS:

Rev No	Date	Revision Detail	Revised by	Approved by
00	03.12.2018	FIRST ISSUE	-	-

Refer Doc	LAYOUTS & PIPING ENGINEERING	PREPARED	CHECKED	APPROVED	DATE
	PROJECT ENGINEERING & SYSTEMS DIVISION	 G PARAMESH	 G KALYAN	 G SRIKANTH	23.07.18

VARIANT TABLE FOR BHEL SPEC: PY52239

Var. No.	Valve Type	Body Matl	SIZE (INCH)	ANSI Pr. Rating	TRIM	STEM	END TYPE	DESCRPTION	MATERIAL CODE	APPLICABLE BHEL SPECIFICATION	ADDITIONAL REQMT	APPLICABLE ANNEXURES
1	GLOBE VALVE	A105	1	CL800	SS316L	SS316L(NO CASTING)	SW-B16.11	GLOBE VALVE CS A105 1" CL 800 SW NACE	PY9752239013	PY52160	NACE AS PER MR0103	ANNEXURE-1
2	GLOBE VALVE	A 351 GR CF3M	8	CL600	SS316L	SS316L(NO CASTING)	RF-B16.5	GLOBE VALVE SS CF3M 8" CL600 RF NACE	PY9752239021	PY52257	NACE AS PER MR0103	ANNEXURE-2
3	GLOBE VALVE	A 182 GR.F316L	1	CL800	SS316L	SS316L(NO CASTING)	SW-B16.11	GLOBE VALVE SS 316L 1" CL 800 SW NACE	PY9752239030	PY52229	NACE AS PER MR0103	ANNEXURE-3
4	GATE VALVE	A216GRWCB	2	CL600	SS316L	SS316L(NO CASTING)	RF-B16.5	GATE VALVE CS WCB 2" CL 600 RF NACE	PY9752239048	PY52183	NACE AS PER MR0103	ANNEXURE-4
5	GATE VALVE	A105	0.75	CL800	SS316L	SS316L(NO CASTING)	SW-B16.11	GATE VALVE CS A105 0.75" CL 800 SW NACE	PY9752239056	PY52151	NACE AS PER MR0103	ANNEXURE-5
6	GATE VALVE	A105	1	CL800	SS316L	SS316L(NO CASTING)	SW-B16.11	GATE VALVE CS A105 1" CL 800 SW NACE	PY9752239064	PY52151	NACE AS PER MR0103	ANNEXURE-5
7	GATE VALVE	A 351 GR CF3M	2	CL600	SS316L	SS316L(NO CASTING)	RF-B16.5	GATE VALVE SS CF3M 2" CL 600 RF NACE	PY9752239072	GT57772	NACE AS PER MR0103	ANNEXURE-6
8	GATE VALVE	A 351 GR CF3M	8	CL600	SS316L	SS316L(NO CASTING)	RF-B16.5	GATE VALVE SS CF3M 8" CL 600 RF NACE	PY9752239080	GT57772	NACE AS PER MR0103	ANNEXURE-6
9	GATE VALVE	A 182 GR.F316L	0.75	CL800	SS316L	SS316L(NO CASTING)	SW-B16.11	GATE VALVE SS316L 0.75" CL 800 SW NACE	PY9752239099	PY52166	NACE AS PER MR0103	ANNEXURE-7
10	GATE VALVE	A 182 GR.F316L	1	CL800	SS316L	SS316L(NO CASTING)	SW-B16.11	GATE VALVE SS 316L 1" CL 800 SW NACE	PY9752239102	PY52166	NACE AS PER MR0103	ANNEXURE-7
11	PISTON LIFT CHECK VALVE	A105	1	CL800	SS316L	SS316L(NO CASTING)	SW-B16.11	PLCV CS A105 1" CL 800 SW NACE	PY9752239110	PY52231	NACE AS PER MR0103	ANNEXURE-8
12	SWING CHECK VALVE	A216GRWCB	4	CL600	SS316L	SS316L(NO CASTING)	RF-B16.5	SCV CS WCB 4" CL 600 RF NACE	PY9752239129	PY52233	NACE AS PER MR0103	ANNEXURE-9
13	SWING CHECK VALVE	A216GRWCB	8	CL600	SS316L	SS316L(NO CASTING)	RF-B16.5	SCV CS WCB 8" CL 600 RF NACE	PY9752239137	PY52233	NACE AS PER MR0103	ANNEXURE-9
14	SWING CHECK VALVE	A 351 GR CF3M	8	CL600	SS316L	SS316L(NO CASTING)	RF-B16.5	SCV SS CF3M 8" CL 600 RF NACE	PY9752239145	PY52258	NACE AS PER MR0103	ANNEXURE-10

