

Số: 753 /NMĐTB2-KTATMT
V/v cung cấp báo giá hạng mục cải tạo nâng cấp
hệ thống van đầu thoát của các bơm nước làm
mát chính NMNĐ Thái Bình 2.

Thái Bình, ngày 18 tháng 04 năm 2025

Kính gửi: Các nhà cung cấp

Chi nhánh Phát điện Dầu khí/Nhà máy Nhiệt điện Thái Bình 2 (NMNĐ Thái Bình 2) đang có nhu cầu triển khai hạng mục “cải tạo nâng cấp hệ thống van đầu thoát của các bơm nước làm mát chính (cho cả 2 tổ máy) NMNĐ Thái Bình 2”. Được biết Quý Công ty là đơn vị có năng lực, kinh nghiệm trong việc cung cấp dịch vụ tương tự. Do đó, đề nghị Quý Công ty quan tâm, xem xét và cung cấp báo giá với nội dung như sau:

- Phạm vi công việc:
 - ✓ Phạm vi công việc hạng mục “cải tạo nâng cấp hệ thống van đầu thoát của các bơm nước làm mát chính (cho cả 2 tổ máy) NMNĐ Thái Bình 2” chi tiết như Phụ lục 01 đính kèm;
- Tiến độ cung cấp dịch vụ: Do Nhà cung cấp đề xuất nhưng không muộn hơn 65 ngày và phải hoàn thành trong đợt BDSC định kỳ năm 2025.
- Hiệu lực báo giá: 60 ngày kể từ ngày báo giá.
- Thời gian gửi báo giá: không muộn hơn 15h00 ngày 06/05/2025.
- Đơn vị báo giá phải có chức năng thực hiện phạm vi công việc theo quy định.
- Báo giá dạng file scan, được ký tên đóng dấu bởi Người đại diện đủ thẩm quyền của Quý Công ty.
- Phương thức gửi báo giá: Gửi qua thư điện tử tới các địa chỉ:
sonhb@pvpqb.vn, hoappt@pvpqb.vn, nhanbaogia.hn@pvpqb.vn.
- Thông tin liên hệ:
 - ✓ Hoàng Bích Sơn, Phòng KTATMT, NMNĐ Thái Bình 2;
 - ✓ Địa chỉ: Xã Mỹ Lộc, huyện Thái Thụy, tỉnh Thái Bình;



✓ Số điện thoại liên hệ: 0982.090.189; Email: sonhb@pvpgb.vn;

Nhà máy Nhiệt điện Thái Bình 2 cảm ơn sự hợp tác của Quý Công ty.

Trân trọng./.

Nơi nhận:

- Như trên;
- CNPĐ DK (để b/c);
- GĐ NM (để b/c);
- Phòng: TM (để p/h);
- Lưu: VT, KTATMT (H.B.S: 1 b).

Đính kèm:

- Phụ lục 01: Phạm vi công việc.

**TL. GIÁM ĐỐC CHI NHÁNH PĐDK
GIÁM ĐỐC NMNĐ THÁI BÌNH 2**



Mai Văn Long

Xã Mỹ Lộc - huyện Thái Thụy - tỉnh Thái Bình

ĐT: 02273.721.515; Fax: 02273.721.678



PHẠM VI CÔNG VIỆC HẠNG MỤC CẢI TẠO NÂNG CẤP HỆ THỐNG VAN ĐẦU THOÁT CÁC BƠM NƯỚC LÀM MÁT CHÍNH (CHO CẢ 2 TỔ MÁY) – NMNĐ THÁI BÌNH 2

1. Tổng quan hạng mục “cải tạo nâng cấp hệ thống van đầu thoát của các bơm nước làm mát chính (cho cả 2 tổ máy) NMNĐ Thái Bình 2”:

- Tên hạng mục: Cải tạo nâng cấp hệ thống van đầu thoát của các bơm nước làm mát chính (cho cả 2 tổ máy) - NMNĐ Thái Bình 2;
- Địa điểm lắp đặt: Trạm bơm nước làm mát chính – Nhà máy Nhiệt điện Thái Bình 2;
- Phạm vi hạng mục: Cải tạo, nâng cấp hệ thống van đầu thoát của các bơm nước làm mát chính (cho cả 2 tổ máy) - NMNĐ Thái Bình

2;

- Tiêu chuẩn thiết kế áp dụng nhưng không giới hạn các tiêu chuẩn sau:
 - + TCVN 3254:1989 An toàn cháy - Yêu cầu chung;
 - + TCVN 9310-4:2012: Tiêu chuẩn phòng cháy chữa cháy – Từ vựng – Phần 4: Thiết bị chữa cháy;
 - + QCVN 4:2009/BKHCN: Quy chuẩn kỹ thuật quốc gia về an toàn thiết bị điện và điện tử;
 - + QCVN 03:2022/BXD Quy chuẩn kỹ thuật Quốc gia về phân cấp công trình phục vụ thiết kế xây dựng;
 - + QCVN 18:2021/BXD Quy chuẩn kỹ thuật quốc gia – An toàn trong thi công xây dựng;
 - + TCVN 4055-2012: Tổ chức thi công;
 - + TCVN 5308-1991: Quy phạm kỹ thuật an toàn trong xây dựng;
 - + Tiêu chuẩn IEC 60034: Tiêu chuẩn kỹ thuật cho máy điện quay loại cụ thể hoặc cho các ứng dụng cụ thể;
 - + TCVN 8300 – 2009: Yêu cầu kỹ thuật trong thiết kế, lắp đặt, nghiệm thu, bàn giao máy đóng mở kiểu xy lanh thủy lực;
 - + TCVN 10651:2014 : Hệ thống và bộ phận truyền động thủy lực/khí nén - xy lanh - mã nhận dạng về kích thước lắp đặt và kiểu lắp đặt;
 - + DIN 24333 – Xi lanh thủy lực – Kích thước và dung sai;
 - + DIN 24334 – Yêu cầu thử nghiệm xi lanh;
 - + DIN ISO 1219 – Ký hiệu thủy lực và sơ đồ hệ thống (được điều chỉnh theo ISO);
 - + Các tiêu chuẩn và quy chuẩn hiện hành khác.

2. Yêu cầu kỹ thuật cơ bản của hạng mục “cải tạo nâng cấp hệ thống van đầu thoát của các bơm nước làm mát chính (cho cả 2 tổ máy) - NMNĐ Thái Bình 2” :

- Đường kính của van: 2700 mm
- Chịu được áp suất đầu xả của bơm: 1.86 bar



- Lưu lượng của bơm: 46.700 m³/h
- Hướng dòng chảy: 1 chiều
- Phương án lắp đặt: Nằm ngang
- Kiểu hoạt động: Mở van bằng xy lanh thủy lực và đóng nhanh van bằng khối đối trọng cơ khí.
- Chức năng làm việc:
 - Tránh hiện tượng xung áp suất ngược;
 - Đóng nhanh 70%, đóng chậm 10% (có thể điều chỉnh được);
 - Giám sát hành trình đóng mở toàn thời gian.
- Các thông số làm việc chính:
 - Thời gian mở hết van: 120 giây (max).
 - Thời gian đóng van (có kiểm soát):
 - +100% >10%: 50 giây;
 - +10% > 0%: 40-80 giây (đóng hết).
 - Thời gian đóng van (sự cố):
 - +100% >10%: 20-30 giây;
 - +10% > 0%: 30-40 giây (đóng hết).

3. Phạm vi công việc hạng mục cải tạo nâng cấp hệ thống van đầu thoát của các bơm nước làm mát chính (cho cả 2 tổ máy)
NMND Thái Bình 2 bao gồm nhưng không giới hạn các công việc chính như sau:

- Thực hiện dịch vụ thiết kế kỹ thuật;
- Thực hiện công tác cung cấp vật tư, thiết bị;
- Thực hiện dịch vụ lắp đặt thi công;
- Thực hiện dịch vụ nghiệm thu chạy thử;
- Các công việc/dịch vụ khác có liên quan.



BẢNG PHẠM VI CÔNG VIỆC

STT	Tên hàng hóa dịch vụ	Yêu cầu kỹ thuật hàng hóa dịch vụ	ĐVT	Khối lượng	Ghi chú
1	Dịch vụ thiết kế kỹ thuật				
-	Tính toán nêu rõ sự cần thiết và lựa chọn chủng loại vật liệu, kích thước, thông số kỹ thuật cho các vật tư, thiết bị của hệ thống van đầu thoát đảm bảo đầy đủ tính năng và đáp ứng yêu cầu kỹ thuật tại Mục yêu cầu kỹ thuật của hệ thống, cũng như tương thích với hệ thống nước làm mát chính của Nhà máy	Trong tính toán thiết kế bao gồm và không giới hạn các công việc: i) Tính toán lựa chọn cấu hình cụm dẫn động bằng thủy lực cho cánh tay đòn, đối trọng; ii) Tính toán chọn công suất piston thủy lực, trạm bơm đầu thủy lực; iii) Tính toán hệ thống đường ống thủy lực; iv) Tính toán lựa chọn cấp động lực, cấp tín hiệu, tủ nguồn và điều khiển, ...;	Hệ thống	1	
-	Thiết kế bản vẽ cho hệ thống cụm van đầu thoát bao gồm nhưng không giới hạn	i) Bản vẽ sơ đồ nguyên lý; ii) Bản vẽ móng và kết cấu (nếu có); iii) Bản vẽ outline/layout; iv) Bản vẽ chi tiết hệ thống điện điện, điều khiển (bao gồm cả tích hợp kiểm soát, điều khiển tại hệ thống DCS của Nhà máy); v) Bản chi tiết đi cáp và đấu nối hệ thống điện, điều khiển; vi) Bản vẽ chi tiết hệ thống điều khiển thủy lực; vii) BOM (bill of material); ...;	Hệ thống	1	
-	Trình tài liệu tính toán, các bản vẽ thiết kế cho Nhà máy xem xét, phê duyệt.	Các bản vẽ tuân theo các tiêu chuẩn được áp dụng tại Việt Nam và Nhà máy	Hệ thống	1	



STT	Tên hàng hóa dịch vụ	Yêu cầu kỹ thuật hàng hóa dịch vụ	ĐVT	Khối lượng	Ghi chú
2	Cung cấp vật tư thiết bị				
-	Cụm tay đòn cơ khí	Kết nối với trục van, cụm xy lanh thủy lực điều khiển đóng mở và khối đối trọng cơ khí, cụm thiết bị cơ khí hỗ trợ đóng/mở khi bảo dưỡng – sửa chữa	Bộ	4	
-	Cụm thiết bị dẫn động thủy lực	Bao gồm: - Thùng chứa dầu NG800; - 02 x Tổ bơm thủy lực và động cơ điện 11 kW (01 bơm chạy - 01 bơm dự phòng); - Áp suất làm việc max: 210 bar; - Cụm van điện thủy lực điều khiển thay đổi tốc độ đóng mở và theo dõi quá trình làm việc của xy lanh; - Các sensor điện tử đo áp suất, mức dầu, nhiệt độ và kiểm soát độ bẩn của dầu thủy lực; - Bình tích áp thủy lực và bơm tay sự cố; - Lọc dầu đường áp và lọc dầu đường hồi; - Đường ống thủy lực và phụ kiện kết nối, phụ kiện thùng dầu.	Cụm	2	
-	Xy lanh thủy lực	- Áp suất max 250 bar, lực đẩy max 40 tấn - Que đo hành trình điện tử để kiểm soát toàn bộ hành trình	Bộ	4	



STT	Tên hàng hóa dịch vụ	Yêu cầu kỹ thuật hàng hóa dịch vụ	DVT	Khối lượng	Ghi chú
-	Hệ thống điện điều khiển bao gồm động cơ điện, tủ điện động lực và tủ điện điều khiển, các thiết bị theo dõi an toàn đáp ứng các chế độ:	- Hệ thống điều khiển bao gồm các chế độ: • REMOTE: Hoàn toàn tự động điều khiển và theo dõi vị trí, duy trì trạng thái làm việc của van nước theo yêu cầu vận hành (phục vụ cho sản xuất); • MANUAL: Vận hành tại chỗ riêng rẽ từ màn hình điều khiển tại tủ điện. (phục vụ cho việc sửa chữa/hiệu chỉnh thiết bị); -Chương trình điều khiển tự động, tại chỗ và kết nối với trung tâm điều khiển (DCS) bao gồm: -Quản lý người sử dụng theo các cấp độ liên quan (USER); -Thiết lập các thông số làm việc theo yêu cầu (SETTING); -Các chế độ vận hành: MAN -REMOTE. Kết nối mạng với DCS; -Theo dõi và giám sát các trạng thái hoạt động của van (độ mở - thời gian đóng/mở và của trạm cấp dầu (áp suất, nhiệt độ, hành trình xy lanh, ...) (STATUS); -Các thông báo lỗi, các chế độ giám sát đảm bảo vận hành an toàn; -Thông kê, theo dõi lịch sử vận hành và bảo dưỡng thiết bị.	Hệ thống	2	



STT	Tên hàng hóa dịch vụ	Yêu cầu kỹ thuật hàng hóa dịch vụ	ĐVT	Khối lượng	Ghi chú
3	Dịch vụ lắp đặt thi công				
-	Hoàn thành lắp đặt hệ thống van đầu thoát bao gồm các công việc sau nhưng không giới hạn	-Chuẩn bị đầy đủ máy móc, thiết bị, công cụ dụng cụ và giàn giáo thi công; -Chuẩn bị mặt bằng lắp đặt; - Tháo dỡ cụm thiết bị điều khiển actuator bằng điện hiện hữu khỏi trục quay của van và các kết cấu đường ống kết nối giữa bơm và van đầu thoát; -Làm sạch, vận chuyển các thiết bị không sử dụng về kho của Nhà máy để bảo quản, lưu trữ; -Lắp đặt cụm truyền động cơ khí, giá đỡ cơ khí với than van; -Lắp đặt trạm cấp dầu thủy lực, tủ điện điều khiển tại vị trí phù hợp bên cạnh van; -Kết nối cơ khí, đường ống, thủy lực, điện và điều khiển;	Hệ thống	1	
3	Dịch vụ chạy thử nghiệm				
-	Nghiệm thu chạy thử bàn giao hệ thống	-Điều khiển chạy thử MANUAL đóng mở van bướm, hiệu chỉnh thiết bị. -Chạy thử nghiệm các chế độ vận hành tự động AUTO, chế độ MANUAL, thử chế độ TRIP, hiệu chỉnh hệ thống; -Vận hành thực tế thiết bị trong các điều kiện làm việc của nhà máy, theo dõi, kiểm tra các thông số làm việc và đánh giá kết	Hệ thống	1	



STT	Tên hàng hóa dịch vụ	Yêu cầu kỹ thuật hàng hóa dịch vụ	ĐVT	Khối lượng	Ghi chú
		quả để nghiệm thu; -Nghiệm thu chạy thử 72h và bàn giao đưa hệ thống van đầu thoát vào vận hành			

4. Bản vẽ tham khảo:

- TB2-SDC.VP110-00PAC-M-M4-DAS-0001;
- TB2-SDC.VP110-00PAC-M-M4-DGA-0001;
- TB2-SDC.VP406-00100-I-I1-DAS-0001;
- TB2-SDC.VP406-00100-I-I1-DSU-0001;
- TB2-SDC-01PAC-M-M4-CAL-0001;
- TB2-SDC-01PAC-M-M4-SPC-0001;
- TB2-SDC-00100-P-M8-DGA-0008.



DOCUMENT SUBMISSION STATUS: FF

NOTE:

2	2015.01.29	FOR FINAL	GAJANAN	J.Y.LEE	S.D.PARK	
1	2014.10.01	FOR FINAL	B.G.JUNG	D.H.JUNG	S.D.PARK	
0	2014.04.11	FOR FINAL	B.G.JUNG	D.H.JUNG	S.D.PARK	
REV.	DATE	DESCRIPTION	DRAWN	CHECKED	APPROVED	APPROVED

OWNER



VIETNAM OIL AND GAS GROUP (PVN)

OWNER'S CONSULTANT

FICHTNER
GmbH & Co. KG

FICHTNER



PVPOWER PCC

EPC CONTRACTOR

PETROVIETNAM CONSTRUCTION JOINT
STOCK CORPORATION (PVC)

EPC CONTRACTOR'S CONSULTANT



WORLEYPARSONS

POWER ISLAND PACKAGE SUPPLIER



SOJITZ CORPORATION



DAELIM INDUSTRIAL CO., LTD.

PROJECT TITLE

THAI BINH 2 THERMAL POWER PLANT 2 x 600MW

DRAWING / DOCUMENT TITLE

DATA SHEET FOR CWP

Vendor's Logo:



FUNCTION	NAME	SIGN	DATE
DRWN	GAJANAN	Gajan	15.01.29
CHKD	J.Y.LEE		15.01.29
APPD	S.D.PARK		15.01.29

DOCUMENT NO: TB2-SDC.VP110-00PAC-M-M4-DAS-0001

No of page:

1 of 3

Scale

Rev.2



P.O NO.	110180-15-110-001-A01
ITEM NO.	18PAC10AP001/AP002, 28PAC10AP001/AP002
ITEM DESCRIPTION	COOLING WATER PUMP
DOCUMENT NO.	TB2-SDC.VP110-00PAC-M-M4-DAS-0001
DOCUMENT TITLE	DATA SHEET FOR CWP
REV NO.	2

Daelim's Approval Status

Daelim Industrial Co., Ltd.	
Job No.	110180
	A - APPROVED
	B - APPROVED WITH COMMENTS
	C - RETURNED FOR CORRECTION
	D - REJECTED
	N - NOT APPLICABLE(REFERENCE ONLY)
SIGNED BY : _____ DATE : _____	
DIC'S PERMISSION TO PROCEED OR REVIEW TAKEN ON VENDOR PRINTS SHALL NOT RELIEVE VENDOR FROM ITS RESPONSIBILITIES OR LIABILITIES UNDER THE PURCHASE ORDER.	

