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DESCRIPTIONS & NOTES

BY

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LIST OF ALTERATION

SN

DWG NO.

REV.

DRAWING NAME OR DOCUMENTS TITLE

LIST OF REFERENCE DRAWING AND DOCUMENTS

2008-10-15

0

For Approval

Ong

Jiang

Guan

DATE

REV.

DESCRIPTION

DRAW.

CHK.

APPD.

BUILDER

COSCO (NANTONG) SHIPYARD CO. LTD

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CLASS

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PROJECT

SM452 SEVAN DRILLING UNIT

Piping Bolt Tightening Procedure

Doc No.

N111-100-011

SM No.

452-106-prc-106689

Status

IFA

Page

1/7



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1.1 Bolting

- 1.1.1 Bolting shall be in accordance with the requirements in the Piping and valve material standard.
- 1.1.2 Manually pulled flange bolts and stud bolts shall extend fully through their nuts with minimum two (2) full thread pitches past the nuts.
- 1.1.3 Bolt sizes, lengths, projection, bolt hole, shall be as specified in ASME/ANSI B18.2.1.
- 1.1.4 All flanged stud bolt shall be progressively controlled to equalize bolt pressure on the gasket. A torque wrench/spanner shall be utilized in such cases. Bolt pressure shall be in accordance with equipment maker's recommendation or construction drawings developed for the project.
- 1.1.5 If the equipment or pipe line material have their own manufacture procedure, the torque value should follow vendor recommendation.

- Tightening sequence and bolt torque for FRP

Required torque for torque wrench/spanner shall be set and the bolts are tightened as per the sequence. For the tightening sequence and bolt torque of supports, flanges, valves, dresser couplings and other must follow the table provide from **FRP Manufacturer**.

1.2 Bolt Torque Value

- 1.2.1 It is a design requirement to use bolts of the minimum strength as to ASTM A193 gr.B7.
- 1.2.2 Calculation of the required bolt tension value shall be in accordance with the DIN 2502, with the following exceptions:
 - Minimum required bolt tension value shall be multiplied with 1.5.
 - Maximum bolt tension value shall not exceed 2/3 of the specified yield of the bolt or maximum allowable stress for the gasket.
- 1.2.3 See below table for the bolt torque value.

RECOMMENDED TORQUES FOR STEEL FLANGE BOLTING

Stud Diameter	Threads Per Inch	S _r = 30 ksi (414 MPa)		S _r = 80 ksi (550 MPa)		S _r = 105 ksi (720 MPa)	
		Torque Coated (Note A) t=0.07 ft-lb (Nm)	Torque Lubricated t=0.13 ft-lb (Nm)	Torque Coated (Note A) t=0.07 ft-lb (Nm)	Torque Lubricated t=0.13 ft-lb (Nm)	Torque Coated (Note A) t=0.07 ft-lb (Nm)	Torque Lubricated t=0.13 ft-lb (Nm)
½"	13	10 (14)	16 (22)	287 (38)	45 (61)	35 (48)	59 (60)
5/8"	11	19 (26)	33 (45)	52 (70)	88 (118)	58 (92)	115 (155)
¾"	10	33 (45)	57 (77)	90 (122)	153 (206)	118 (160)	200 (270)
7/8"	9	53 (72)	91 (123)	143 (193)	243 (328)	168 (253)	319 (429)
1"	8	79 (107)	135 (163)	213 (288)	361 (468)	279 (375)	474 (639)
1 1/8"	8	144 (155)	196 (259)	305 (413)	523 (706)	401 (540)	686 (925)
1 ¼"	8	157 (213)	272 (359)	421 (568)	725 (981)	553 (745)	953 (1285)
1 3/8"	8	211 (266)	355 (496)	563 (751)	976 (1320)	739 (996)	1231 (1727)
1 ½"	8	274 (371)	473 (543)	753 (931)	1278 (1727)	952 (1297)	1677 (2261)
1 5/8"	8	350 (475)	513 (851)	934 (1263)	1615 (2211)	1226 (1653)	2146 (2694)
1 ¾"	8	438 (594)	778 (1044)	1169 (1581)	2054 (2777)	1534 (2069)	2596 (3636)
1 7/8"	8	540 (732)	952 (1291)	1440 (1947)	2539 (3433)	1890 (2549)	3332 (4483)
2"	8	656 (889)	1160 (1573)	1750 (2366)	3094 (4183)	2297 (3097)	4061 (5476)
2 ¼"	8	936 (1263)	1683 (2255)	2455 (3375)	4436 (5997)	3275 (4418)	5022 (7851)
2 ½"	8	1285 (1742)	2394 (3110)	3429 (4635)	5118 (6068)	4500 (6068)	8030 (10828)