Annexure-1

GLOBE VALVE CS A105 CL 800 SW NACE

GLOBE VALVE SPECIFICATION			MANUF'S OFFER	
TAG NO. : RATING : 800 SIZE RANGE : 0.5" TO 1.5"			PIPING CLASS : STANDARD : API 602/ ISO 15761 ENDS : SW 3000 TO B-16.11	
			STANDARD: MFGRS CAT/FIG: RATING: ENDS:	
DESCRIPTION	CONSTRUCTION	MATERIAL	CONSTRUCTION	MATERIAL
BODY	FORGED	ASTM A 105		
BONNET	BOLTED	ASTM A 105		
STEM	RISING	SS 316L (NO CASTING)		
DISC	LOOSE PLUG TYPE	STELLITED		
BODY SEAT RING	RENEWABLE/NON RENEWABLE	STELLITED		
STEM PACKING	RENEWABLE WITH VALVE OPEN ON STREAM	CORROSION INHIBITED DIE FORMED FLEXIBLE GRAPHITE WITH BRAIDED ANTI EXTRUSION RINGS		
HAND WHEEL	RISING	MALLEABLE IRON/CAST ST/FAB.ST/DUCT. IRON		
BONNET BOLTS		ASTM A193 GR B7M		
BONNET NUTS		ASTM A194 GR 2HM		
BONNET GASKET		SP WND SS316L WITH GRAFOIL FILLER		
OTHERS	O S & Y			
SPECIAL SERVICE CONDITION	NACE	SOUR SERVICE; MAX. TEMP. 427 DEG.C.		
BACK SEAT & SHOULDER	INTEGRAL			
HYDROSTATIC TEST PRESSURE	BODY : 2975 PSIG	SEAT : 2175 PSIG		
TEST PRESSURE WITH AIR	80 PSIG			

NOTES

NACE REQUIREMENTS SHALL BE AS PER MR0103.

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Annexure-2

GLOBE VALVE SS CF3M CL600

GLOBE VALVE SPECIFICATION			MANUF'S OFFER	
TAG NO. : RATING : 600 SIZE RANGE : 2.0" TO 12.0"			PIPING CLASS : STANDARD : BS-1873 ENDS : FLGD TO B-16.5 RF/125AARH	
			STANDARD: MFGRS CAT/FIG: RATING: ENDS:	
DESCRIPTION	CONSTRUCTION	MATERIAL	CONSTRUCTION	MATERIAL
BODY	CAST	ASTM A 351 GR CF3M		
BONNET	BOLTED	ASTM A 351 GR.CF3M		
STEM	RISING	SS 316L (NO CASTING)		
DISC	LOOSE PLUG TYPE/BALL TYP	STELLITED		
BODY SEAT RING	RENEWABLE/NON RENEWABLE	STELLITED		
STEM PACKING	RENEWABLE WITH VALVE OPEN ON STREAM	CORROSION INHIBITED DIE FORMED FLEXIBLE GRAPHITE WITH BRAIDED ANTI EXTRUSION RINGS		
HAND WHEEL	RISING	MALLEABLE IRON/CAST ST/FAB.ST/DUCT. IRON		
BONNET BOLTS		ASTM A193 GR B7M		
BONNET NUTS		ASTM A194 GR 2HM		
BONNET GASKET		SP WND SS316L-GRAFOIL FILLER		
REQUIREMENT OF GEAR OPERATOR		REFER TECHNICAL NOTES FOR PURCHASE OF VALVES.		
REQUIREMENT OF RADIOGRAPHY		REFER TECHNICAL NOTES FOR PURCHASE OF VALVES.		
OTHERS	O S & Y			
SPECIAL SERVICE CONDITION	NACE	MAX TEMP 427 DEG. C.		
BACK SEAT & SHOULDER		SS316L		
HYDROSTATIC TEST PRESSURE	BODY : 2175 PSIG	SEAT : 1600 PSIG		
TEST PRESSURE WITH AIR	80 PSIG			