VENDOR'S LOGO:



PUMP DATA SHEET										DOC. NO. TB2-SDC.VP110-00PAC-M-M4-DAS-0001									
										SPECIFICATION OF PUMP		☒ FOR MFG ☐ ESTIMATED							
												CUSTOMER		DAELIM INDUSTRIAL CO., LTD.					
LOCATION		VIETNAM		PO NO		110180-15-110-001-A01					1		S.D.PARK		D.H.JUNG		B.G.JUNG		
ITEM NO.		18PAC10AP001, 18PAC10AP002 28PAC10AP001, 28PAC10AP002		ORDER NO		1202347-001					2		S.D.PARK		J.Y.LEE		GAJANAN		
PUMP TYPE		VMF2100-1810C		Q'TY		4 SETS				DRIVER		☒ MOTOR ☐ ENGINE							
SUPPLIER		HGS		MFG.		HGS						Q'TY	4	SETS					
SERVICE		Cooling Water Pump																	
OPERATING CONDITIONS										PERFORMANCE									
LIQUID		Sea Water								SPEED	330	RPM		DES. EFF.	89	%			
CAPACITY		46,700 m ³ /h		205727.5		US gpm				NPSHr(rate)	10.0	m		SFT. POWER	2794	kW			
TOTAL HEAD		19 m		62.3352		ft				NPSHr(Min.Flow)	13.0	m		NPSHr(Run out.Flow)	13.0	m			
PRESS	DIF.	1.90 Kg/cm ²		1.86		bar				MATERIALS									
	DIS.	- Kg/cm ² (g)		-		bar (g)				ASTM									
	SUC.	- Kg/cm ² (g)		-		barg (g)				DIFFUSER(CASING)							A240 Tp316L + A743 Gr CF3M		
PUMPING TMP.		30.5 °C								IMPELLER		A890 Gr.1B							
VAPOR PRESS		0.0432 kg/cm ²		0.61		Psi				SHAFT		A276 Tp316L							
NPSH Avail.		13.9 m		44.95		ft				SHAFT SLEEVE		A182 Gr F51							
VISCOSITY		0.78932 CP		S.GRAVITY		1.029				COLUMN		A240 Tp316L							
SOLID	SIZE	- mm		CORR/EROS		-				DISCHARGE ELBOW		A240 Tp316L							
	CONTENT :	- %		CAUSED BY						DISCHARGE ELBOW RIB		A36							
CONSTRUCTIONS										BASE PLATE		A36+A240 Tp316L (Cladding)							
CASING	MOUNTING	☐ Foot ☐ Centerline ☐ Bracket ☒ Vertical ☐ Inline								JOURNAL BEARING		TEFLON							
	SPLIT	☐ Axial ☒ Radial								SEALING WATER ☐ YES ☒ NO									
	FLANGE	BORE DIA.		RATING		FACING		POSITION		INLET	SIZE	- mm	RATING	-					
SUCTION		DN2800		N/A		-		BOTTOM		OUTLET	SIZE	- mm	RATING	-					
DISCHARGE		DN2100		AWWA C207 D		FF		SIDE		PRESS	- Kg/cm ²	Q'ty	-	ℓ/min					
ELECTRIC MOTOR										MFR.		HHI		TYPE		TEAAC			
DEPTH FLOOR TO SUMP BOTTOM (VER.PUMP)										9.35 m		R.OUTPUT		4200 kW		NO.OF POLE		18	
MIN. SUBMERGENCE[from SUCTION BELL MOUTH]										5.4 m		SYN.SPEED		333 rpm		INS.CLASS		F	
SPECIFIC SPEED										1011		PHASE		3 Φ		CYCLE		50 Hz	
SUCTION SPECIFIC SPEED										1637		VOLTAGE		10000 V					
NO. OF STAGE		1								ASSESSORIES									
INSTALLATION		☒ INDOOR ☐ OUTDOOR								COUPL. SET		☒ YES ☐ NO		BASE PLATE		☒ YES ☐ NO			
BASE PLATE		☐ COMMON ☒ SOLE								C. FLANGE		☐ YES ☒ NO		ANCH. BOLT		☒ YES ☐ NO			
IMPELLER		☐ CLOSE ☐ OPEN ☒ SEMI-OPEN								FUNNEL		☐ YES ☒ NO		GAUGE COCK		☐ YES ☒ NO			
LUBRICANT		☐ GREASE ☒ OIL ☒ SELF WATER								SUC.STRAINER		☐ YES ☒ NO		PRESS.GAUGE		☒ YES ☐ NO			
COUPLING		☒ FLEXIBLE ☐ RIGID ☐ FLANGE								APPENDED DRAWINGS									
TRANSMISSION		☒ DIRECT ☐ V-BELT								PERFORMANCE		TB2-SDC.VP110-00PAC-M-M4-DAS-0002							
BRG. NO.		JOURNAL		TEFLON		THRUST		#29460		OUTLINE DWG.		TB2-SDC.VP110-00PAC-M-M4-DGA-0001							
ROTATION VIEWD FROM DRIVER										☒ CW ☐ CCW		SECTIONAL DWG.		TB2-SDC.VP110-00PAC-M-M4-DSE-0001					
TAPPED		VENT		DRAIN		GAUGE CONN.				WEIGHTS (APPROX)									
OPENING		3"(DN80)		1"(DN25)		NPT1/2"(DN15)				PUMP		41,200 kg		Lbs					
SHAFT SEAL		☒ PACKING ☐ MECH. SEAL								BASE[PUMP]		3,700 kg		Lbs					
	SIZE	22		TYPE		N/A				MOTOR		33,500 kg		Lbs					
	TURN	3		MODEL		N/A				REMARKS									
SPARE PARTS																			



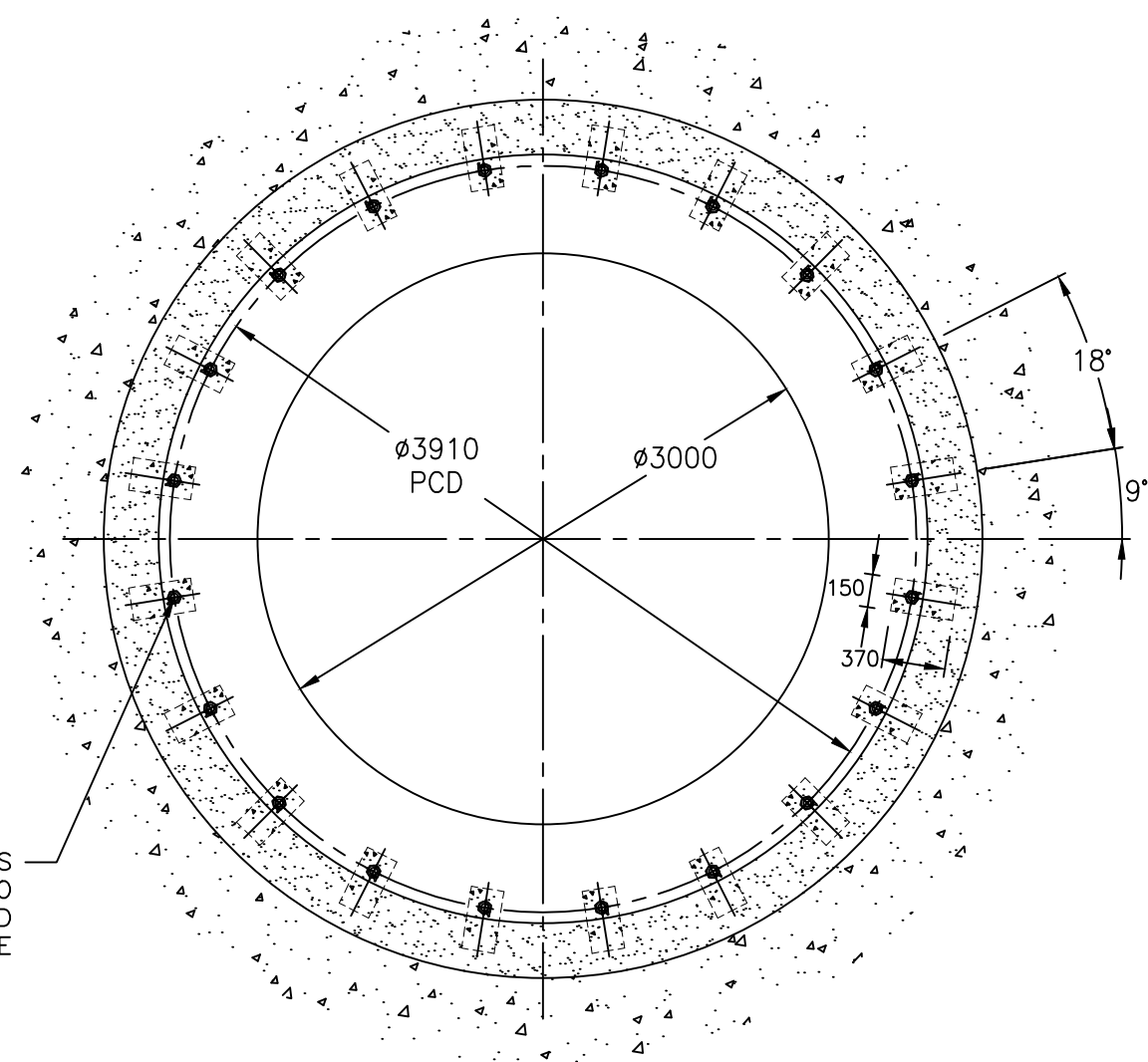
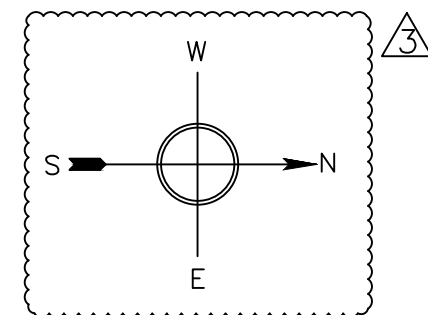
Document Review Comment Sheet			Ref. No TB2-PEB-SDC-M4-TVI-09467			
No.		Rev	Title	Purpose	Approval Status	
					In	Out
1	TB2-SDC.VP110-00PAC-M-M4-DGA-0001	2	Dimensional Outline Drawing with Loading Data for CWP	FF		A
2	TB2-SDC.VP110-00PAC-M-M4-DGA-0011	3	Dimensional Outline Drawing with Loading Data for IFP	FF		A
3	TB2-SDC.VP110-00PAC-M-M4-PID-0001	1	P&I Diagram for Cooling Water Pump	FF		B
4	TB2-SDC.VP110-00PAC-M-M4-PID-0011	3	P&I Diagram for Initial Filling Pump	FF		A
5	TB2-SDC.VP110-00PAC-M-M4-DAS-0011	4	Data Sheet for Initial Filling Pump	FF		A
No	TB2PEB's Comments	Item status	Contractor's Response			
	Detailed Comment/s					
	<u>TB2-SDC.VP110-00PAC-M-M4-DGA-0001</u>					
1	No further comment/s.					
	<u>TB2-SDC.VP110-00PAC-M-M4-DGA-0011</u>					
1	No further comment/s.					
	<u>TB2-SDC.VP110-00PAC-M-M4-PID-0001</u>					
1	As commented under previous revision, supplier must follow TB2 KKS numbering by tagging instrumentation root valves with sequence number that starts with '9'.					
	<u>TB2-SDC.VP110-00PAC-M-M4-PID-0011</u>					
1	Refer to comment, above.					
	<u>TB2-SDC.VP110-00PAC-M-M4-DAS-0011</u>					
1	No further comment/s.					
No	owner's Comments	Item status	Contractor's Response			
	No comment					

AP = For Approval
RE = For Reference
FC = For Construction
AB = As Built
INFO = For Information

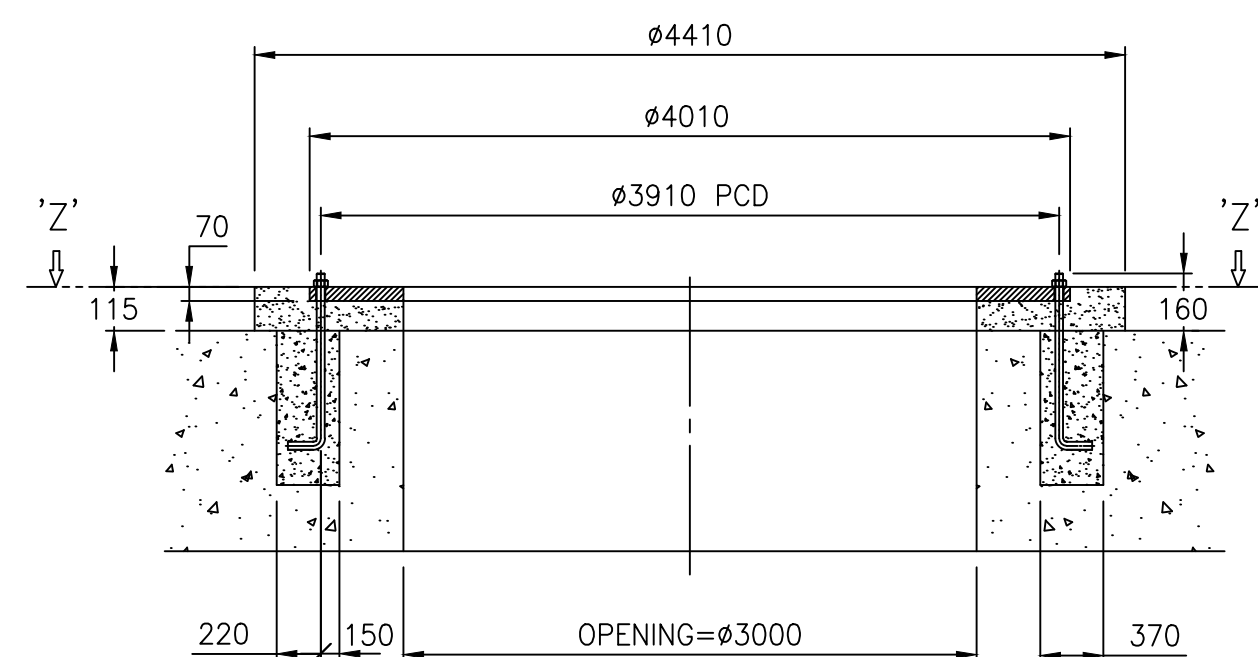
For AP:
A = Approved
B = Approved with Comments
C = Returned for Correction
D = Rejected

For RE:
I=Accepted for Reference
IB=Accepted for Reference with comment
R= Returned for Correction



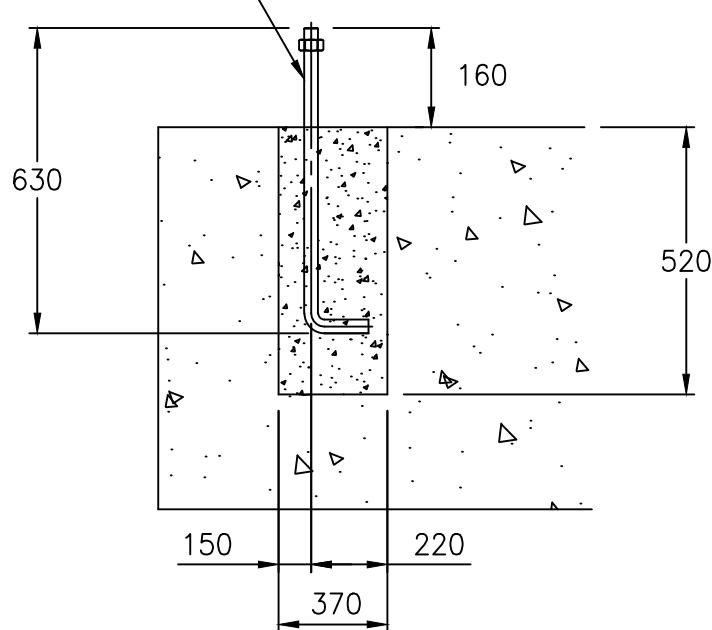


SECTION AT 'Z-Z'