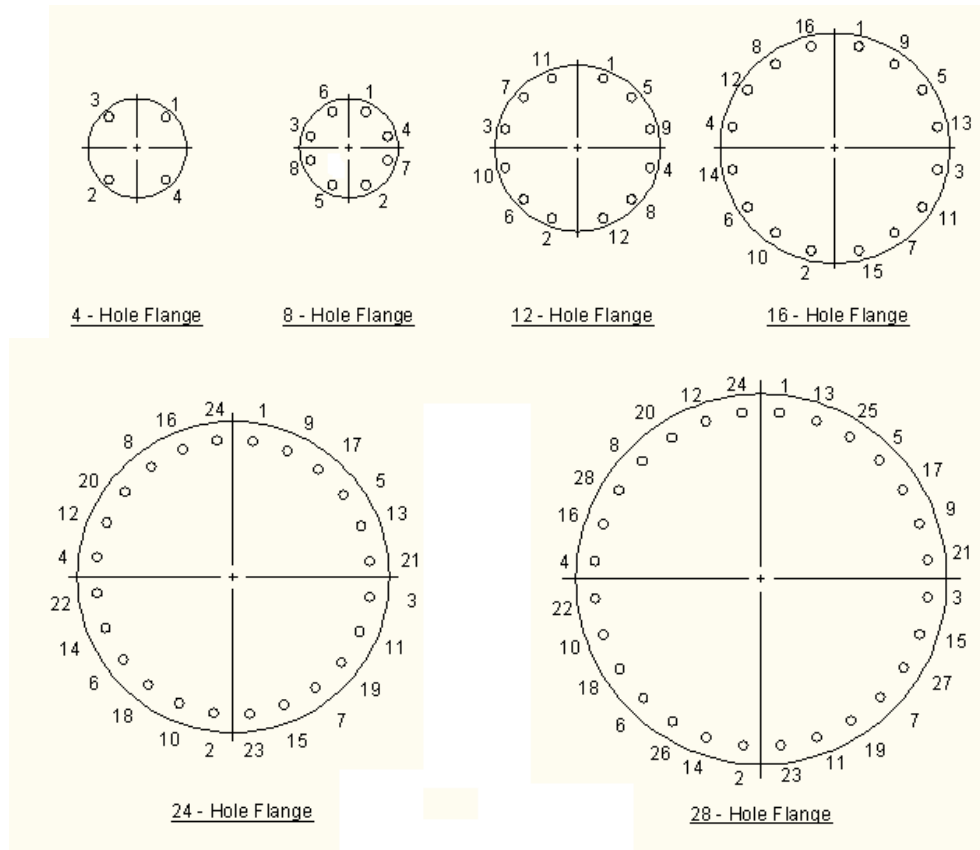
Note A: BOLT THREADS AND NUT FACE COATED WITH FLUROPOLYMER MATERIAL.

S_r = Bolt Weld Strength, the comparison with metric grades of steels for bolts as per below table

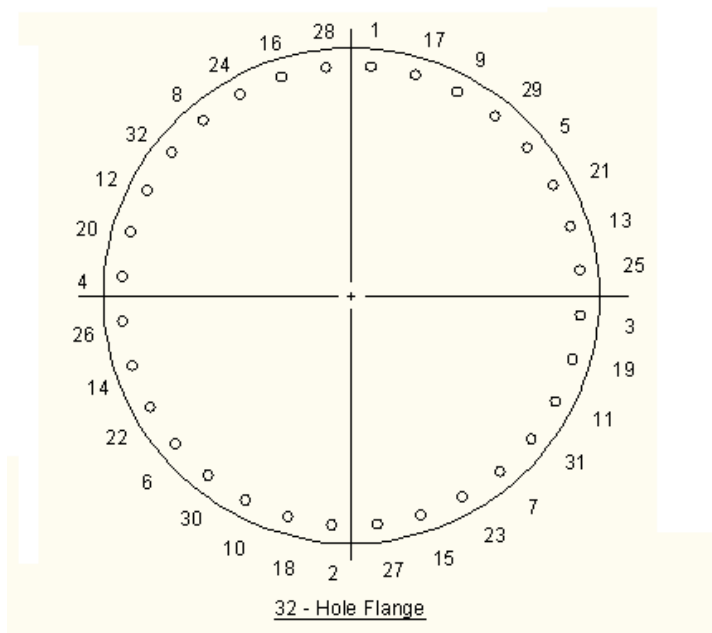
Grade	Bolt Size	Min Tensile Strength (Mpa)	Min (offset 2% Yield Strength (Mpa)	Proof Strength (Mpa)
4.6	M5-M36	400	240	225
4.8	M1.6-M16	420	340	310
5.8	M5-M24	520	415	380
8.8	above or equal to M16	800	640	580
8.8	M17-M36	830	660	600
9.8	M1.6-M16	900	720	650