NOTES

TESTING SHALL BE AS PER BS EN 12266-1.
 ALL CASTINGS SHALL BE SOLUTION HEAT TREATED
 WELD REPAIR, IF ANY, SHALL BE CARRIED OUT BEFORE SOLUTION HEAT
 TREATMENT.
 100% VALVE CASTINGS SHALL UNDERGO RADIOGRAPHIC EXAMINATION.
 NACE REQUIREMENTS SHALL BE AS PER MR 0103.

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Annexure-3

GLOBE VALVE SS 316L CL 800 SW NACE

GLOBE VALVE SPECIFICATION			MANUF'S OFFER	
TAG NO. : RATING : 800 SIZE RANGE : 0.5" TO 1.5"			PIPING CLASS : STANDARD : BS EN ISO 15761 ENDS : SW 3000 TO B-16.11	
			STANDARD: MFGRS CAT/FIG: RATING: ENDS:	
DESCRIPTION	CONSTRUCTION	MATERIAL	CONSTRUCTION	MATERIAL
BODY	FORGED	ASTM A 182 GR.F316L		
BONNET	BOLTED	ASTM A 182 GR.F316L		
STEM	RISING	SS 316L (NO CASTING)		
DISC	LOOSE PLUG TYPE	STELLITED		
BODY SEAT RING	RENEWABLE/NON RENEWABLE	STELLITED		
STEM PACKING	RENEWABLE WITH VALVE OPEN ON STREAM	CORROSION INHIBITED DIE FORMED FLEXIBLE GRAPHITE WITH BRAIDED ANTI EXTRUSION RINGS		
HAND WHEEL	RISING	MALLEABLE IRON/CAST ST/FAB.ST/DUCT. IRON		
BONNET BOLTS		ASTM A193 GR B7M		
BONNET NUTS		ASTM A194 GR 2HM		
BONNET GASKET		SP WND SS316L-GRAFOIL FILLER		
OTHERS	O S & Y			
SPECIAL SERVICE CONDITION	NACE	MAX TEMP 427 DEG. C.		
BACK SEAT & SHOULDER	INTEGRAL			
HYDROSTATIC TEST PRESSURE	BODY : 2400 PSIG	SEAT : 1775 PSIG		
TEST PRESSURE WITH AIR	80 PSIG			

NOTES

TESTING SHALL BE AS PER BS EN 12266-1.
 NACE REQUIREMENTS SHALL BE AS PER MR0103.

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Annexure-4

GATE VALVE CS WCB CL 600 RF NACE

GLOBE VALVE SPECIFICATION			MANUF'S OFFER	
TAG NO. : RATING : 600 SIZE RANGE : 2.0" TO 12.0"			PIPING CLASS : STANDARD : BS-1873 ENDS : FLGD TO B-16.5 RF/125AARH	
			STANDARD: MFGRS CAT/FIG: RATING: ENDS:	
DESCRIPTION	CONSTRUCTION	MATERIAL	CONSTRUCTION	MATERIAL
BODY	CAST	ASTM A 216 GR.WCB		
BONNET	BOLTED	ASTM A 216 GR.WCB		
STEM	RISING	SS 316L (NO CASTING)		
DISC	LOOSE PLUG TYPE/BALL TYP	STELLITED		
BODY SEAT RING	RENEWABLE/NON RENEWABLE	STELLITED		
STEM PACKING	RENEWABLE WITH VALVE OPEN ON STREAM	CORROSION INHIBITED DIE FORMED FLEXIBLE GRAPHITE WITH BRAIDED ANTI EXTRUSION RINGS		
HAND WHEEL	RISING	MALLEABLE IRON/CAST ST/FAB.ST/DUCT. IRON		
BONNET BOLTS		ASTM A193 GR B7M		
BONNET NUTS		ASTM A194 GR 2HM		
BONNET GASKET		SP WND SS316L-GRAFOIL FILLER		
REQUIREMENT OF GEAR OPERATOR		REFER TECHNICAL NOTES FOR PURCHASE OF VALVES.		
REQUIREMENT OF RADIOGRAPHY		REFER TECHNICAL NOTES FOR PURCHASE OF VALVES.		
OTHERS	O.S & Y			
SPECIAL SERVICE CONDITION	NACE	SOUR SERVICE; MAX TEMP 427 DEG. C.		
BACK SEAT & SHOULDER		SS 316L		
HYDROSTATIC TEST PRESSURE	BODY : 2225 PSIG	SEAT : 1650 PSIG		
TEST PRESSURE WITH AIR	80 PSIG			