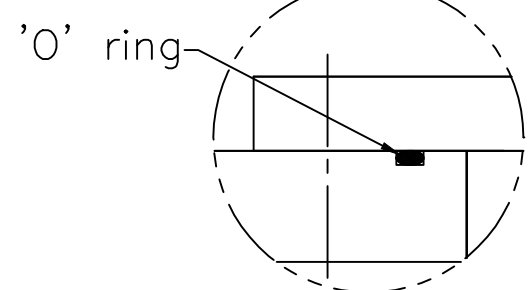


FOUNDATION DETAILS

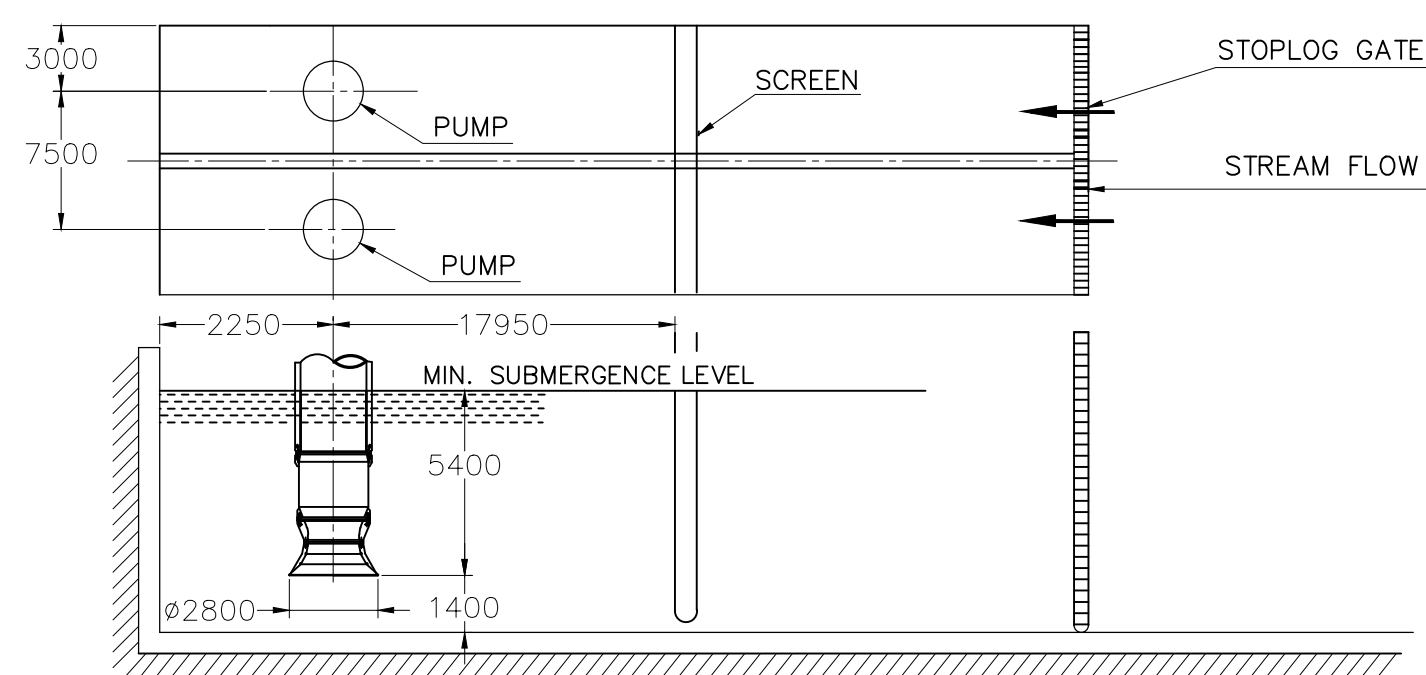
20 NOS 'L' BOLTS
M42X630L



ANCHOR BOLT DETAILS

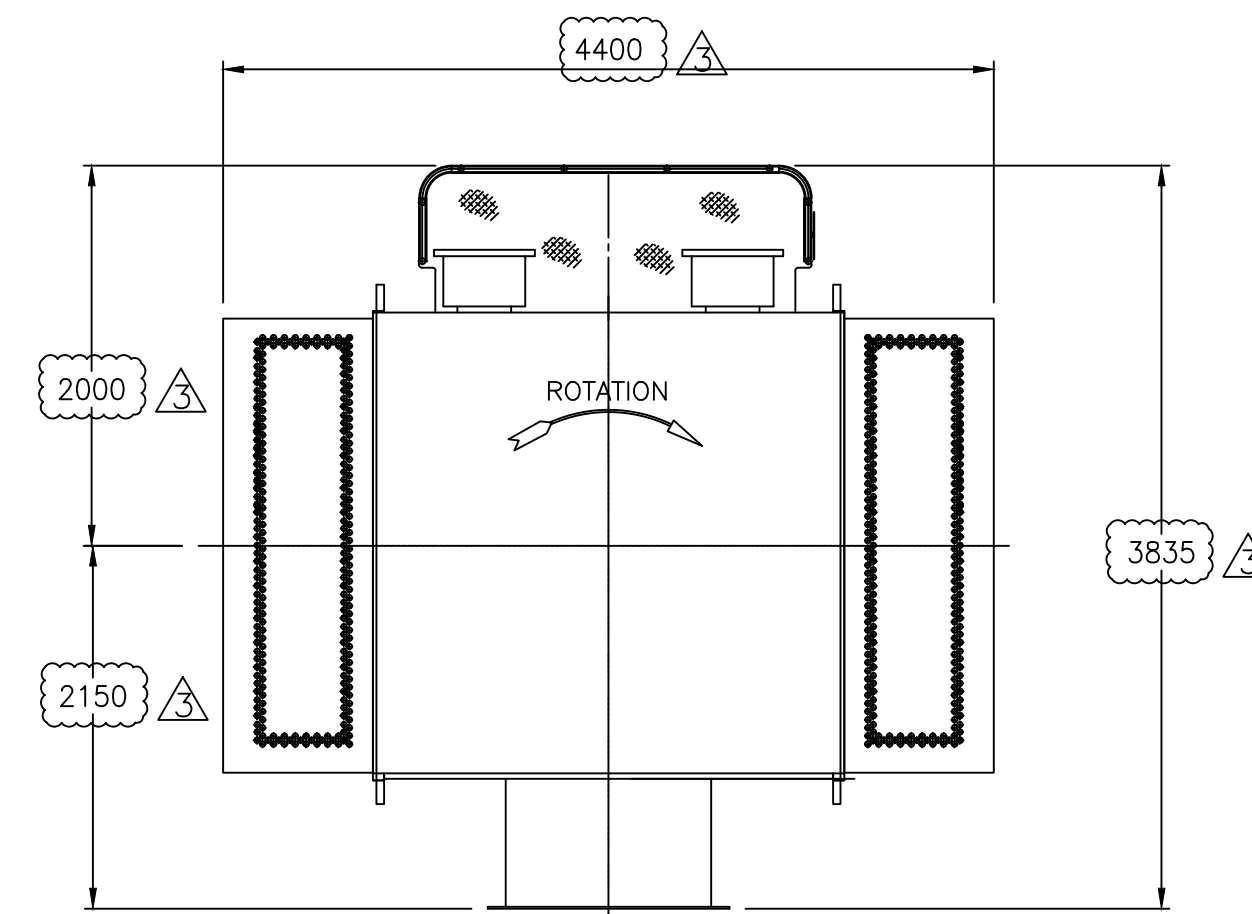
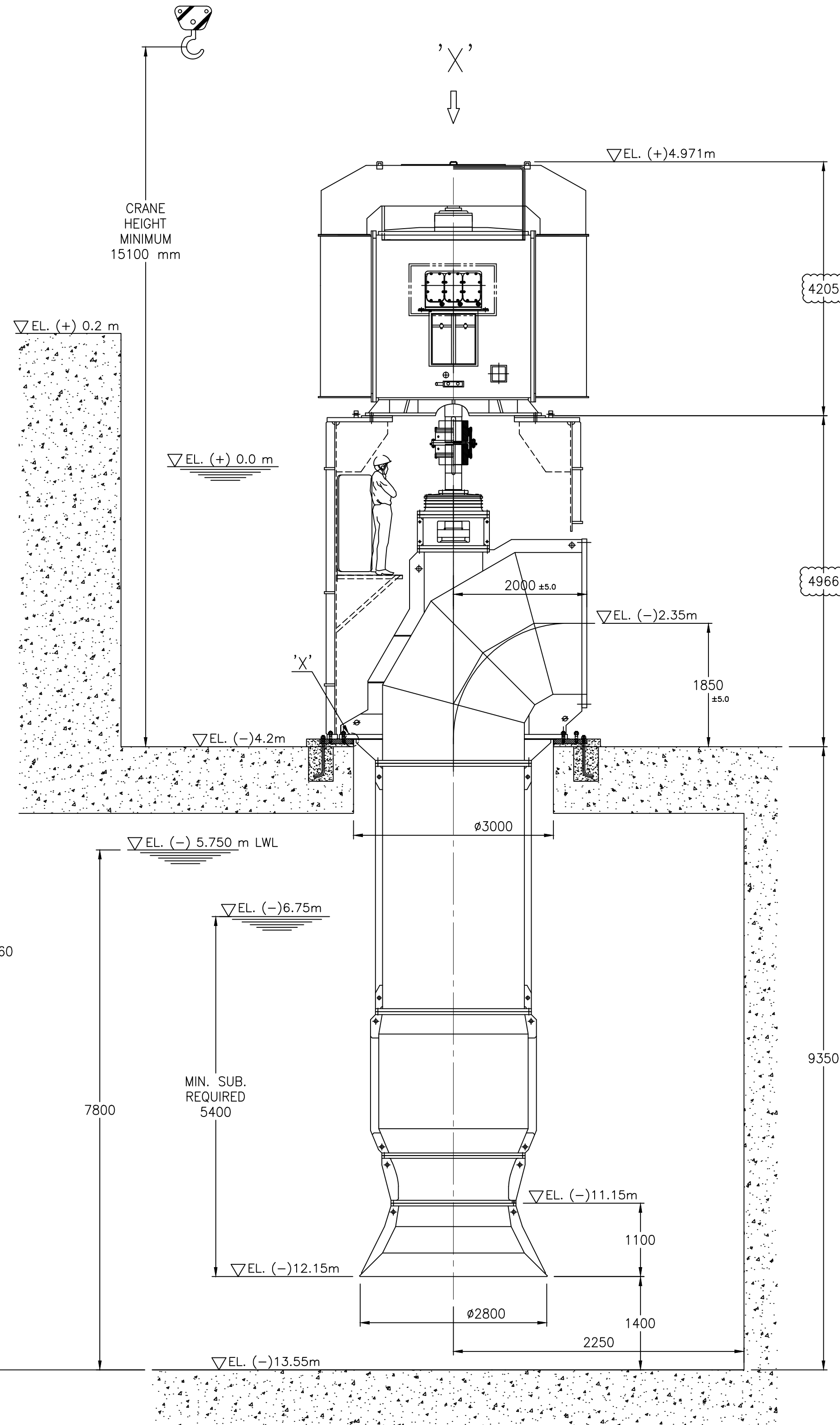


Details at "X"
"O" ring sealing



SUMP DIMENSIONS AS PER H.I

! DIRECTION OF ROTATION IS CLOCKWISE
WHEN VIEWED FROM THE TOP.



MOTOR TOP DETAILS FROM 'X'

DISCHARGE FLANGE HOLE DETAIL (84", AWWA C207 CL D, FF)	
OD(øD)	ø2533.6 mm
ID (øA)	ø2100 mm
PCD (C)	2425.7 mm
TOTAL NO. OF HOLES	64
NO. OF DRILLED HOLES	60
NO. OF TAPPED HOLES	4
DIA OF THE BOLT	M48
DIA OF HOLE	ø54 mm
THICKNESS (t)	73 mm

(UNIT : kg)		
EQUIPMENT	STATIC	DYNAMIC
PUMP	41,200	—
MOTOR	33,500	—
MOTOR STOOL	19,400	—
BED	3,700	163,700
WATER IN PUMP	38,600	—
TOTAL	136,400	APP.163,700

FOUNDATION LOADING DATA

ALLOWABLE MOMENTS & FORCES ON DELIVERY FLANGE.			
FORCE IN (kgf)		MOMENTS IN (kgf-m)	
	DISCHARGE		DISCHARGE
FX	11,550	MX	2,080
FY	11,550	MY	2,080
FZ	11,550	MZ	2,080

NOTE

- Operation of CW pump : discharge valve partially open.
(0%~10%)
- Direction of static,dynamic load : downward
- Plant EL 0m = MSL 4.5m

Daelim Industrial Co., Ltd.	
Job No.	110180
A	APPROVED
B	APPROVED WITH COMMENTS
C	RETURNED FOR CORRECTION
D	REJECTED
N	NOT APPLICABLE (REFERENCE ONLY)
SIGNED BY :	DATE :
DIC'S PERMISSION TO PROCEED OR REVIEW TAKEN ON VENDOR PRINTS SHALL NOT RELIEVE VENDOR FROM ITS RESPONSIBILITIES OR LIABILITIES UNDER THE PURCHASE ORDER.	

DOCUMENT
SUBMISSION
STATUS:FF
NOTE:

	13.Sep.2017	FOR FINAL	Y.H.LEE	D.H.JUNG	S.D.PARK
	28.Apr.2015	FOR FINAL	B.G.JUNG	D.H.JUNG	S.D.PARK
	29.Jun.2015	FOR FINAL	B.G.JUNG	D.H.JUNG	S.D.PARK
	01.Jun.2014	FOR FINAL	B.G.JUNG	D.H.JUNG	S.D.PARK
REV	DATE	DESCRIPTION	PREP	CHKD	APRD
OWNER		OWNER'S CONSULTANT			
					
VIETNAM OIL AND GAS GROUP (VNG)		FICHTNER		PV POWER PCC	
EPC CONTRACTOR		EPC CONTRACTOR'S CONSULTANT			
		 WorleyParsons resources & energy			
PETROVIETNAM CONSTRUCTION JOINT STOCK CORPORATION (VJC)		WORLEYPARSONS			
POWER ISLAND PACKAGE SUPPLIER		 DAELIM INDUSTRIAL CO., LTD.			
					
SOJITZ CORPORATION					
PROJECT TITLE					
THAI BINH2 THERMAL POWER PLANT 2 x 600MW					
DRAWING TITLE					
Dimensional Outline Drawing with Loading Data for CWP					
VENDOR NAME		FUNCTION	NAME	SIGN	DATE
 HYOSUNG GOODSPRINGS INC		DRWN	B.G.JUNG		2014.06.01
		CHKD	D.H.JUNG		2014.06.01
		APPD	S.D.PARK		2014.06.01
		APPD			
DRAWING NO.		JOB NO.	110180	SCALE	1/1
TB2-SDC.VP110-00PAC-M-M4-DGA-0001					REV.NO. 
1 0		1 1		FILE NAME : TB2-SDC.VP110-00PAC-M-M4-DGA-0001	

DOCUMENT SUBMISSION STATUS: FF

NOTE:

3	22-Jun-15	FOR FINAL	S.T. WOO	S.K. LEE	-	S.K. JUNG
2	8-May-15	FOR FINAL	S.T. WOO	S.K. LEE	-	S.K. JUNG
1	27-Jan-15	FOR FINAL	S.T. WOO	S.K. LEE	-	S.K. JUNG
0	30-Sep-14	FOR FINAL	S.T. WOO	S.K. LEE	-	S.K. JUNG
REV.	DATE	DESCRIPTION	DRAWN	CHECKED	APPROVED	APPROVED

OWNER



VIETNAM OIL AND GAS GROUP (PVN)

OWNER'S CONSULTANT

FICHTNER
GmbH & Co. KG

FICHTNER



PVPOWER PCC

EPC CONTRACTOR



PETROVIETNAM CONSTRUCTION JOINT
STOCK CORPORATION (PVC)

EPC CONSTRUCTOR'S CONSULTANT



WORLEYPARSONS

POWER ISLAND PACKAGE SUPPLIER



SOJITZ CORPORATION



DAELIM INDUSTRIAL CO., LTD.

PROJECT TITLE

THAI BINH 2 THERMAL POWER PLANT 2 x 600MW

DRAWING / DOCUMENT TITLE

TECHNICAL DATA SHEET FOR BUTTERFLY VALVE



FUNCTION	NAME	SIGN	DATE
DRWN	S.T. WOO		22-Jun-15
CHKD	S.K. LEE		22-Jun-15
APPD	S.K. JUNG		22-Jun-15

DOCUMENT NO: TB2-SDC.VP406-00100-I-11-DAS-0001

No of page:

Scale

Rev. 3



P.O NO. (MR NO.)	MR-110180-44-406-001-REV.1
ITEM NO.	ALL
ITEM DESCRIPTION	MOTOR OPERATED VALVE (BUTTERFLY)
DOCUMENT NO.	TB2-SDC.VP406-00100-I-I1-DAS-0001
DOCUMENT TITLE	TECHNICAL DATA SHEET FOR BUTTERFLY VALVE
REV NO.	3

Daelim's Approval Status

Daelim Industrial Co., Ltd.	
Job No.	110180
	A - APPROVED
	B - APPROVED WITH COMMENTS
	C - RETURNED FOR CORRECTION
	D - REJECTED
	N - NOT APPLICABLE(REFERENCE ONLY)
SIGNED BY :	DATE :
DIC'S PERMISSION TO PROCEED OR REVIEW TAKEN ON VENDOR PRINTS SHALL NOT RELIEVE VENDOR FROM ITS RESPONSIBILITIES OR LIABILITIES UNDER THE PURCHASE ORDER.	

DUKWON
VALVES



Document Review Comment Sheet			Ref. No TB2-SDC-PEB-TV-7400			
No.	Document No.	Rev	Title	Purpose	Approval	
					In	Out
1	TB2-SDC.VP406-00100-I-I1-DAS-0001	2	TECHNICAL DATA SHEET FOR M.O.V (BUTTERFLY)	FF		B
No	TB2PEB's Comments	Item status	Contractor's Response			
1	Owner's comment to be provided later.					