10.9	M6-M36 (or all diameters)	1040	940	830
12.9	M1.6-M36	1220	1100	970

RECOMMENDED TORQUES FOR FLANGE BOLTING & TIGHTENING SEQUENCE FOR FRP FLANGES



Flanges with ANSI B16.5 CL 150 Drilling Recommended Torques For FRP Flange Bolting				
No of Bolts	Bolt Diameter	Torque Increments (ft-lb)/(Nm)	Bondstrand Flanges Final Torque (ft-lb)/(Nm)	Smith Fibercast GT175 Flanges Final Torque (ft-lb)/(Nm)
4	½"	5.0 (7.0)	20.0 (27.0)	30.0 (41.0)
4	5/8"	5.0 (7.0)	20.0 (27.0)	30.0 (41.0)
8	5/8"	5.0 (7.0)	20.0 (27.0)	30.0 (41.0)
8	¾"	10.0 (14.0)	30.0 (41.0)	30.0 (41.0)
12	7/8"	10.0 (14.0)	30.0 (41.0)	100.0 (136.0)
12	1"	10.0 (14.0)	50.0 (68.0)	100.0 (136.0)
16	1"	10.0 (14.0)	50.0 (68.0)	100.0 (136.0)
16	1 1/8"	20.0 (27.0)	50.0 (68.0)	100.0 (136.0)



20	1 1/8"	20.0 (27.0)	60.0 (81.0)	100.0 (136.0)
20	1 1/4"	25.0 (34.0)	75.0 (102.0)	100.0 (136.0)
28	1 1/4"	25.0 (34.0)	75.0 (102.0)	NA
32	1 1/2"	25.0 (34.0)	75.0 (102.0)	NA

RECOMMENDED TORQUES FOR EXPANSION JOINT BOLTING

Style 204/204 HP/206 EZ Flo			
NPS (Metric Nominal)	No of Bolts	Bolt Diameter	Bolt Torque ft-lb (Nm)
3" (DN80)	4	5/8"	65 (88.1)
3 1/2" (DN90)	8	5/8"	40 (54.2)
4" (DN100)	8	5/8"	45 (61.0)
5" (DN125)	8	3/4"	50 (67.8)
6" (DN150)	8	3/4"	55 (74.6)
8" (DN200)	8	3/4"	85 (115.2)
10" (DN250)	12	7/8"	80 (108.5)
12" (DN300)	12	7/8"	115 (155.9)
14" (DN350)	12	1"	145 (196.6)
16" (DN400)	16	1"	135 (183.0)
18" (DN450)	16	1 1/8"	140 (189.8)
20" (DN500)	20	1 1/8"	135 (183.0)

Style 306 EZ Flo			
NPS (Metric Nominal)	No of Bolts	Bolt Diameter	Bolt Torque ft-lb (Nm)
3" (DN80)	4	5/8"	70 (94.5)
4" (DN100)	8	5/8"	45 (61.0)
5" (DN125)	8	3/4"	50 (67.8)
6" (DN150)	8	3/4"	100 (122)
10" (DN250)	12	7/8"	85 (115.0)
12" (DN300)	12	7/8"	120 (152.7)
14" (DN350)	12	1"	160 (216.9)

16" (DN400)	16	1"	150 (203.4)
18" (DN450)	16	1 1/8"	155 (210.1)
20" (DN500)	20	1 1/8"	145 (195.6)

1.3 Applicable Systems

1.3.1 Torque wrench/spanner shall be used for the tightening of the bolts or components for the following systems:

- High Pressure Mud System
- High Pressure Cement System
- Hydraulic Oil System
- High Pressure Air System (≥ 435 psi)
- FRP Flange Connections
- Compression Fitting Connections
- High Pressure washing system
- High pressure oil lines 15 000 psi
- kill and choke line 10 000 psi
- 1500 psi lines for oil from well test area to burner boom