NOTES

TESTING SHALL BE AS PER BS EN 12266-1.
 100% VALVE CASTINGS SHALL UNDERGO RADIOGRAPHIC EXAMINATION.
 NACE REQUIREMENTS SHALL BE AS PER MR0103.

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Annexure-5

GATE VALVE CS A105 CL 800 SW NACE

GATE VALVE SPECIFICATION			MANUF'S OFFER	
TAG NO. : PIPING CLASS : RATING : 800 STANDARD : API 602/ ISO 15761 SIZE RANGE : 0.5" TO 1.5" ENDS : SW 3000 TO B-16.11			STANDARD: MFGRS CAT/FIG: RATING: ENDS:	
DESCRIPTION	CONSTRUCTION	MATERIAL	CONSTRUCTION	MATERIAL
BODY	FORGED	ASTM A 105		
BONNET	BOLTED	ASTM A 105		
STEM	RISING	SS 316L (NO CASTING)		
WEDGE DISC	SOLID	STELLITED		
BODY SEAT RING	RENEWABLE	STELLITED		
STEM PACKING	RENEWABLE WITH VALVE OPEN ON STREAM	CORROSION INHIBITED DIE FORMED FLEXIBLE GRAPHITE WITH BRAIDED ANTI EXTRUSION RINGS		
HAND WHEEL	NON RISING	MALLEABLE IRON/CAST ST/FAB.ST/DUCT. IRON		
BONNET BOLTS		ASTM A193 GR B7M		
BONNET NUTS		ASTM A194 GR 2HM		
BONNET GASKET		SP WND SS316L -GRAFOIL FILLER.		
SPECIAL SERVICE CONDITIONS	NACE	SOUR SERVICE (MAX TEMP 427 DEG.C.)		
BACK SEAT & SHOULDER	INTEGRAL			
OTHERS	O.S & Y.			
HYDROSTATIC TEST PRESSURE	BODY : 2975 PSIG	SEAT : 2175 PSIG		
TEST PRESSURE WITH AIR	80 PSIG			

NOTES

NACE REQUIREMENTS SHALL BE AS PER MR0103.

VALVES AS PER API-602 AND TESTING AS PER API-598 ARE ALSO ACCEPTABLE.

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Annexure-6

GATE VALVE SS CF3M CL 600 RF NACE

GATE VALVE SPECIFICATION			MANUF'S OFFER	
TAG NO. : RATING : 600 SIZE RANGE : 2.0" TO 12.0"			PIPING CLASS : STANDARD : API 600/ ISO 10434 ENDS : FLGD TO B-16.5 RF/125AARH	
			STANDARD: MFGRS CAT/FIG: RATING: ENDS:	
DESCRIPTION	CONSTRUCTION	MATERIAL	CONSTRUCTION	MATERIAL
BODY	CAST	ASTM A 351 GR CF3M		
BONNET	BOLTED	ASTM A 351 GR.CF3M		
STEM	RISING	SS 316L (NO CASTING)		
WEDGE DISC	FLEXIBLE	STELLITED		
BODY SEAT RING	RENEWABLE/NON-RENEWABLE	STELLITED		
STEM PACKING	RENEWABLE WITH VALVE OPEN ON STREAM	CORROSION INHIBITED DIE FORMED FLEXIBLE GRAPHITE WITH BRAIDED ANTI EXTRUSION RINGS		
HAND WHEEL	NON RISING	MALLEABLE IRON/CAST ST/FAB.ST/DUCT. IRON		
BONNET BOLTS		ASTM A193 GR B7M		
BONNET NUTS		ASTM A194 GR 2HM		
BONNET GASKET		SP WND SS316L-GRAFOIL FILLER		
REQUIREMENT OF GEAR OPERATOR		REFER TECHNICAL NOTES FOR PURCHASE OF VALVES.		
REQUIREMENT OF RADIOGRAPHY		REFER TECHNICAL NOTES FOR PURCHASE OF VALVES.		
SPECIAL SERVICE CONDITIONS	NACE	MAX TEMP 427 DEG.C.		
BACK SEAT & SHOULDER		SS316L		
OTHERS	O.S & Y.			
HYDROSTATIC TEST PRESSURE	BODY : 2175 PSIG	SEAT : 1600 PSIG		
TEST PRESSURE WITH AIR	80 PSIG			