Legend

Contractor Purpose:

AP = For Approval
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TB2PEB Approval Status:

For AP:

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For RE:

I=Accepted for Reference
 IB=Accepted for Reference with Comments
 R= Returned for Correction





INDEX FOR DATA SHEET - REQ. NO. : MR-110180-44-406-001

SERIAL NO.	TAG NO.	VALVE SIZE	VALVE TYPE		P&ID NO.	Q'TY	REMARK
1	07GHB10AA001	150A	CONTROL	(Butterfly)	00GBK-M-M3-PID-0002	1	44 PAGE OF 4 & 6
2	07GHB10AA002	150A	CONTROL	(Butterfly)	00GBK-M-M3-PID-0002	1	
3	07GHB10AA003	150A	CONTROL	(Butterfly)	00GBK-M-M3-PID-0002	1	
4	11PAB70AA201	80A	MOV	(Butterfly)	01PAB-M-M4-PID-0004	1	44 PAGE OF 7 & 8
5	21PAB70AA201	80A	MOV	(Butterfly)	01PAB-M-M4-PID-0004	1	
6	11PAB71AA201	80A	MOV	(Butterfly)	01PAB-M-M4-PID-0004	1	44 PAGE OF 9 & 10
7	21PAB71AA201	80A	MOV	(Butterfly)	01PAB-M-M4-PID-0004	1	
8	07GNK11AA201	150A	MOV	(Butterfly)	00GMA-M-M3-PID-0002	1	44 PAGE OF 11 & 12
9	11PAB73AA201	750A	MOV	(Butterfly)	01PAB-M-M4-PID-0004	1	44 PAGE OF 13 & 14
10	21PAB73AA201	750A	MOV	(Butterfly)	01PAB-M-M4-PID-0004	1	
11	11PAB77AA201	750A	MOV	(Butterfly)	01PAB-M-M4-PID-0004	1	44 PAGE OF 15 & 16
12	21PAB77AA201	750A	MOV	(Butterfly)	01PAB-M-M4-PID-0004	1	
13	11PGB21AA201	750A	MOV	(Butterfly)	01PGB-M-M4-PID-0001	1	44 PAGE OF 17 & 18
14	21PGB21AA201	750A	MOV	(Butterfly)	01PGB-M-M4-PID-0001	1	
15	11PGB23AA201	750A	MOV	(Butterfly)	01PGB-M-M4-PID-0001	1	44 PAGE OF 19 & 20
16	21PGB23AA201	750A	MOV	(Butterfly)	01PGB-M-M4-PID-0001	1	
17	11PAB50AA201	1950A	MOV	(Butterfly)	01PAB-M-M4-PID-0003	1	44 PAGE OF 21 & 22
18	21PAB50AA201	1950A	MOV	(Butterfly)	01PAB-M-M4-PID-0003	1	
19	11PAB51AA201	1950A	MOV	(Butterfly)	01PAB-M-M4-PID-0003	1	44 PAGE OF 23 & 24
20	21PAB51AA201	1950A	MOV	(Butterfly)	01PAB-M-M4-PID-0003	1	
21	11PAB52AA201	1950A	MOV	(Butterfly)	01PAB-M-M4-PID-0003	1	44 PAGE OF 25 & 26
22	21PAB52AA201	1950A	MOV	(Butterfly)	01PAB-M-M4-PID-0003	1	
23	11PAB53AA201	1950A	MOV	(Butterfly)	01PAB-M-M4-PID-0003	1	44 PAGE OF 27 & 28
24	21PAB53AA201	1950A	MOV	(Butterfly)	01PAB-M-M4-PID-0003	1	
25	11PAB70AA251	1950A	MOV	(Butterfly)	01PAB-M-M4-PID-0005	1	44 PAGE OF 29 & 30
26	21PAB70AA251	1950A	MOV	(Butterfly)	01PAB-M-M4-PID-0005	1	
27	11PAB71AA251	1950A	MOV	(Butterfly)	01PAB-M-M4-PID-0005	1	44 PAGE OF 31 & 32
28	21PAB71AA251	1950A	MOV	(Butterfly)	01PAB-M-M4-PID-0005	1	
29	11PAB72AA251	1950A	MOV	(Butterfly)	01PAB-M-M4-PID-0005	1	44 PAGE OF 33 & 34
30	21PAB72AA251	1950A	MOV	(Butterfly)	01PAB-M-M4-PID-0005	1	
31	11PAB73AA251	1950A	MOV	(Butterfly)	01PAB-M-M4-PID-0005	1	44 PAGE OF 35 & 36
32	21PAB73AA251	1950A	MOV	(Butterfly)	01PAB-M-M4-PID-0005	1	
33	11LBD15AA201	2100A	MOV	(Butterfly)	01LBD-M-M1B-PID-0004	1	44 PAGE OF 37 & 38
34	21LBD15AA201	2100A	MOV	(Butterfly)	01LBD-M-M1B-PID-0004	1	
35	11LBD15AA202	2100A	MOV	(Butterfly)	01LBD-M-M1B-PID-0004	1	44 PAGE OF 39 & 40
36	21LBD15AA202	2100A	MOV	(Butterfly)	01LBD-M-M1B-PID-0004	1	
37	18PAB10AA251	2700A	MOV	(Butterfly)	01PAB-M-M4-PID-0001	1	44 PAGE OF 41 & 42
38	28PAB10AA251	2700A	MOV	(Butterfly)	01PAB-M-M4-PID-0001	1	
39	18PAB11AA251	2700A	MOV	(Butterfly)	01PAB-M-M4-PID-0001	1	44 PAGE OF 43 & 44
40	28PAB11AA251	2700A	MOV	(Butterfly)	01PAB-M-M4-PID-0001	1	
					TOTAL	40	



TECHNICAL DATASHEET

Client : DAELIM INDUSTRIAL CO., LTD.

Project : THAIBINH 2 THERMAL POWER PLANT 2 x 600 MW

CONTROL VALVE (BUTTERFLY)

1	SERVICE CONDITION	Fluid		FILTERED WTR (LIQUID)				Survice			FILTERED WTR TK 1 INL LCV		
				Unit	Max.	Nor.	Min.	TAG NO.		07GHB10AA001			
2		Flow Rate		TPH	327.7	163.8	109.2	PID No.		00GBK-M-M3-PID-0002			
3		Press.		bar(g)	2.12	2.21	2.22	Q'TY		1 EA			
4		Diff. Pressure		bar(g)	0.59	0.76	0.79	Line Size/Spec./SCH		200mm / HBY1 / STD(40)			
5		Max. Shut off Delta P		bar(g)	5	-	-						
6		Design Temp.		℃	38	-	-	Valve Model No.		DWV-BU1107RPR			
7		Density		Kg/m3	1000			Instrument		CONTROL VALVE			
8		Viscosity (Cp)		-	0.67846			Type		CONTROL-MODULATING			
9		Cv. Calculated		-	508.58	223.98	146.46						
10	Cv. Selected		-	1300									
11	VALVE SPECIFICATION	Body Type		Butterfly valve			37	ACTUATOR	Type		Penumatic Cylinder		
12		Size		150 A			38		Mfgr.		FLOWBUS		
13		Leakage Class		ANSI CLASS IV			39		Model		EPR160-SR08		
14		End Connection	Inlet	ANSI B16.5-150LB, FLGD-RF			40		Operating Mode		Single Acting		
15			Outlet	ANSI B16.5-150LB, FLGD-RF			41				Modulating		
16		Face To Face		MAKER S.T.D (MSS SP-67, TABLE 3)			42		Fail position		OPEN		
17		MATERIAL	Body	ASTM A216 WCB			43		Design Pressure		12 bar		
18			Body Seat	BUNA-N			44		Max. Operating Press.		8.2 bar		
19			Disc	A351-CF8M			45		Operating Air Press.		4.5 bar(g)		
20			Disc Seat	Hard Facing (Stellite #6)			46		Actuator Temp.		-20~80℃		
21			Stem	A276 T316			47		Max. Torque		256.76 N.m (26.2 Kg.m)		
22	PAINT	Exterior		N/A (RUBBER LINNING)			48	Operating Time		O<-->C	Less than 10 sec.		
23		Interior		SILICONE MODIFIED (SILVER)			49			Mfgr.		SIEMENS	
24	GEAR	Type		WORM GEAR (With Hand Wheel)			50	Model		6DR5110-0NG00-OAA0			
25		Model		FB036-DGO			51	Type		I/P, SMART HART PROTOCOL			
26		Allowable Torque		56.94	Kgf.m		52	Signal, Input / Output		4~20mA DC / 0.2~0.98 bar(g)			
27		Ratio		36	: 1		53	Enclosure		WEATHERPROOF / IP65			
28		Number of Turn		9			54	Connection Elec./Pneu.		1/2"NPT(F) / 3/8"NPT(F)			
29	TEST	Examination Standard		MSS SP61			55	ACCESSORIES	Air filter & Regulator		AW30-03BG-2-A	SMC	
30		Shell	Test Press. (Water)		7.5	bar(g)			56	Position Transmitter		Yes, SMART HART PROTOCOL	
31			Test Duration		60	sec.			57				
32		Seat	Test Press. (Water)		5.5	bar(g)			58				
33			Test Duration		30	sec.			2	2015.04.22	For approval	W.S.T	L.S.K
34	DWG.	Valve Assembly DWG.		TB2-SDC.VP406-00100-I-11-DSU-0001-12			1	2015.01.26	For approval	W.S.T	L.S.K	J.S.K	
35		Pneumatic Cylinder DWG.		TB2-SDC.VP406-00100-I-11-DSU-0001-19			0	2014.07.23	For approval	W.S.T	L.S.K	J.S.K	
36		Pneumatic Circuit DWG.		-			Rev.	Date	Description	Drawn	REV.	App.	

Special Comments : - 0 to 90 degrees rotation for On/Off valve, 60 degrees rotation for Control valve



Flow Coefficient (CV) & Noise Calculation

Client : PVC
Project : Thai Binh 2 Thermal Power Plant
Valve Name : FILTERED WTR TK 1 INL LCV
Tag No. : 07GHB10AA001

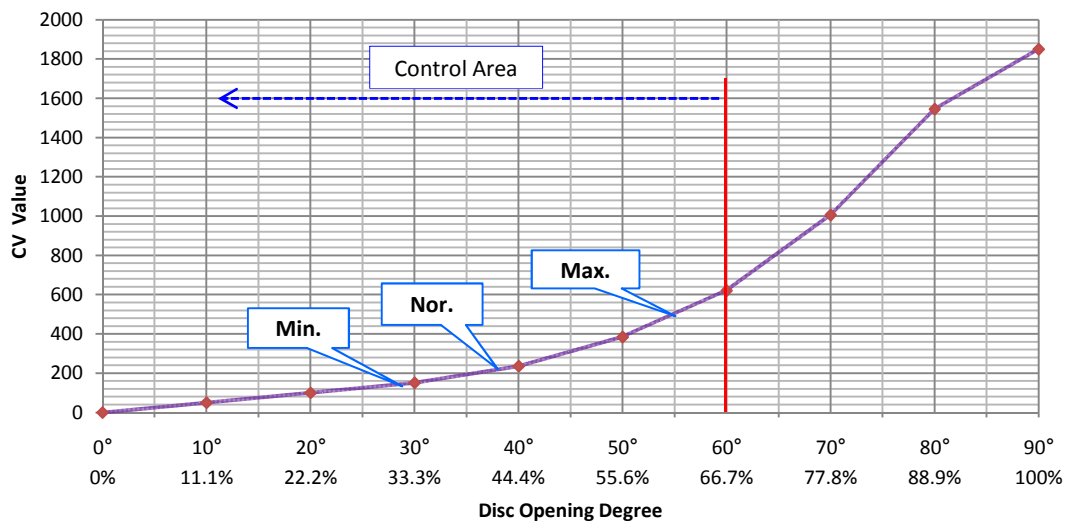
Valve Type : Butterfly Valve type Inlet Pipe : 200A (Sch40)
Valve Size : 6" (DN150) Outlet Pipe : 200A (Sch40)
Cv Selected : 1300 Fluid Type : Liquid
Opening : 90deg. Disc Open (Max.) Fluid Name : Water
(0 to 90 degrees rotation for On/Off valve, 60 degrees rotation for Control valve)

		Min.	Nor.	Max.
Flow Quantity	TPH	109.200	163.800	327.700
inlet Pressure	kgf/cm2(G)	2.220	2.210	2.120
Differential Pressure	kgf/cm3(G)	0.790	0.760	0.590
Shutoff Pressure	kgf/cm4(G)			5.000
Temperature	deg.C	38.000	38.000	38.000
Density	kg/m3	1000.000	1000.000	1000.000
Viscosity	cP	0.678	0.678	0.678

Calculated Cv	146.46	223.98	508.58
Opening (%)	31.6	41.01	59.63
Noise Level (dB)	<75	<75	<75

* Comment about Flow condition : Non Cavitation

DN150 Cv Value



(0 to 90 degrees rotation for On/Off valve, 60 degrees rotation for Control valve)



TECHNICAL DATASHEET

Client : DAELIM INDUSTRIAL CO., LTD.

Project : THAIBINH 2 THERMAL POWER PLANT 2 x 600 MW

CONTROL VALVE (BUTTERFLY)

1	SERVICE CONDITION	Fluid		FILTERED WTR (LIQUID)				Survice			FILTERED WTR TK 2 INL LCV		
				Unit	Max.	Nor.	Min.	TAG NO.		07GHB10AA002			
2		Flow Rate		TPH	327.7	163.8	109.2	PID No.		00GBK-M-M3-PID-0002			
3		Press.		bar(g)	2.03	2.18	2.21	Q'TY		1 EA			
4		Diff. Pressure		bar(g)	0.49	0.73	0.78	Line Size/Spec./SCH		200mm / HBY1 / STD(40)			
5		Max. Shut off Delta P		bar(g)	5	-	-						
6		Design Temp.		℃	38	-	-	Valve Model No.		DWV-BU1107RPR			
7		Density		Kg/m3	1000				Instrument		CONTROL VALVE		
8		Viscosity (Cp)		-	0.67846				Type		CONTROL-MODULATING		
9		Cv. Calculated		-	561.76	230.05	148.37						
10	Cv. Selected		-	1300									
11	VALVE SPECIFICATION	Body Type		Butterfly valve				37	ACTUATOR	Type		Penumatic Cylinder	
12		Size		150 A				38		Mfgr.		FLOWBUS	
13		Leakage Class		ANSI CLASS IV				39		Model		EPR160-SR08	
14		End Connection	Inlet	ANSI B16.5-150LB, FLGD-RF				40		Operating Mode	Single Acting		
15			Outlet	ANSI B16.5-150LB, FLGD-RF				41			Modulating		
16		Face To Face		MAKER S.T.D (MSS SP-67, TABLE 3)				42		Fail position		OPEN	
17		MATERIAL	Body	ASTM A216 WCB				43		Design Pressure		12 bar	
18			Body Seat	BUNA-N				44		Max. Operating Press.		8.2 bar	
19			Disc	A351-CF8M				45		Operating Air Press.		4.5 bar(g)	
20			Disc Seat	Hard Facing (Stellite #6)				46		Actuator Temp.		-20~80℃	
21			Stem	A276 T316				47		Max. Torque		256.76 N.m (26.2 Kg.m)	
22	PAINT	Exterior		N/A (RUBBER LINNING)				48	Operating Time	O<-->C	Less than 10 sec.		
23		Interior		SILICONE MODIFIED (SILVER)				49		Mfgr.		SIEMENS	
24	GEAR	Type		WORM GEAR (With Hand Wheel)				50	Model		6DR5110-0NG00-OAA0		
25		Model		FB036-DGO				51	Type		I/P, SMART HART PROTOCOL		
26		Allowable Torque		56.94	Kgf.m		52	Signal, Input / Output		4~20mA DC / 0.2~0.98 bar(g)			
27		Ratio		36	: 1		53	Enclosure		WEATHERPROOF / IP65			
28		Number of Turn		9				54	Connection Elec./Pneu.		1/2"NPT(F) / 3/8"NPT(F)		
29	TEST	Examination Standard		MSS SP61				55	ACCESSORIES	Air filter & Regulator		AW30-03BG-2-A	SMC
30		Shell	Test Press. (Water)	7.5	bar(g)		56	Position Transmitter		Yes, SMART HART PROTOCOL			
31			Test Duration	60	sec.		57						
32		Seat	Test Press. (Water)	5.5	bar(g)		58						
33			Test Duration	30	sec.		2	2015.04.22		For approval	W.S.T	L.S.K	J.S.K
34	DWG.	Valve Assembly DWG.		TB2-SDC.VP406-00100-I-11-DSU-0001-12				1	2015.01.26	For approval	W.S.T	L.S.K	J.S.K
35		Pneumatic Cylinder DWG.		TB2-SDC.VP406-00100-I-11-DSU-0001-19				0	2014.07.23	For approval	W.S.T	L.S.K	J.S.K
36		Pneumatic Circuit DWG.		-				Rev.	Date	Description	Drawn	REV.	App.

Special Comments : - 0 to 90 degrees rotation for On/Off valve, 60 degrees rotation for Control valve



Flow Coefficient (CV) & Noise Calculation

Client : PVC
Project : Thai Binh 2 Thermal Power Plant
Valve Name : FILTERED WTR TK 2 INL LCV
Tag No. : 07GHB10AA002

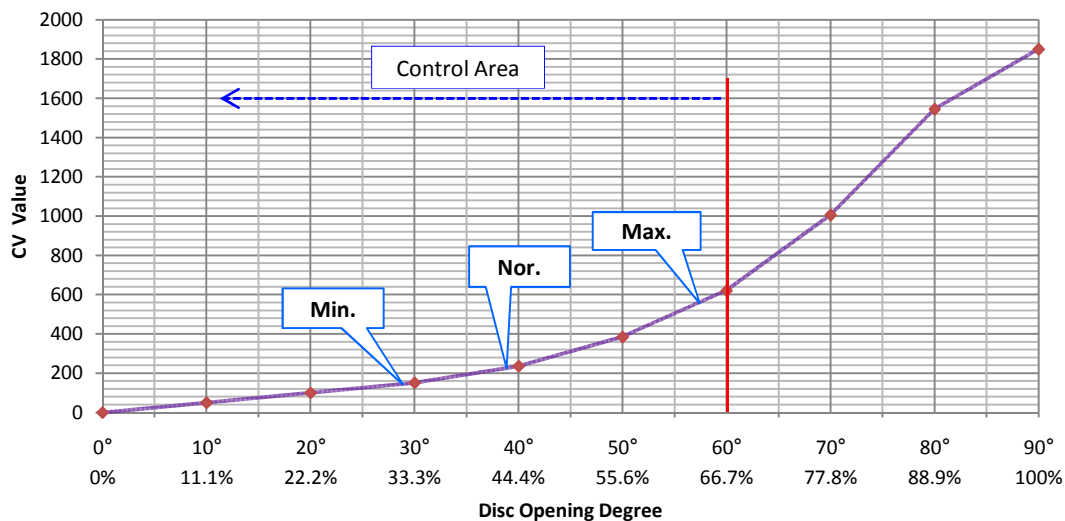
Valve Type : Butterfly Valve type Inlet Pipe : 200A (Sch40)
Valve Size : 6" (DN150) Outlet Pipe : 200A (Sch40)
Cv Selected : 1300 Fluid Type : Liquid
Opening : 90deg. Disc Open (Max.) Fluid Name : Water
(0 to 90 degrees rotation for On/Off valve, 60 degrees rotation for Control valve)

		Min.	Nor.	Max.
Flow Quantity	TPH	109.200	163.800	327.700
inlet Pressure	kgf/cm2(G)	2.210	2.180	2.030
Differential Pressure	kgf/cm3(G)	0.780	0.730	0.490
Shutoff Pressure	kgf/cm4(G)			5.000
Temperature	deg.C	38.000	38.000	38.000
Density	kg/m3	1000.000	1000.000	1000.000
Viscosity	cP	0.678	0.678	0.678

Calculated Cv	148.37	230.05	561.76
Opening (%)	31.87	41.62	62.25
Noise Level (dB)	<75	<75	<75

* Comment about Flow condition : Non Cavitation

DN150 Cv Value



(0 to 90 degrees rotation for On/Off valve, 60 degrees rotation for Control valve)



TECHNICAL DATASHEET

Client : DAELIM INDUSTRIAL CO., LTD.

Project : THAIBINH 2 THERMAL POWER PLANT 2 x 600 MW

CONTROL VALVE (BUTTERFLY)

1	SERVICE CONDITION	Fluid		FILTERED WTR (LIQUID)				Survice		FILTERED WTR TK 3 INL LCV			
				Unit	Max.	Nor.	Min.	TAG NO.		07GHB10AA003			
2		Flow Rate		TPH	327.7	163.8	109.2	PID No.		00GBK-M-M3-PID-0002			
3		Press.		bar(g)	1.93	2.16	2.20	Q'TY		1 EA			
4		Diff. Pressure		bar(g)	0.39	0.70	0.76	Line Size/Spec./SCH		200mm / HBY1 / STD(40)			
5		Max. Shut off Delta P		bar(g)	5	-	-						
6		Design Temp.		℃	38	-	-	Valve Model No.		DWV-BU1107RPR			
7		Density		Kg/m3	1000			Instrument		CONTROL VALVE			
8		Viscosity (Cp)		-	0.67846			Type		CONTROL-MODULATING			
9		Cv. Calculated		-	636.1	237.32	151.84						
10	Cv. Selected		-	1300									
11	VALVE SPECIFICATION	Body Type		Butterfly valve			37	ACTUATOR	Type		Penumatic Cylinder		
12		Size		150 A			38		Mfgr.		FLOWBUS		
13		Leakage Class		ANSI CLASS IV			39		Model		EPR160-SR08		
14		End Connection	Inlet	ANSI B16.5-150LB, FLGD-RF			40		Operating Mode		Single Acting		
15			Outlet	ANSI B16.5-150LB, FLGD-RF			41				Modulating		
16		Face To Face		MAKER S.T.D (MSS SP-67, TABLE 3)			42		Fail position		OPEN		
17		MATERIAL	Body		ASTM A216 WCB				43	Design Pressure		12 bar	
18			Body Seat		BUNA-N				44	Max. Operating Press.		8.2 bar	
19			Disc		A351-CF8M				45	Operating Air Press.		4.5 bar(g)	
20			Disc Seat		Hard Facing (Stellite #6)				46	Actuator Temp.		-20~80 ℃	
21	Stem		A276 T316			47	Max. Torque		256.76 N.m (26.2 Kg.m)				
22	PAINT	Exterior		N/A (RUBBER LINNING)			48	Operating Time		O<-->C	Less than 10 sec.		
23		Interior		SILICONE MODIFIED (SILVER)			49	Mfgr.		SIEMENS			
24	GEAR	Type		WORM GEAR (With Hand Wheel)			50	Model		6DR5110-0NG00-OAA0			
25		Model		FB036-DGO			51	Type		I/P, SMART HART PROTOCOL			
26		Allowable Torque		56.94	Kgf.m		52	Signal, Input / Output		4~20mA DC / 0.2~0.98 bar(g)			
27		Ratio		36	: 1		53	Enclosure		WEATHERPROOF / IP65			
28		Number of Turn		9			54	Connection Elec./Pneu.		1/2"NPT(F) / 3/8"NPT(F)			
29	TEST	Examination Standard		MSS SP61			55	ACCESSORIES	Air filter & Regulator		AW30-03BG-2-A	SMC	
30		Shell	Test Press. (Water)		7.5	bar(g)			56	Position Transmitter		Yes, SMART HART PROTOCOL	
31			Test Duration		60	sec.			57				
32		Seat	Test Press. (Water)		5.5	bar(g)			58				
33			Test Duration		30	sec.			2	2015.04.22	For approval	W.S.T	L.S.K
34	DWG.	Valve Assembly DWG.		TB2-SDC.VP406-00100-I-11-DSU-0001-12			1	2015.01.26	For approval	W.S.T	L.S.K	J.S.K	
35		Pneumatic Cylinder DWG.		TB2-SDC.VP406-00100-I-11-DSU-0001-19			0	2014.07.23	For approval	W.S.T	L.S.K	J.S.K	
36		Pneumatic Circuit DWG.		-			Rev.	Date	Description	Drawn	REV.	App.	

Special Comments : - 0 to 90 degrees rotation for On/Off valve, 60 degrees rotation for Control valve



Flow Coefficient (CV) & Noise Calculation

Client : PVC
Project : Thai Binh 2 Thermal Power Plant
Valve Name : FILTERED WTR TK 3 INL LCV
Tag No. : 07GHB10AA003

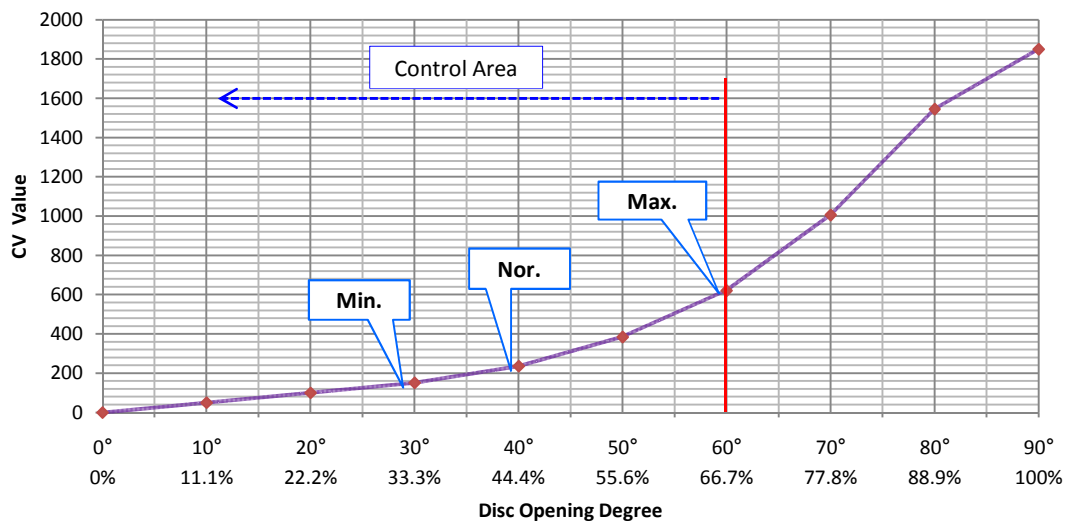
Valve Type : Butterfly Valve type Inlet Pipe : 200A (Sch40)
Valve Size : 6" (DN150) Outlet Pipe : 200A (Sch40)
Cv Selected : 1300 Fluid Type : Liquid
Opening : 90deg. Disc Open (Max.) Fluid Name : Water
(0 to 90 degrees rotation for On/Off valve, 60 degrees rotation for Control valve)

		Min.	Nor.	Max.
Flow Quantity	TPH	109.200	163.800	327.700
inlet Pressure	kgf/cm2(G)	2.200	2.160	1.930
Differential Pressure	kgf/cm3(G)	0.760	0.700	0.390
Shutoff Pressure	kgf/cm4(G)			5.000
Temperature	deg.C	38.000	38.000	38.000
Density	kg/m3	1000.000	1000.000	1000.000
Viscosity	cP	0.678	0.678	0.678

Calculated Cv	151.84	237.32	636.1
Opening (%)	32.37	42.32	65.91
Noise Level (dB)	<75	<75	<75

* Comment about Flow condition : Non Cavitation

DN150 Cv Value



(0 to 90 degrees rotation for On/Off valve, 60 degrees rotation for Control valve)



TECHNICAL DATASHEET

Client : DAELIM INDUSTRIAL CO., LTD.

Project : THAIBINH 2 THERMAL POWER PLANT 2 x 600 MW

MOTOR OPERATED VALVES FOR BUTTERFLY

1	SERVICE CONDITION	Fluid		RIVER (BRACKISH) WATER				Survive		STRAINER-A DRAIN MV		
2				Unit	Max.	Nor.	Min.	TAG NO.	11PAB70AA201/21PAB70AA201			
3		Flow Rate		m3/h	110	37	-	PID No.	01PAB-M-M4-PID-0004			
4		Specific Gravity		-	1.029 @ 30.5℃			Molecular Weight	N/A			
5		Operating Pressure		Bar g	5.39	3.92	-					
6		Operating Temperature		℃	33.4	26	12.4	Viscosity (Cp)	0.86 @ 30.5oC			
7		Diff. Press. open&close		BAR	7/ Vac.							
8		Design Press. / Temp.		Bar g	7 & FV / 50			Q'TY	2 EA			
9	LINE	Pipe Line No.		-			36	ACTUATOR	Type		"see electric actuator data sheet"	
10		Pipe Line Size & Sch.		80 / JXD / STD (40)			37		Mfgr. / Type			
11	VALVE SPECIFICATION	Type		Butterfly valve			38		Model			
12		Size		80 A			39		Operating Mode			
13		Leakage Class		ANSI CLASS IV			40		Power Source			
14		End Connection	Inlet & Ooulet	ASME B 16.5 CLASS 150			41		Operating Time			
15				LUG-FF			42		Output Speed			
16		MATERIAL	Body	A536-65-45-12(DUCTILE) & RUBBER LINED			43		Control Power			
17							44		Cable Connection			
18				Body Seat BUNA-N			45		Enclosure			
19				Disc A351-CF8M			46		Motor Power			
20				Disc Seat A240-316			47		Limit Switch(es)			
21		Stem A276-T316			48	Torque Switch(es)						
22	PAINT	Exterior		N/A (RUBBER LINNING)			49		Space Heater			
23		Interior		SILICONE MODIFIED (SILVER)			50		Transformer			
24	GEAR	Type		N / A			51		Reversing Contactor			
25		Model					52		Potentiometer			
26		Allowable Torque					53		Position Transmitter			
27		Ratio					54		Positioner			
28		Number of Turn					55		Position Indicator			
29	TEST	Examination Standard		"According to ITP"			56		Indication Lamp			
30		Shell	Test Press.				57		Selector Switch			
31			Test Medium				58		Cable Connection			
32		Seat	Test Press.				59		Manual Hand Wheel			
33			Test Medium									
34	DWG.	Assembly DWG.		TB2-SDC.VP406-00100-I-11-DSU-0001-1			1	2015.01.23	For Final	S.T. WOO	S.K. LEE	S.K. JUNG
35		Actuator DWG.		TB2-SDC.VP406-00100-I-11-DSU-0001-13			0	2014.09.30	For Final	S.T. WOO	S.K. LEE	S.K. JUNG
36		Wiring diagram		IM003-XX-AC-XAA/0P0-18			Rev.	Date	Description	Drawn	REV.	App.

Special Comments :

PROJECT	THAIBINH 2 THERMAL POWER PLANT 2 x 600 MW
TAG NO.	11PAB70AA201 / 21PAB70AA201
Q'TY	2 Sets
CONTRACT	DAELIM INDUSTRIAL CO., LTD.
DATE	2014. 07. 17
MR. No.	110180-44-406-001

1	Valve Condition	Type	BUTTERFLY	32	Motor	Three Thermal Switch	Yes
2		Size	80	33		Motor Duty	S2
3		Rating Class	150#	34		Insulation Class	F Class
4		End Connection	ASME B 16.5 CL.150 / LUG-FF	35		RPM	1360
5		Body Matl	A536-65-45-12 (DUCTILE)	36		Rated power	0.12 [kw]
6		Disc Material	A351-CF8M	37		Rated Current	0.53 [A]
7		Seat (Body / Disc)	BUNA-N / 316	38		Current Consumption	0.6 [A]
8		Stem Material	A276-T316	39		Starting Current	1.5 [A]
9		Open / Close Time	24 [sec] ± 5 sec	40		Power Factor	0.66 [cosφ]
10		Turn per stroke	90.0 °	41		Efficiency	50 [%]
11		Required torque [N.m]	40	42		Power Supply	400 VAC, 3PH, 50Hz
12		Manufacture	DUKWON Valve	43	Accessory	Control Voltage	DC 24V
13	Actuator	Version	i-Matic / DREHMO	44		Electric Wiring	iM003-XX-AC-XAA_0P0-18
14		Mode of Operation	ON-OFF	45		Potentiometer	Yes
15		Model	DPiM119-B	46		Position Transmitter	N/A
16		Max. Torque [N.m]	Open : 120 Close : 120	47		Positioner	No
17		Setting Torque [N.m]	Open : 60 Close : 60	48		Local Switch (Open / Stop / Close)	Yes
18		Limit Switch	2 NC 4 NO	49		Selector SW (Local / Off / Remote)	Yes
19		Intermediate Switch	- NC - NO	50		Ind. Lamp (Open[R]/Fault[Y]/Close[G])	Yes
20		Torque Switch	- NC 1 NO	51		Transformer	Yes
21		Rotation	Clock wise Close	52		Reversing Contactor	Yes
22		Output / Max bore size	"B3" FORM	53		Auto.Phases Correction	Yes
23		Output Flange	ISO 5211 F07	54		Torque Failue	Yes
24		Stem Cover	YES	55		Interposing Relay	Yes
25		Handwheel	Yes (Side)	56		Monitor Relay	Yes
26		Space Heater	Anti Condensation	57		Drain plug	Yes
27		Position Indicator	LCD indicator	58			
28		Output RPM / Actuator	24	59			
29		Enclosure Class	IP 67	60			
30		Ambient Temp.	-25 °C to +70 °C	61			
31		Cable Entry	1 x M25, 2 x NPT 1"	62			
	Notes	1. The dry contact for remote selected and trouble signal to be provied refer to electric wiring diagram.	Rev.	Date	Description	Oring	App.
			1	2015.01.23	For Final	H.K.BAEK	Y. K. CHO
			0	2014.09.30	For Final	H.K.BAEK	Y. K. CHO



TECHNICAL DATASHEET

Client : DAELIM INDUSTRIAL CO., LTD.