NOTES

TESTING SHALL BE AS PER API 598.
 ALL CASTINGS SHALL BE SOLUTION HEAT TREATED.
 WELD REPAIRS, IF ANY, SHALL BE CARRIED OUT BEFORE SOLUTION HEAT TREATMENT.
 100% VALVE CASTINGS SHALL UNDERGO RADIOGRAPHIC EXAMINATION.
 NACE REQUIREMENTS SHALL BE AS PER MR0103.

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Annexure-7

GATE VALVE SS316L CL 800 SW NACE

GATE VALVE SPECIFICATION			MANUF'S OFFER	
TAG NO. : ; PIPING CLASS : RATING : 800 STANDARD : API 602/ ISO 15761 SIZE RANGE : 0.5" TO 1.5" ENDS : SW 3000 TO B-16.11			STANDARD: MFGRS CAT/FIG: RATING: ENDS:	
DESCRIPTION	CONSTRUCTION	MATERIAL	CONSTRUCTION	MATERIAL
BODY	FORGED	ASTM A 182 GR.F316L		
BONNET	BOLTED	ASTM A 182 GR.F316L		
STEM	RISING	SS 316L (NO CASTING)		
WEDGE DISC	SOLID	STELLITED		
BODY SEAT RING	RENEWABLE	STELLITED		
STEM PACKING	RENEWABLE WITH VALVE OPEN ON STREAM	CORROSION INHIBITED DIE FORMED FLEXIBLE GRAPHITE WITH BRAIDED ANTI EXTRUSION RINGS		
HAND WHEEL	NON RISING	MALLEABLE IRON/CAST ST/FAB.ST/DUCT. IRON		
BONNET BOLTS		ASTM A193 GR B7M		
BONNET NUTS		ASTM A194 GR 2HM		
BONNET GASKET		SP WND SS316L-GRAFOIL FILLER		
SPECIAL SERVICE CONDITIONS	NACE	MAX TEMP 427 DEG.C.		
BACK SEAT & SHOULDER	INTEGRAL			
OTHERS	O.S & Y.			
HYDROSTATIC TEST PRESSURE	BODY : 2400 PSIG	SEAT : 1775 PSIG		
TEST PRESSURE WITH AIR	80 PSIG			

NOTES

TESTING SHALL BE AS PER API-598.

NACE REQUIREMENTS SHALL BE AS PER MR0103.

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Annexure-8

PLCV CS A105 CL 800 SW NACE

CHECK VALVE SPECIFICATION			MANUF'S OFFER	
TAG NO. : PIPING CLASS : RATING : 800 STANDARD : API 602/ ISO 15761 SIZE RANGE : 0.5" TO 1.5" ENDS : SW 3000 TO B-16.11			STANDARD: MFGRS CAT/FIG: RATING: ENDS:	
DESCRIPTION	CONSTRUCTION	MATERIAL	CONSTRUCTION	MATERIAL
BODY	FORGED	ASTM A 105		
COVER	BOLTED	ASTM A 105		
DISC/PISTON		STELLITED		
BODY SEAT RING	RENEWABLE/NON-RENEWABLE	STELLITED		
DISC HINGE/HINGE PIN				
COVER STUD BOLT		ASTM A193 GR B7M		
COVER NUT		ASTM A194 GR 2HM		
COVER GASKET		SP WND SS316L-GRAFOIL FILLER		
TYPE	LIFT CHECK TYPE			
OTHERS				
SPECIAL SERVICE CONDITIONS	NACE	SOUR SERVICE; MAX TEMP 427 DEG.C.		
WASHER,NUT,PIN				
HYDROSTATIC TEST PRESSURE	BODY : 2975 PSIG	SEAT : 2175 PSIG		
TEST PRESSURE WITH AIR				

NOTES

NACE REQUIREMENTS SHALL BE AS PER MR0103.