Project : THAIBINH 2 THERMAL POWER PLANT 2 x 600 MW

MOTOR OPERATED VALVES FOR BUTTERFLY

1	SERVICE CONDITION	Fluid		RIVER (BRACKISH) WATER				Survive		STRAINER-B DRAIN MV			
2				Unit	Max.	Nor.	Min.	TAG NO.	11PAB71AA201/21PAB71AA201				
3		Flow Rate		m3/h	110	37	-	PID No.	01PAB-M-M4-PID-0004				
4		Specific Gravity		-	1.029 @ 30.5℃			Molecular Weight	N/A				
5		Operating Pressure		Bar g	5.39	3.92	-						
6		Operating Temperature		℃	33.4	26	12.4	Viscosity (Cp)	0.86 @ 30.5oC				
7		Diff. Press. open&close		BAR	7/ Vac.								
8		Design Press. / Temp.		Bar g	7 & FV / 50			Q'TY	2 EA				
9	LINE	Pipe Line No.		-			36	ACTUATOR	Type		"see electric actuator data sheet"		
10		Pipe Line Size & Sch.		80 / JXD / STD (40)			37		Mfgr. / Type				
11	VALVE SPECIFICATION	Type		Butterfly valve			38		Model				
12		Size		80 A			39		Operating Mode				
13		Leakage Class		ANSI CLASS IV			40		Power Source				
14		End Connection	Inlet & Ooulet	ASME B 16.5 CLASS 150			41		Operating Time				
15				LUG-FF			42		Output Speed				
16		MATERIAL	Body		A536-65-45-12(DUCTILE) & RUBBER LINED				43	Control Power			
17									Cable Connection				
18			Body Seat		BUNA-N				45	Enclosure			
19			Disc		A351-CF8M				46	Motor Power			
20			Disc Seat		A240-316				47	ACCESSORIES		Limit Switch(es)	
21		Stem		A276-T316			48		Torque Switch(es)				
22	PAINT	Exterior		N/A (RUBBER LINNING)			49		Space Heater				
23		Interior		SILICONE MODIFIED (SILVER)			50		Transformer				
24	GEAR	Type		N / A			51		Reversing Contactor				
25		Model					52		Potentiometer				
26		Allowable Torque					53		Position Transmitter				
27		Ratio					54		Positioner				
28	Number of Turn					55	Position Indicator						
29	TEST	Examination Standard		"According to ITP"			56		Indication Lamp				
30		Shell	Test Press.				57		Selector Switch				
31			Test Medium				58		Cable Connection				
32		Seat	Test Press.				59		Manual Hand Wheel				
33			Test Medium										
34	DWG.	Assembly DWG.		TB2-SDC.VP406-00100-I-11-DSU-0001-1			1	2015.01.23	For Final	S.T. WOO	S.K. LEE	S.K. JUNG	
35		Actuator DWG.		TB2-SDC.VP406-00100-I-11-DSU-0001-13			0	2014.03.05	For Final	S.T. WOO	S.K. LEE	S.K. JUNG	
36		Wiring diagram		IM003-XX-AC-XAA/0P0-18			Rev.	Date	Description	Drawn	REV.	App.	

Special Comments :

PROJECT	THAIBINH 2 THERMAL POWER PLANT 2 x 600 MW
TAG NO.	11PAB71AA201 / 21PAB71AA201
Q'TY	2 Sets
CONTRACT	DAELIM INDUSTRIAL CO., LTD.
DATE	2014. 07. 17
MR. No.	110180-44-406-001

1	Valve Condition	Type	BUTTERFLY		32	Motor	Three Thermal Switch		Yes		
2		Size	80		33		Motor Duty		S2		
3		Rating Class	150#		34		Insulation Class		F Class		
4		End Connection	ASME B 16.5 CL.150 / LUG-FF		35		RPM		1360		
5		Body Matl	A536-65-45-12 (DUCTILE)		36		Rated power		0.12 [kw]		
6		Disc Material	A351-CF8M		37		Rated Current		0.53 [A]		
7		Seat (Body / Disc)	BUNA-N / 316		38		Current Consumption		0.6 [A]		
8		Stem Material	A276-T316		39		Starting Current		1.5 [A]		
9		Open / Close Time	24 [sec] ± 5 sec		40		Power Factor		0.66 [cosφ]		
10		Turn per stroke	90.0 °		41		Efficiency		50 [%]		
11		Required torque [N.m]	40		42		Power Supply		400 VAC, 3PH, 50Hz		
12		Manufacture	DUKWON Valve		43		Accessory	Control Voltage		DC 24V	
13	Actuator	Version	i-Matic / DREHMO		44	Electric Wiring		iM003-XX-AC-XAA_0P0-18			
14		Mode of Operation	ON-OFF		45	Potentiometer		Yes			
15		Model	DPiM119-B		46	Position Transmitter		N/A			
16		Max. Torque [N.m]	Open : 120	Close : 120	47	Positioner		No			
17		Setting Torque [N.m]	Open : 60	Close : 60	48	Local Switch (Open / Stop / Close)		Yes			
18		Limit Switch	2 NC	4 NO	49	Selector SW (Local / Off / Remote)		Yes			
19		Intermediate Switch	- NC	- NO	50	Ind. Lamp (Open[R]/Fault[Y]/Close[G])		Yes			
20		Torque Switch	- NC	1 NO	51	Transformer		Yes			
21		Rotation	Clock wise Close		52	Reversing Contactor		Yes			
22		Output / Max bore size	"B3" FORM		53	Auto.Phases Correction		Yes			
23		Output Flange	ISO 5211 F07		54	Torque Failue		Yes			
24		Stem Cover	YES		55	Interposing Relay		Yes			
25		Handwheel	Yes (Side)		56	Monitor Relay		Yes			
26		Space Heater	Anti Condensation		57	Drain plug		Yes			
27		Position Indicator	LCD indicator		58						
28		Output RPM / Actuator	24		59						
29		Enclosure Class	IP 67		60						
30		Ambient Temp.	-25 °C to +70 °C		61						
31	Cable Entry	1 x M25, 2 x NPT 1"		62							
	Notes	1. The dry contact for remote selected and trouble signal to be provied refer to electric wiring diagram.			Rev.	Date	Description	Oring	App.		
					1	2015.01.23	For Final	H.K.BAEK	Y. K. CHO		
					0	2014.09.30	For Final	H.K.BAEK	Y. K. CHO		



TECHNICAL DATASHEET

Client : DAELIM INDUSTRIAL CO., LTD.

Project : THAIBINH 2 THERMAL POWER PLANT 2 x 600 MW

MOTOR OPERATED VALVES FOR BUTTERFLY

1	SERVICE CONDITION	Fluid		WATER (LIQUID)				Survive		DISCH WASTE WTR MV			
2				Unit	Max.	Nor.	Min.	TAG NO.	07GNK11AA201				
3		Flow Rate		m3/h	-	150	-	PID No.	00GMA-M-M3-PID-0002				
4		Specific Gravity		-	1.00			Molecular Weight	18				
5		Operating Pressure		Bar g	-	3.00	-						
6		Operating Temperature		℃	-	45	-	Viscosity (Cp)	0.86 @ 30.5oC				
7		Diff. Press. open&close		BAR	5								
8		Design Press. / Temp.		Bar g	6 / 50			Q'TY	1 EA				
9	LINE	Pipe Line No.					36	ACTUATOR	Type			"see electric actuator data sheet"	
10		Pipe Line Size & Sch.		150 / JXD /STD(40)			37		Mfgr. / Type				
11	VALVE SPECIFICATION	Type		Butterfly valve			38		Model				
12		Size		150 A			39		Operating Mode				
13		Leakage Class		ANSI CLASS IV			40		Power Source				
14		End Connection	Inlet & Ooulet	ASME B 16.5 CLASS 150 LUG-FF			41		Operating Time				
15							42		Output Speed				
16		MATERIAL	Body		A536-65-45-12(DUCTILE) & RUBBER LINED				43	Control Power			
17									44	Cable Connection			
18			Body Seat		BUNA-N				45	Enclosure			
19			Disc		A351-CF8M				46	Motor Power			
20			Disc Seat		A240-316			47	Limit Switch(es)				
21		48						Torque Switch(es)					
22	PAINT	Exterior		N/A (RUBBER LINNING)			49	Space Heater					
23		Interior		SILICONE MODIFIED (SILVER)			50	Transformer					
24	GEAR	Type		N / A			51	Reversing Contactor					
25		Model					52	Potentiometer					
26		Allowable Torque					53	Position Transmitter					
27		Ratio					54	Positioner					
28		Number of Turn					55	Position Indicator					
29	TEST	Examination Standard		"According to ITP"			56	Indication Lamp					
30		Shell	Test Press.				57	Selector Swith					
31			Test Medium				58	Cable Connection					
32		Seat	Test Press.				59	Manual Hand Wheel					
33			Test Medium										
34	DWG.	Assembly DWG.		TB2-SDC.VP406-00100-I-I1-DSU-0001-2			1	2015.01.23	For Final	S.T. WOO	S.K. LEE	S.K. JUNG	
35		Actuator DWG.		TB2-SDC.VP406-00100-I-I1-DSU-0001-14			0	2014.03.05	For Final	S.T. WOO	S.K. LEE	S.K. JUNG	
36		Wiring diagram		IM003-XX-AC-XAA/0P0-18			Rev.	Date	Description	Drawn	REV.	App.	

Special Comments :

PROJECT	THAIBINH 2 THERMAL POWER PLANT 2 x 600 MW
TAG NO.	07GNK11AA201
Q'TY	1 Set
CONTRACT	DAELIM INDUSTRIAL CO., LTD.
DATE	2014. 07. 17
MR. No.	110180-44-405-001

1	Valve Condition	Type	BUTTERFLY		32	Motor	Three Thermal Switch		Yes		
2		Size	150		33		Motor Duty		S2		
3		Rating Class	150#		34		Insulation Class		F Class		
4		End Connection	ASME B 16.5 CL.150 / LUG-FF		35		RPM		1360		
5		Body Matl	A536-65-45-12 (DUCTILE)		36		Rated power		0.12 [kw]		
6		Disc Material	A351-CF8M		37		Rated Current		0.53 [A]		
7		Seat (Body / Disc)	BUNA-N / 316		38		Current Consumption		0.5 [A]		
8		Stem Material	A276-T316		39		Starting Current		1.5 [A]		
9		Open / Close Time	24 [sec] ± 5 sec		40		Power Factor		0.66 [cosφ]		
10		Turn per stroke	90.0 °		41		Efficiency		50 [%]		
11		Required torque [N.m]	75		42		Power Supply		400 VAC, 3PH, 50Hz		
12		Manufacture	DUKWON Valve		43		Accessory	Control Voltage		DC 24V	
13	Actuator	Version	i-Matic / DREHMO		44	Electric Wiring		iM003-XX-AC-XAA_0P0-18			
14		Mode of Operation	ON-OFF		45	Potentiometer		Yes			
15		Model	DPiM319-B		46	Position Transmitter		N/A			
16		Max. Torque [N.m]	Open : 320	Close : 320	47	Positioner		No			
17		Setting Torque [N.m]	Open : 160	Close : 160	48	Local Switch (Open / Stop / Close)		Yes			
18		Limit Switch	2 NC	4 NO	49	Selector SW (Local / Off / Remote)		Yes			
19		Intermediate Switch	- NC	- NO	50	Ind. Lamp (Open[R]/Fault[Y]/Close[G])		Yes			
20		Torque Switch	- NC	1 NO	51	Transformer		Yes			
21		Rotation	Clock wise Close		52	Reversing Contactor		Yes			
22		Output / Max bore size	"B3" FORM		53	Auto.Phases Correction		Yes			
23		Output Flange	ISO 5211 F10		54	Torque Failue		Yes			
24		Stem Cover	YES		55	Interposing Relay		Yes			
25		Handwheel	Yes (Side)		56	Monitor Relay		Yes			
26		Space Heater	Anti Condensation		57	Drain plug		Yes			
27		Position Indicator	LCD indicator		58						
28		Output RPM / Actuator	24		59						
29		Enclosure Class	IP 67		60						
30		Ambient Temp.	-25 °C to +70 °C		61						
31		Cable Entry	1 x M25, 2 x NPT 1"		62						
	Notes	1. The dry contact for remote selected and trouble signal to be provied refer to electric wiring diagram.			Rev.	Date	Description	Oring	App.		
					1	2015.01.23	For Final	H.K.BAEK	Y. K. CHO		
					0	2014.09.30	For Final	H.K.BAEK	Y. K. CHO		



TECHNICAL DATASHEET

Client : DAELIM INDUSTRIAL CO., LTD.

Project : THAIBINH 2 THERMAL POWER PLANT 2 x 600 MW

MOTOR OPERATED VALVES FOR BUTTERFLY

1	SERVICE CONDITION	Fluid		RIVER (BRACKISH) WATER				Survive		ACW PP-A DISCH MV				
2				Unit	Max.	Nor.	Min.	TAG NO.	11PAB73AA201/21PAB73AA201					
3		Flow Rate		m3/h	4940	3800	900	PID No.	01PAB-M-M4-PID-0004					
4		Specific Gravity		-	1.029 @ 30.5℃			Molecular Weight	N/A					
5		Operating Pressure		Bar g	5.39	3.92	-							
6		Operating Temperature		℃	33.6	26	12.4	Viscosity (Cp)	0.86 @ 30.5oC					
7		Diff. Press. open&close		BAR	7/ Vac.									
8		Design Press. / Temp.		Bar G	10 & FV / 50			Q'TY	2 EA					
9	LINE	Pipe Line No.		-			36	ACTUATOR	Type		"see electric actuator data sheet"			
10		Pipe Line Size & Sch.		750 / JXD / STD			37		Mfgr. / Type					
11	VALVE SPECIFICATION	Type		Butterfly valve			38		Model					
12		Size		750 A			39		Operating Mode					
13		Leakage Class		ANSI CLASS IV			40		Power Source					
14		End Connection	Inlet & Outlet	ASME B 16.47 Cl. 150, SERIES A / FF			41		Operating Time					
15				THICKNESS_AWWA C 207-D			42		Output Speed					
16		MATERIAL	Body		A536-65-45-12(DUCTILE) & RUBBER LINED				43	Control Power				
17									Cable Connection					
18			Body Seat		A240-316				45	Enclosure				
19			Disc		A351-CF8M				46	Motor Power				
20			Disc Seat		BUNA-N				47	Limit Switch(es)				
21									Torque Switch(es)					
22	PAINT	Exterior		N/A (RUBBER LINNING)			49		Space Heater					
23		Interior		SILICONE MODIFIED (SILVER)			50		Transformer					
24	GEAR	Type		WORM GEAR BOX			51		Reversing Contactor					
25		Model		TM-W4SDM			52		Potentiometer					
26		Allowable Torque		926	kgf.m		53		Position Transmitter					
27		Ratio		357.9	: 1		54		Positioner					
28		Number of Turn		89.475			55		Position Indicator					
29	TEST	Examination Standard		"According to ITP"			56		Indication Lamp					
30		Shell	Test Press.				57		Selector Switch					
31			Test Medium				58		Cable Connection					
32		Seat	Test Press.				59		Manual Hand Wheel					
33			Test Medium											
34		DWG.	Assembly DWG.				TB2-SDC.VP406-00100-I-I1-DSU-0001-4			1	2015.01.23	For Final	S.T. WOO	S.K. LEE
35	Actuator DWG.		TB2-SDC.VP406-00100-I-I1-DSU-0001-15			0	2014.03.05	For Final	S.T. WOO	S.K. LEE	S.K. JUNG			
36	Wiring diagram		IM003-XX-AC-XAA/0P0-18			Rev.	Date	Description	Drawn	REV.	App.			

Special Comments :

PROJECT	THAIBINH 2 THERMAL POWER PLANT 2 x 600 MW
TAG NO.	11PAB73AA201/21PAB73AA201
Q'TY	2 Sets
CONTRACT	DAELIM INDUSTRIAL CO., LTD.
DATE	2014. 07. 17
MR. No.	110180-44-406-001

1	Valve Condition	Type	BUTTERFLY		32	Motor	Three Thermal Switch		Yes		
2		Size	750		33		Motor Duty		S2		
3		Rating Class	150#		34		Insulation Class		F Class		
4		End Connection	ASME B 16.47 SERIES "A" CLASS 150 / FF		35		RPM		2820		
5		Body Matl	A536-65-45-12 (DUCTILE)		36		Rated power		1.6 [kw]		
6		Disc Material	A351-CF8M		37		Rated Current		3.7 [A]		
7		Seat (Body / Disc)	316 / BUNA-N		38		Current Consumption		7.7 [A]		
8		Stem Material	A276-T316		39		Starting Current		20.5 [A]		
9		Open / Close Time	45 [sec]		40		Power Factor		0.8 [cosφ]		
10		Turn per stroke	90.0 °		41		Efficiency		80 [%]		
11		Required torque [N.m]	6126		42		Power Supply		400 VAC, 3PH, 50Hz		
12		Manufacture	DUKWON Valve		43		Accessory	Control Voltage		DC 24V	
13	Actuator	Version	i-Matic / DREHMO		44	Electric Wiring		iM003-XX-AC-XAA_0P0-18			
14		Mode of Operation	ON-OFF		45	Potentiometer		Yes			
15		Model	DiM120-B3		46	Position Transmitter		N/A			
16		Max. Torque [N.m]	Open : 120	Close : 120	47	Positioner		No			
17		Setting Torque [N.m]	Open : 100	Close : 100	48	Local Switch (Open / Stop / Close)		Yes			
18		Limit Switch	2 NC	4 NO	49	Selector SW (Local / Off / Remote)		Yes			
19		Intermediate Switch	- NC	- NO	50	Ind. Lamp (Open[R]/Fault[Y]/Close[G])		Yes			
20		Torque Switch	- NC	1 NO	51	Transformer		Yes			
21		Rotation	Clock wise Close		52	Reversing Contactor		Yes			
22		Output / Max bore size	"B3" FORM		53	Auto.Phases Correction		Yes			
23		Output Flange	ISO 5210 F10		54	Torque Failue		Yes			
24		Stem Cover	YES		55	Interposing Relay		Yes			
25		Handwheel	Yes (Side)		56	Monitor Relay		Yes			
26		Space Heater	Anti Condensation		57	Drain plug		Yes			
27		Position Indicator	LCD indicator		58						
28		Output RPM / Actuator	120		59						
29		Enclosure Class	IP 67		60						
30		Ambient Temp.	-25 °C to +70 °C		61						
31	Cable Entry	1 x M25, 2 x NPT 1"		62							

Notes	1. The dry contact for remote selected and trouble signal to be provied refer to electric wiring diagram.	Rev.	Date	Description	Oring	App.
		1	2015.01.23	For Final	H.K.BAEK	Y. K. CHO
		0	2014.09.30	For Final	H.K.BAEK	Y. K. CHO



TECHNICAL DATASHEET

Client : DAELIM INDUSTRIAL CO., LTD.

Project : THAIBINH 2 THERMAL POWER PLANT 2 x 600 MW

MOTOR OPERATED VALVES FOR BUTTERFLY

1	SERVICE CONDITION	Fluid		RIVER (BRACKISH) WATER				Survive		ACW PP-B DISCH MV		
2				Unit	Max.	Nor.	Min.	TAG NO.	11PAB77AA201/21PAB77AA201			
3		Flow Rate		m3/h	4940	3800	900	PID No.	01PAB-M-M4-PID-0004			
4		Specific Gravity		-	1.029 @ 30.5℃			Molecular Weight	N/A			
5		Operating Pressure		Bar g	5.39	3.92	-					
6		Operating Temperature		℃	33.6	26	12.4	Viscosity (Cp)	0.86 @ 30.5oC			
7		Diff. Press. open&close		BAR	7 / Vac.							
8		Design Press. / Temp.		Bar G	10 & FV / 50			Q'TY	2 EA			
9	LINE	Pipe Line No.		-		36	ACTUATOR	Type		"see electric actuator data sheet"		
10		Pipe Line Size & Sch.		750 / JXD / STD		37		Mfgr. / Type				
11	VALVE SPECIFICATION	Type		Butterfly valve		38		Model				
12		Size		750 A		39		Operating Mode				
13		Leakage Class		ANSI CLASS IV		40		Power Source				
14		End Connection	Inlet & Outlet	ASME B 16.47 Cl.150, SERIES A / FF		41		Operating Time				
15				THICKNESS_AWWA C 207-D		42		Output Speed				
16		MATERIAL	Body	A536-65-45-12(DUCTILE) & RUBBER LINED		43		Control Power				
17						44		Cable Connection				
18				Body Seat		A240-316		45	Enclosure			
19				Disc		A351-CF8M		46	Motor Power			
20				Disc Seat		BUNA-N		47	Limit Switch(es)			
21		Stem		A276-T316	48	Torque Switch(es)						
22	PAINT	Exterior		N/A (RUBBER LINNING)		49		Space Heater				
23		Interior		SILICONE MODIFIED (SILVER)		50		Transformer				
24	GEAR	Type		WORM GEAR BOX		51		Reversing Contactor				
25		Model		TM-W4SDM		52		Potentiometer				
26		Allowable Torque		926	kgf.m	53		Position Transmitter				
27		Ratio		357.9	: 1	54		Positioner				
28		Number of Turn		89.475		55		Position Indicator				
29	TEST	Examination Standard		"According to ITP"		56		Indication Lamp				
30		Shell	Test Press.			57		Selector Switch				
31			Test Medium			58		Cable Connection				
32		Seat	Test Press.			59		Manual Hand Wheel				
33			Test Medium									
34	DWG.	Assembly DWG.		TB2-SDC.VP406-00100-I-I1-DSU-0001-4		1	2015.01.23	For Final	S.T. WOO	S.K. LEE	S.K. JUNG	
35		Actuator DWG.		TB2-SDC.VP406-00100-I-I1-DSU-0001-15		0	2014.03.05	For Final	S.T. WOO	S.K. LEE	S.K. JUNG	
36		Wiring diagram		IM003-XX-AC-XAA/0P0-18		Rev.	Date	Description	Drawn	REV.	App.	

Special Comments :

PROJECT	THAIBINH 2 THERMAL POWER PLANT 2 x 600 MW
TAG NO.	11PAB77AA201/21PAB77AA201
Q'TY	2 Sets
CONTRACT	DAELIM INDUSTRIAL CO., LTD.
DATE	2014. 07. 17
MR. No.	110180-44-406-001

1	Valve Condition	Type	BUTTERFLY		32	Motor	Three Thermal Switch		Yes	
2		Size	750		33		Motor Duty		S2	
3		Rating Class	150#		34		Insulation Class		F Class	
4		End Connection	ASME B 16.47 SERIES "A" CLASS 150 / FF		35		RPM		2820	
5		Body Matl	A536-65-45-12 (DUCTILE)		36		Rated power		1.6 [kw]	
6		Disc Material	A351-CF8M		37		Rated Current		3.7 [A]	
7		Seat (Body / Disc)	316 / BUNA-N		38		Current Consumption		7.7 [A]	
8		Stem Material	A276-T316		39		Starting Current		20.5 [A]	
9		Open / Close Time	45 [sec]		40		Power Factor		0.8 [cosφ]	
10		Turn per stroke	90.0 °		41		Efficiency		80 [%]	
11		Required torque [N.m]	6126		42		Power Supply		400 VAC, 3PH, 50Hz	
12		Manufacture	DUKWON Valve		43	Accessory	Control Voltage		DC 24V	
13	Actuator	Version		44	Electric Wiring		iM003-XX-AC-XAA_0P0-18			
14		Mode of Operation		45	Potentiometer		Yes			
15		Model		46	Position Transmitter		N/A			
16		Max. Torque [N.m]		47	Positioner		No			
17		Setting Torque [N.m]		48	Local Switch (Open / Stop / Close)		Yes			
18		Limit Switch		49	Selector SW (Local / Off / Remote)		Yes			
19		Intermediate Switch		50	Ind. Lamp (Open[R]/Fault[Y]/Close[G])		Yes			
20		Torque Switch		51	Transformer		Yes			
21		Rotation		52	Reversing Contactor		Yes			
22		Output / Max bore size		53	Auto.Phases Correction		Yes			
23		Output Flange		54	Torque Failue		Yes			
24		Stem Cover		55	Interposing Relay		Yes			
25		Handwheel		56	Monitor Relay		Yes			
26		Space Heater		57	Drain plug		Yes			
27		Position Indicator		58						
28		Output RPM / Actuator		59						
29		Enclosure Class		60						
30		Ambient Temp.		61						
31		Cable Entry		62						
	Notes	1. The dry contact for remote selected and trouble signal to be provied refer to electric wiring diagram.			Rev.	Date	Description		Oring	App.
					1	2015.01.23	For Final		H.K.BAEK	Y. K. CHO
					0	2014.09.30	For Final		H.K.BAEK	Y. K. CHO



TECHNICAL DATASHEET

Client : DAELIM INDUSTRIAL CO., LTD.

Project : THAIBINH 2 THERMAL POWER PLANT 2 x 600 MW

MOTOR OPERATED VALVES FOR BUTTERFLY

1	SERVICE CONDITION	Fluid		CCW				Survive		CCWP-A DISCH MV			
2				Unit	Max.	Nor.	Min.	TAG NO.	11PGB21AA201 / 21PGB21AA201				
3		Flow Rate		m3/h	4420	3400	840	PID No.	01PGB-M-M4-PID-0001				
4		Specific Gravity		-	1.012			Molecular Weight	18				
5		Operating Pressure		Bar g	8.33	4.90	-						
6		Operating Temperature		℃	46	42	-	Viscosity (Cp)	0.54716				
7		Diff. Press. open&close		BAR	10								
8		Design Press. / Temp.		Bar G	10 / 50			Q'TY	2 EA				
9	LINE	Pipe Line No.		-			36	ACTUATOR	Type		"see electric actuator data sheet"		
10		Pipe Line Size & Sch.		750 / HBY / STD			37		Mfgr. / Type				
11	VALVE SPECIFICATION	Type		Butterfly valve			38		Model				
12		Size		750 A			39		Operating Mode				
13		Leakage Class		ANSI CLASS IV			40		Power Source				
14		End Connection	Inlet & Outlet	ASME B 16.47 Cl.150, SERIES A / RF			41		Operating Time				
15				THICKNESS_AWWA C 207-D			42		Output Speed				
16		MATERIAL	Body		A216-WCB				43	Control Power			
17									44	Cable Connection			
18			Body Seat		A240-316				45	Enclosure			
19			Disc		A351-CF8M				46	Motor Power			
20			Disc Seat		VITON WITH RTFE			47	Limit Switch(es)				
21			Stem		A276-T316			48					Torque Switch(es)
22	PAINT	Exterior		INORGANIC ZINC			49	Space Heater					
23		Interior		SILICONE MODIFIED (SILVER)			50	Transformer					
24	GEAR	Type		WORM GEAR BOX			51	Reversing Contactor					
25		Model		TM-W4SDM			52	Potentiometer					
26		Allowable Torque		926	kgf.m		53	Position Transmitter					
27		Ratio		357.9	: 1		54	Positioner					
28		Number of Turn		89.475			55	Position Indicator					
29	TEST	Examination Standard		"According to ITP"			56	Indication Lamp					
30		Shell	Test Press.				57	Selector Switch					
31			Test Medium				58	Cable Connection					
32		Seat	Test Press.				59	Manual Hand Wheel					
33			Test Medium										
34	DWG.	Assembly DWG.		TB2-SDC.VP406-00100-I-I1-DSU-0001-4			1	2015.01.23	For Final	S.T. WOO	S.K. LEE	S.K. JUNG	
35		Actuator DWG.		TB2-SDC.VP406-00100-I-I1-DSU-0001-15			0	2014.03.05	For Final	S.T. WOO	S.K. LEE	S.K. JUNG	
36		Wiring diagram		IM003-XX-AC-XAA/0P0-18			Rev.	Date	Description	Drawn	REV.	App.	

Special Comments :

PROJECT	THAIBINH 2 THERMAL POWER PLANT 2 x 600 MW
TAG NO.	11PGB21AA201 / 21PGB21AA201
Q'TY	2 Sets
CONTRACT	DAELIM INDUSTRIAL CO., LTD.
DATE	2014. 07. 17
MR. No.	110180-44-406-001

1	Valve Condition	Type	BUTTERFLY		32	Motor	Three Thermal Switch		Yes		
2		Size	750		33		Motor Duty		S2		
3		Rating Class	150#		34		Insulation Class		F Class		
4		End Connection	ASME B 16.47 SERIES "A" CLASS 150 / RF		35		RPM		2820		
5		Body Matl	A216-WCB		36		Rated power		1.6 [kw]		
6		Disc Material	A351-CF8M		37		Rated Current		3.7 [A]		
7		Seat (Body / Disc)	316 / R.T.F.E		38		Current Consumption		7.7 [A]		
8		Stem Material	A276-T316		39		Starting Current		20.5 [A]		
9		Open / Close Time	45 [sec]		40		Power Factor		0.8 [cosφ]		
10		Turn per stroke	90.0 °		41		Efficiency		80 [%]		
11		Required torque [N.m]	6126		42		Power Supply		400 VAC, 3PH, 50Hz		
12		Manufacture	DUKWON Valve		43		Accessory	Control Voltage		DC 24V	
13	Actuator	Version	i-Matic / DREHMO		44	Electric Wiring		iM003-XX-AC-XAA_0P0-18			
14		Mode of Operation	ON-OFF		45	Potentiometer		Yes			
15		Model	DiM120-B3		46	Position Transmitter		N/A			
16		Max. Torque [N.m]	Open : 120	Close : 120	47	Positioner		No			
17		Setting Torque [N.m]	Open : 100	Close : 100	48	Local Switch (Open / Stop / Close)		Yes			
18		Limit Switch	2 NC	4 NO	49	Selector SW (Local / Off / Remote)		Yes			
19		Intermediate Switch	- NC	- NO	50	Ind. Lamp (Open[R]/Fault[Y]/Close[G])		Yes			
20		Torque Switch	- NC	1 NO	51	Transformer		Yes			
21		Rotation	Clock wise Close		52	Reversing Contactor		Yes			
22		Output / Max bore size	"B3" FORM		53	Auto.Phases Correction		Yes			
23		Output Flange	ISO 5210 F10		54	Torque Failue		Yes			
24		Stem Cover	YES		55	Interposing Relay		Yes			
25		Handwheel	Yes (Side)		56	Monitor Relay		Yes			
26		Space Heater	Anti Condensation		57	Drain plug		Yes			
27		Position Indicator	LCD indicator		58						
28		Output RPM / Actuator	120		59						
29		Enclosure Class	IP 67		60						
30		Ambient Temp.	-25 °C to +70 °C		61						
31	Cable Entry	1 x M25, 2 x NPT 1"		62							

Notes	1. The dry contact for remote selected and trouble signal to be provied refer to electric wiring diagram.	Rev.	Date	Description	Oring	App.
		1	2015.01.23	For Final	H.K.BAEK	Y. K. CHO
		0	2014.09.30	For Final	H.K.BAEK	Y. K. CHO



TECHNICAL DATASHEET

Client : DAELIM INDUSTRIAL CO., LTD.

Project : THAIBINH 2 THERMAL POWER PLANT 2 x 600 MW

MOTOR OPERATED VALVES FOR BUTTERFLY

1	SERVICE CONDITION	Fluid		CCW			Survive		CCWP-B DISCH MV			
2				Unit	Max.	Nor.	Min.	TAG NO.	11PGB23AA201 / 21PGB23AA201			
3		Flow Rate		m3/h	4420	3400	840	PID No.	01PGB-M-M4-PID-0001			
4		Specific Gravity		-	1.012			Molecular Weight	18			
5		Operating Pressure		Bar g	8.33	4.90	-					
6		Operating Temperature		℃	46	42	-	Viscosity (Cp)	0.54716			
7		Diff. Press. open&close		BAR	10							
8		Design Press. / Temp.		Bar G	10 / 50			Q'TY	2 EA			
9	LINE	Pipe Line No.		-		36	ACTUATOR	Type		"see electric actuator data sheet"		
10		Pipe Line Size & Sch.		750 / HBY / STD		37		Mfgr. / Type				
11	VALVE SPECIFICATION	Type		Butterfly valve		38		Model				
12		Size		750 A		39		Operating Mode				
13		Leakage Class		ANSI CLASS IV		40		Power Source				
14		End Connection	Inlet & Outlet	ASME B 16.47 SERIES A / RF		41		Operating Time				
15				THICKNESS_AWWA C 207-D		42		Output Speed				
16		MATERIAL	Body		A216-WCB			43	Control Power			
17								44	Cable Connection			
18			Body Seat		A240-316			45	Enclosure			
19			Disc		A351-CF8M			46	Motor Power			
20			Disc Seat		VITON WITH RTFE		47	Limit Switch(es)				
21			Stem		A276-T316		48	Torque Switch(es)				
22	PAINT	Exterior		INORGANIC ZINC		49	Space Heater					
23		Interior		SILICONE MODIFIED (SILVER)		50	Transformer					
24	GEAR	Type		WORM GEAR BOX		51	Reversing Contactor					
25		Model		TM-W4SDM		52	Potentiometer					
26		Allowable Torque		926	kgf.m	53	Position Transmitter					
27		Ratio		357.9	: 1	54	Positioner					
28		Number of Turn		89.475		55	Position Indicator					
29	TEST	Examination Standard		"According to ITP"		56	Indication Lamp					
30		Shell	Test Press.			57	Selector Switch					
31			Test Medium			58	Cable Connection					
32		Seat	Test Press.			59	Manual Hand Wheel					
33			Test Medium									
34		DWG.	Assembly DWG.			TB2-SDC.VP406-00100-I-I1-DSU-0001-4		1	2015.01.23	For Final	S.T. WOO	S.K. LEE
35	Actuator DWG.		TB2-SDC.VP406-00100-I-I1-DSU-0001-15		0	2014.03.05	For Final	S.T. WOO	S.K. LEE	S.K. JUNG		
36	Wiring diagram		IM003-XX-AC-XAA/0P0-18		Rev.	Date	Description	Drawn	REV.	App.		