VALVES SHALL BE OF STANDARD BORE DESIGN.

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Annexure-9

CHECK VALVE CS WCB CL 600 RF NACE

CHECK VALVE SPECIFICATION			MANUF'S OFFER	
TAG NO. : RATING : 600 SIZE RANGE : 2.0" TO 24.0"			PIPING CLASS : STANDARD : BS-1868 ENDS : FLGD TO B-16.5 RF/125AARH	
			STANDARD: MFGRS CAT/FIG: RATING: ENDS:	
DESCRIPTION	CONSTRUCTION	MATERIAL	CONSTRUCTION	MATERIAL
BODY	CAST	ASTM A 216 GR.WCB		
COVER	BOLTED	ASTM A 216 GR.WCB		
DISC		STELLITED		
BODY SEAT RING	RENEWABLE/NON-RENEWABLE	STELLITED		
HINGE PIN		SS316L(NO CASTING)		
DISC HINGE		SS 316L/A 216 GR.WCB		
COVER STUD BOLT		ASTM A193 GR B7M		
COVER NUT		ASTM A194 GR 2HM		
COVER GASKET		SP WND SS316L-GRAFOIL FILLER		
BY PASSES				
TYPE	SWING CHECK TYPE			
REQUIREMENT OF RADIOGRAPHY		REFER TECHNICAL NOTES FOR PURCHASE OF VALVES.		
OTHERS				
SPECIAL SERVICE CONDITIONS	NACE	SOUR SERVICE; MAX TEMP 427 DEG. C.		
WASHER,NUT,PIN				
HYDROSTATIC TEST PRESSURE	BODY : 2225 PSIG	SEAT : 1650 PSIG		
TEST PRESSURE WITH AIR				

NOTES

TESTING SHALL BE AS PER BS EN 12266-1.

100% VALVE CASTINGS SHALL UNDERGO RADIOGRAPHIC EXAMINATION.

NACE REQUIREMENTS SHALL BE AS PER MR0103.

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Annexure-10

SWING CHECK VALVE SS CF3M CL 600 RF NACE

CHECK VALVE SPECIFICATION			MANUF'S OFFER	
TAG NO. : RATING : 600 SIZE RANGE : 2.0" TO 24.0"			PIPING CLASS : STANDARD : BS-1868 ENDS : FLGD TO B-16.5 RF/125AARH	
			STANDARD: MFGRS CAT/FIG: RATING: ENDS:	
DESCRIPTION	CONSTRUCTION	MATERIAL	CONSTRUCTION	MATERIAL
BODY	CAST	ASTM A351 Gr CF3M		
COVER	BOLTED	ASTM A351 Gr CF3M		
DISC		SS 316 L		
BODY SEAT RING	RENEWABLE/NON-RENEWABLE	A351 Gr CF3M		
HINGE PIN		SS316L(NO CASTING)		
DISC HINGE		SS 316L/		
COVER STUD BOLT		ASTM A193 GR B7M		
COVER NUT		ASTM A194 GR 2HM		
COVER GASKET		SP WND SS316L-GRAFOIL FILLER		
BY PASSES				
TYPE	SWING CHECK TYPE			
REQUIREMENT OF RADIOGRAPHY		REFER TECHNICAL NOTES FOR PURCHASE OF VALVES.		
OTHERS				
SPECIAL SERVICE CONDITIONS	NACE	SOUR SERVICE; MAX TEMP 427 DEG. C.		
WASHER,NUT,PIN				
HYDROSTATIC TEST PRESSURE	BODY : 2225 PSIG	SEAT : 1650 PSIG		
TEST PRESSURE WITH AIR				

NOTES

TESTING SHALL BE AS PER BS EN 12266-1.
 100% VALVE CASTINGS SHALL UNDERGO RADIOGRAPHIC EXAMINATION.
 NACE REQUIREMENTS SHALL BE AS PER MR0103.
 ALL CASTINGS SHALL BE SOLUTION HEAT TREATED.
 WELD REPAIRS, IF ANY, SHALL BE CARRIED OUT BEFORE SOLUTION HEAT TREATMENT

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पेट्रोलियम रिफाइनरी वातावरण में सॉर सर्विस
में इस्तेमाल होने वाले कार्बन स्टील अवयवों
हेतु सामग्री अपेक्षा

MATERIAL REQUIREMENTS FOR CARBON STEEL COMPONENTS USED IN SOUR SERVICE IN PETROLEUM REFINERY ENVIRONMENTS

1	07.10.11	REVISED & REISSUED AS STANDARD SPECIFICATION	AR	SG	PPL	DM
0	07.10.04	ISSUED AS STANDARD SPECIFICATION	GM	VRK	KKM	SKG
Rev. No	Date	Purpose	Prepared by	Checked by	Standards Committee Convenor	Standards Bureau Chairman
Approved by						

Abbreviations:

ANSI	:	American National Standards Institute
API	:	American Petroleum Institute
ASME	:	American Society of Mechanical Engineers
ASTM	:	American Society for Testing and Materials
ISO	:	International Organization for Standardization
NACE	:	National Association of Corrosion Engineers

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Mr. GS Hegde
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Mr. MP Jain (Projects)

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1.0 SCOPE

- 1.1 In general, for refinery services, NACE Standard MR 0103 shall be applicable. For services where HIC (Hydrogen Induced Cracking) resistant carbon steel is specifically mentioned in the Process Documents, this specification shall be followed.
- 1.2 This specification lays down the requirements related to the chemical composition, manufacture, fabrication and testing requirements for carbon steel components intended to be used in sour service in petroleum refinery environments. These requirements are specified in order to make the carbon steel component resistant to the various forms of material damage in a sour environment, such as Sulfide Stress Cracking (SSC), Hydrogen Induced Cracking (HIC), Stress Oriented Hydrogen Induced Cracking (SOHIC), Blistering etc. These requirements can be used for resisting Alkaline Stress Corrosion Cracking (ASCC) also. This specification is applicable for corrosive petroleum refining facilities.
- 1.3 The service medium is defined as "Sour" when the service environment conforms to one of the following conditions, as defined in NACE Standard MR0103.

Service environments containing free water (in liquid phase) and:

- (a) >50 ppmw dissolved H₂S in the free water.
- (b) Free water pH < 4 and some dissolved H₂S present.
- (c) Free water pH >7.6 and 20 ppmw dissolved hydrogen cyanide (HCN) in the water and some dissolved H₂S present.
- (d) >0.003 MPa absolute (0.05 psia) partial pressure H₂S in the gas in processes with a gas phase.

2.0 REFERENCED CODES/STANDARDS

NACE MR 0103	ASTM A 694	ASTM A 770
NACE RP 0472	ASTM A 216	ASTM A 370
NACE Publication 8X194 & 8X294	ASTM A 106	ASTM A 578
NACE TM 0284	API 5 L	ASME SEC II PART C
ASTM A 20	API 6 A	ASME SEC VIII-DIV.I
ASTM A 516	ASTM E 18	ASME SEC IX
ASTM A 105	ASTM E 45	ANSI B 16.34
ASTM A 234	ASTM E 92	ANSI B 31.3

All ASTM Standard designations shall be applicable for corresponding ASME designations which would be read as ASME SA XXX instead of ASTM A XXX.

3.0 GENERAL REQUIREMENTS

- 3.1 The steel for sour service shall be manufactured by either basic oxygen or electric arc furnace route and shall be fully killed and fine grained.
- 3.2 Carbon steel shall not contain intentional additions of elements such as lead, selenium or sulphur to improve machinability.
- 3.3 Carbon steel shall be used in one of the following heat treatment conditions.

- (i) Hot-rolled;
- (ii) Annealed;
- (iii) Normalised;
- (iv) Normalised and tempered;
- (v) Normalised, austenitised, quenched and tempered;
- (vi) Austenitised, quenched and tempered.

3.4 All material after cold forming shall be thermally stress relieved to meet a hardness requirement of 200 BHN maximum.

3.5 All products shall be free of low temperature transformation microstructures such as bainite bands or islets of martensite.

4.0 MATERIAL SPECIFICATION

All items are required to conform to the chemical composition of the respective specification as listed below.

Plate: SA-516 Gr.60

Pipe: SA-106 Gr. B or SA-333 Gr.1 or 6

Forgings: SA-105 or SA-350 Gr.LF1 or LF2 or SA-266 Class 1

Fittings: SA-234 Gr. WCB or SA-420 Gr.WPL6

Castings: SA-216 Gr. WCA, WCB or WCC or SA-352 Gr. LCA, LCB or LCC

Tubing: SA-179 or SA-214

5.0 PRODUCT SPECIFIC REQUIREMENTS

5.1 Plates and rolled products

All rolled products such as plates and sheets and fittings / pipes made of rolled products shall meet the following specific requirements.

- 5.1.1 The steel shall be made through a clean steel making route and shall have minimum of inclusions.
- 5.1.2 The sulphur level shall be restricted to 0.003 wt%.
- 5.1.3 The steel shall be calcium treated for inclusion morphology control and the Ca/S ratio shall be in the range of 2 to 3. When sulphur content is less than 0.0015%, then Ca/S ratio is not applicable and calcium can be present up to 50 ppm.
- 5.1.4 For plates including and above 25mm thick, through-thickness tensile testing shall be carried out in accordance with ASTM A770, with minimum reduction in area being 35% as determined in accordance with ASTM A370, on one plate per heat.
- 5.1.5 No repair welding shall be permitted on plated.

5.1.6 When the fabrication of the components from the previously HIC tested plates involves no heavy wall thickness reduction or material flow, such as bending, spinning or welding, no fresh HIC test would be required on the final product. However, for fabrication of products where heavy reduction of thickness and heavy flow of material is encountered while forming such as like forging, extrusion or drawing, metallographic examination of the final product shall be required to be carried out to ensure absence of elongated inclusions.

5.1.7 The plates shall be procured only from pre-qualified manufacturers.

5.2 Pre-qualification criteria for vendors with prior experience track record

Vendors/manufacturers who have proven track record of supplying materials for sour service applications in petroleum refineries to any of the reputed operating companies/Engineering Consultants or Process Licensors such as UOP/ IFP/ EXXON/ BP/ CHEVRON/ IOCL/ HPCL/ BPCL/ EIL will be considered as 'pre-qualified vendors/manufacturers', on production of the relevant Purchase Orders and test certificates, certified by a witnessing third party inspection agency such as DNV/Lloyds/BV/ABSTECH/TUV/SGS/CEIL for the conformance of the materials to the respective materials specification of the mentioned operators / engineering consultants. For pre-qualified vendors, Clause No.5.4 is not applicable.

5.3 Pre-qualification criteria for New Vendors with out track record

A vendor who has no track record of supplying sour service materials to any of the reputed engineering consultants/operators, as mentioned in Clause 5.2 above, shall be considered as a new vendor and shall be required to carry out HIC test as detailed out in Clause 5.4 for pre-qualification by any one of the reputed third party inspection agencies like Lloyds, BV, CEIL, DNV or TUV etc..

5.4 Hydrogen Induced Cracking (HIC) Test

The requirements for HIC test shall be as follows.

- (i) This test is required for vendor pre-qualification only.
- (ii) This test shall be performed on a set of three specimens representing each production batch/heat of rolled products in accordance with NACE TM 0284 with the following acceptance criteria:
 - (a) Crack Length Ratio (CLR) $\leq 10.0\%$
 - (b) Crack Sensitivity Ratio (CSR) $\leq 1\%$
- (iii) In case of failure of any one of the specimens, three more specimens from the same product shall be retested and all the specimens shall meet the acceptance criteria. In case of failure of any retest sample, the material shall be considered unacceptable.

6.0 POST WELD HEAT TREATMENT (PWHT) AND HARDNESS REQUIREMENT

All the weld joints, irrespective of thickness, shall be given a post weld heat treatment. The temperature range for PWHT shall be 595-650°C. Other aspects such as rate of heating, holding time etc. for PWHT shall be as per ASME Sec.VIII, Div.I /ANSI B31.3 requirements. The hardness of the weldment after PWHT shall be 200 BHN maximum.