Special Comments :

PROJECT	THAIBINH 2 THERMAL POWER PLANT 2 x 600 MW
TAG NO.	11PGB23AA201 / 21PGB23AA201
Q'TY	2 Sets
CONTRACT	DAELIM INDUSTRIAL CO., LTD.
DATE	2014. 07. 17
MR. No.	110180-44-406-001

1	Valve Condition	Type	BUTTERFLY		32	Motor	Three Thermal Switch		Yes		
2		Size	750		33		Motor Duty		S2		
3		Rating Class	150#		34		Insulation Class		F Class		
4		End Connection	ASME B 16.47 SERIES "A" CLASS 150 / RF		35		RPM		2820		
5		Body Matl	A216-WCB		36		Rated power		1.6 [kw]		
6		Disc Material	A351-CF8M		37		Rated Current		3.7 [A]		
7		Seat (Body / Disc)	316 / R.T.F.E		38		Current Consumption		7.7 [A]		
8		Stem Material	A276-T316		39		Starting Current		20.5 [A]		
9		Open / Close Time	45 [sec]		40		Power Factor		0.8 [cosφ]		
10		Turn per stroke	90.0 °		41		Efficiency		80 [%]		
11		Required torque [N.m]	6126		42		Power Supply		400 VAC, 3PH, 50Hz		
12		Manufacture	DUKWON Valve		43		Accessory	Control Voltage		DC 24V	
13	Actuator	Version	i-Matic / DREHMO		44	Electric Wiring		iM003-XX-AC-XAA_0P0-18			
14		Mode of Operation	ON-OFF		45	Potentiometer		Yes			
15		Model	DiM120-B3		46	Position Transmitter		N/A			
16		Max. Torque [N.m]	Open : 120 Close : 120		47	Positioner		No			
17		Setting Torque [N.m]	Open : 100 Close : 100		48	Local Switch (Open / Stop / Close)		Yes			
18		Limit Switch	2 NC 4 NO		49	Selector SW (Local / Off / Remote)		Yes			
19		Intermediate Switch	- NC - NO		50	Ind. Lamp (Open[R]/Fault[Y]/Close[G])		Yes			
20		Torque Switch	- NC 1 NO		51	Transformer		Yes			
21		Rotation	Clock wise Close		52	Reversing Contactor		Yes			
22		Output / Max bore size	"B3" FORM		53	Auto.Phases Correction		Yes			
23		Output Flange	ISO 5210 F10		54	Torque Failue		Yes			
24		Stem Cover	YES		55	Interposing Relay		Yes			
25		Handwheel	Yes (Side)		56	Monitor Relay		Yes			
26		Space Heater	Anti Condensation		57	Drain plug		Yes			
27		Position Indicator	LCD indicator		58						
28		Output RPM / Actuator	120		59						
29		Enclosure Class	IP 67		60						
30		Ambient Temp.	-25 °C to +70 °C		61						
31		Cable Entry	1 x M25, 2 x NPT 1"		62						
	Notes	1. The dry contact for remote selected and trouble signal to be provied refer to electric wiring diagram.			Rev.	Date	Description	Oring	App.		
					1	2015.01.23	For Final	H.K.BAEK	Y. K. CHO		
					0	2014.09.30	For Final	H.K.BAEK	Y. K. CHO		



TECHNICAL DATASHEET

Client : DAELIM INDUSTRIAL CO., LTD.

Project : THAIBINH 2 THERMAL POWER PLANT 2 x 600 MW

MOTOR OPERATED VALVES FOR BUTTERFLY

1	SERVICE CONDITION	Fluid		RIVER (BRACKISH) WATER				Survive		DEBRIS FILTER-A INL MV					
2				Unit	Max.	Nor.	Min.	TAG NO.	11PAB50AA201/ 21PAB50AA201						
3		Flow Rate		m3/h	29200	23350	15000	PID No.	01PAB-M-M4-PID-0003						
4		Specific Gravity		-	1.029 @ 30.5℃			Molecular Weight	N/A						
5		Operating Pressure		Bar g	3.72	1.90	1.37								
6		Operating Temperature		℃	33.6	26	12.4	Viscosity (Cp)	0.86 @ 30.5oC						
7		Diff. Press. open&close		BAR	6 / Vac.										
8		Design Press. / Temp.		Bar G	6 & FV / 50			Q'TY	2 EA						
9	LINE	Pipe Line No.		-		36	ACTUATOR	Type		"see electric actuator data sheet"					
10		Pipe Line Size & Sch.		1950 / JXD / 16.66		37		Mfgr. / Type							
11	VALVE SPECIFICATION	Type		Butterfly valve		38		Model							
12		Size		1950 A		39		Operating Mode							
13		Leakage Class		ANSI CLASS IV		40		Power Source							
14		End Connection	Inlet		AWWA C 207-D / FF			41	Operating Time						
15			Outlet		AWWA C 207-D / FF			42	Output Speed						
16		MATERIAL	Body		A536-65-45-12(DUCTILE) & RUBBER LINED			43	Control Power						
17								44	Cable Connection						
18								45	Enclosure						
19								46	Motor Power						
20								Disc Seat	BUNA-N			47	Limit Switch(es)		
21									A276-T316			48	Torque Switch(es)		
22	Exterior		N/A (RUBBER LINNING)		49	Space Heater									
23	PAINT	Interior		SILICONE MODIFIED (SILVER)		50		Transformer							
24		Type		WORM GEAR BOX		51		Reversing Contactor							
25	GEAR	Model		TM-W8SDM		52		Potentiometer							
26		Allowable Torque		11918	kgf.m	53		Position Transmitter							
27		Ratio		324.1	: 1	54		Positioner							
28		Number of Turn		81.025		55		Position Indicator							
29	TEST	Examination Standard		"According to ITP"		56		Indication Lamp							
30		Shell	Test Press.			57		Selector Switch							
31			Test Medium			58		Cable Connection							
32		Seat	Test Press.			59		Manual Hand Wheel							
33			Test Medium												
34	DWG.	Assembly DWG.		TB2-SDC.VP406-00100-I-I1-DSU-0001-7		1	2015.01.23	For Final	S.T. WOO	S.K. LEE	S.K. JUNG				
35		Actuator DWG.		TB2-SDC.VP406-00100-I-I1-DSU-0001-17		0	2014.03.05	For Final	S.T. WOO	S.K. LEE	S.K. JUNG				
36		Wiring diagram		IM003-XX-AC-XAA/0P0-18		Rev.	Date	Description	Drawn	REV.	App.				

Special Comments :

PROJECT	THAIBINH 2 THERMAL POWER PLANT 2 x 600 MW
TAG NO.	11PAB50AA201/ 21PAB50AA201
Q'TY	2 Sets
CONTRACT	DAELIM INDUSTRIAL CO., LTD.
DATE	2014. 07. 17
MR. No.	110180-44-406-001

1	Valve Condition	Type	BUTTERFLY		32	Motor	Three Thermal Switch		Yes		
2		Size	1950		33		Motor Duty		S2		
3		Rating Class	150#		34		Insulation Class		F Class		
4		End Connection	AWWA C207 CLASS-D / FF		35		RPM		2875		
5		Body Matl	A536-65-45-12 (DUCTILE)		36		Rated power		8.5 [kw]		
6		Disc Material	A351-CF8M		37		Rated Current		18.7 [A]		
7		Seat (Body / Disc)	316 / BUNA-N		38		Current Consumption		41.5 [A]		
8		Stem Material	A276-T316		39		Starting Current		112.0 [A]		
9		Open / Close Time	60 [sec]		40		Power Factor		0.82 [cosφ]		
10		Turn per stroke	90.0 °		41		Efficiency		81.5 [%]		
11		Required torque [N.m]	57790		42		Power Supply		400 VAC, 3PH, 50Hz		
12		Manufacture	DUKWON Valve		43		Accessory	Control Voltage		DC 24V	
13	Actuator	Version	i-Matic / DREHMO		44	Electric Wiring		iM003-XX-AC-XAA_0P0-18			
14		Mode of Operation	ON-OFF		45	Potentiometer		Yes			
15		Model	DiM1000-B3		46	Position Transmitter		N/A			
16		Max. Torque [N.m]	Open : 1000	Close : 1000	47	Positioner		No			
17		Setting Torque [N.m]	Open : 800	Close : 800	48	Local Switch (Open / Stop / Close)		Yes			
18		Limit Switch	2 NC	4 NO	49	Selector SW (Local / Off / Remote)		Yes			
19		Intermediate Switch	- NC	- NO	50	Ind. Lamp (Open[R]/Fault[Y]/Close[G])		Yes			
20		Torque Switch	- NC	1 NO	51	Transformer		Yes			
21		Rotation	Clock wise Close		52	Reversing Contactor		Yes			
22		Output / Max bore size	"B3" FORM		53	Auto.Phases Correction		Yes			
23		Output Flange	ISO 5210 F16		54	Torque Failue		Yes			
24		Stem Cover	YES		55	Interposing Relay		Yes			
25		Handwheel	Yes (Side)		56	Monitor Relay		Yes			
26		Space Heater	Anti Condensation		57	Drain plug		Yes			
27		Position Indicator	LCD indicator		58						
28		Output RPM / Actuator	80		59						
29		Enclosure Class	IP 67		60						
30		Ambient Temp.	-25 °C to +70 °C		61						
31	Cable Entry	1 x M32, 2 x NPT 1"		62							
	Notes	1. The dry contact for remote selected and trouble signal to be provied refer to electric wiring diagram.		Rev.	Date	Description		Oring	App.		
				1	2015.01.23	For Final		H.K.BAEK	Y. K. CHO		
				0	2014.09.30	For Final		H.K.BAEK	Y. K. CHO		



TECHNICAL DATASHEET

Client : DAELIM INDUSTRIAL CO., LTD.

Project : THAIBINH 2 THERMAL POWER PLANT 2 x 600 MW

MOTOR OPERATED VALVES FOR BUTTERFLY

1	SERVICE CONDITION	Fluid		RIVER (BRACKISH) WATER				Survive		DEBRIS FILTER-B INL MV					
2				Unit	Max.	Nor.	Min.	TAG NO.	11PAB51AA201/21PAB51AA201						
3		Flow Rate		m3/h	29200	23350	15000	PID No.	01PAB-M-M4-PID-0003						
4		Specific Gravity		-	1.029 @ 30.5℃			Molecular Weight	N/A						
5		Operating Pressure		Bar g	3.72	1.90	1.37								
6		Operating Temperature		℃	33.6	26	12.4	Viscosity (Cp)	0.86 @ 30.5oC						
7		Diff. Press. open&close		BAR	6 / Vac.										
8		Design Press. / Temp.		Bar G	6 & FV / 50			Q'TY	2 EA						
9	LINE	Pipe Line No.		-		36	ACTUATOR	Type		"see electric actuator data sheet"					
10		Pipe Line Size & Sch.		1950 / JXD / 16.66		37		Mfgr. / Type							
11	VALVE SPECIFICATION	Type		Butterfly valve		38		Model							
12		Size		1950 A		39		Operating Mode							
13		Leakage Class		ANSI CLASS IV		40		Power Source							
14		End Connection	Inlet		AWWA C 207-D / FF			41	Operating Time						
15			Outlet		AWWA C 207-D / FF			42	Output Speed						
16		MATERIAL	Body		A536-65-45-12(DUCTILE) & RUBBER LINED			43	Control Power						
17								44	Cable Connection						
18								45	Enclosure						
19								46	Motor Power						
20								Disc Seat	BUNA-N			47	Limit Switch(es)		
21									A276-T316			48	Torque Switch(es)		
22	Exterior		N/A (RUBBER LINNING)		49	Space Heater									
23	PAINT	Interior		SILICONE MODIFIED (SILVER)		50		Transformer							
24		Type		WORM GEAR BOX		51		Reversing Contactor							
25	GEAR	Model		TM-W8SDM		52		Potentiometer							
26		Allowable Torque		11918	kgf.m	53		Position Transmitter							
27		Ratio		324.1	: 1	54		Positioner							
28		Number of Turn		81.025		55		Position Indicator							
29	TEST	Examination Standard		"According to ITP"		56		Indication Lamp							
30		Shell	Test Press.			57		Selector Switch							
31			Test Medium			58		Cable Connection							
32		Seat	Test Press.			59		Manual Hand Wheel							
33			Test Medium												
34	DWG.	Assembly DWG.		TB2-SDC.VP406-00100-I-I1-DSU-0001-7		1	2015.01.23	For Final	S.T. WOO	S.K. LEE	S.K. JUNG				
35		Actuator DWG.		TB2-SDC.VP406-00100-I-I1-DSU-0001-17		0	2014.03.05	For Final	S.T. WOO	S.K. LEE	S.K. JUNG				
36		Wiring diagram		IM003-XX-AC-XAA/0P0-18		Rev.	Date	Description	Drawn	REV.	App.				

Special Comments :

PROJECT	THAIBINH 2 THERMAL POWER PLANT 2 x 600 MW
TAG NO.	11PAB51AA201/21PAB51AA201
Q'TY	2 Sets
CONTRACT	DAELIM INDUSTRIAL CO., LTD.
DATE	2014. 07. 17
MR. No.	110180-44-406-001

1	Valve Condition	Type	BUTTERFLY	32	Motor	Three Thermal Switch	Yes
2		Size	1950	33		Motor Duty	S2
3		Rating Class	150#	34		Insulation Class	F Class
4		End Connection	AWWA C207 CLASS-D / FF	35		RPM	2875
5		Body Matl	A536-65-45-12 (DUCTILE)	36		Rated power	8.5 [kw]
6		Disc Material	A351-CF8M	37		Rated Current	18.7 [A]
7		Seat (Body / Disc)	316 / BUNA-N	38		Current Consumption	41.5 [A]
8		Stem Material	A276-T316	39		Starting Current	112.0 [A]
9		Open / Close Time	60 [sec]	40		Power Factor	0.82 [cosφ]
10		Turn per stroke	90.0 °	41		Efficiency	81.5 [%]
11		Required torque [N.m]	57790	42		Power Supply	400 VAC, 3PH, 50Hz
12		Manufacture	DUKWON Valve	43	Accessory	Control Voltage	DC 24V
13	Actuator	Version	i-Matic / DREHMO	44		Electric Wiring	iM003-XX-AC-XAA_0P0-18
14		Mode of Operation	ON-OFF	45		Potentiometer	Yes
15		Model	DiM1000-B3	46		Position Transmitter	N/A
16		Max. Torque [N.m]	Open : 1000 Close : 1000	47		Positioner	No
17		Setting Torque [N.m]	Open : 800 Close : 800	48		Local Switch (Open / Stop / Close)	Yes
18		Limit Switch	2 NC 4 NO	49		Selector SW (Local / Off / Remote)	Yes
19		Intermediate Switch	- NC - NO	50		Ind. Lamp (Open[R]/Fault[Y]/Close[G])	Yes
20		Torque Switch	- NC 1 NO	51		Transformer	Yes
21		Rotation	Clock wise Close	52		Reversing Contactor	Yes
22		Output / Max bore size	"B3" FORM	53		Auto.Phases Correction	Yes
23		Output Flange	ISO 5210 F16	54		Torque Failue	Yes
24		Stem Cover	YES	55		Interposing Relay	Yes
25		Handwheel	Yes (Side)	56		Monitor Relay	Yes
26		Space Heater	Anti Condensation	57		Drain plug	Yes
27		Position Indicator	LCD indicator	58			
28		Output RPM / Actuator	80	59			
29		Enclosure Class	IP 67	60			
30		Ambient Temp.	-25 °C to +70 °C	61			
31		Cable Entry	1 x M32, 2 x NPT 1"	62			
	Notes	1. The dry contact for remote selected and trouble signal to be provied refer to electric wiring diagram.	Rev.	Date	Description	Oring	App.
			1	2015.01.23	For Final	H.K.BAEK	Y. K. CHO
			0	2014.09.30	For Final	H.K.BAEK	Y. K. CHO



TECHNICAL DATASHEET

Client : DAELIM INDUSTRIAL CO., LTD.

Project : THAIBINH 2 THERMAL POWER PLANT 2 x 600 MW

MOTOR OPERATED VALVES FOR BUTTERFLY

1	SERVICE CONDITION	Fluid		RIVER (BRACKISH) WATER				Survive		DEBRIS FILTER-C INL MV					
2				Unit	Max.	Nor.	Min.	TAG NO.	11PAB52AA201/21PAB52AA201						
3		Flow Rate		m3/h	29200	23350	15000	PID No.	01PAB-M-M4-PID-0003						
4		Specific Gravity		-	1.029 @ 30.5℃			Molecular Weight	N/A						
5		Operating Pressure		Bar g	3.72	1.90	1.37								
6		Operating Temperature		℃	33.6	26	12.4	Viscosity (Cp)	0.86 @ 30.5oC						
7		Diff. Press. open&close		BAR	6 / Vac.										
8		Design Press. / Temp.		Bar G	6 & FV / 50			Q'TY	2 EA						
9	LINE	Pipe Line No.		-		36	ACTUATOR	Type		"see electric actuator data sheet"					
10		Pipe Line Size & Sch.		1950 / JXD / 16.66		37		Mfgr. / Type							
11	VALVE SPECIFICATION	Type		Butterfly valve		38		Model							
12		Size		1950 A		39		Operating Mode							
13		Leakage Class		ANSI CLASS IV		40		Power Source							
14		End Connection	Inlet		AWWA C 207-D / FF			41	Operating Time						
15			Outlet		AWWA C 207-D / FF			42	Output Speed						
16		MATERIAL	Body		A536-65-45-12(DUCTILE) & RUBBER LINED			43	Control Power						
17								44	Cable Connection						
18								45	Enclosure						
19								46	Motor Power						
20								Disc Seat	BUNA-N			47	Limit Switch(es)		
21									A276-T316			48	Torque Switch(es)		
22	Exterior		N/A (RUBBER LINNING)		49	Space Heater									
23	PAINT	Interior		SILICONE MODIFIED (SILVER)		50		Transformer							
24		Type		WORM GEAR BOX		51		Reversing Contactor							
25	GEAR	Model		TM-W8SDM		52		Potentiometer							
26		Allowable Torque		11918	kgf.m	53		Position Transmitter							
27		Ratio		324.1	: 1	54		Positioner							
28		Number of Turn		81.025		55		Position Indicator							
29	TEST	Examination Standard		"According to ITP"		56		Indication Lamp							
30		Shell	Test Press.			57		Selector Switch							
31			Test Medium			58		Cable Connection							
32		Seat	Test Press.			59		Manual Hand Wheel							
33			Test Medium												
34	DWG.	Assembly DWG.		TB2-SDC.VP406-00100-I-I1-DSU-0001-7		1	2015.01.23	For Final	S.T. WOO	S.K. LEE	S.K. JUNG				
35		Actuator DWG.		TB2-SDC.VP406-00100-I-I1-DSU-0001-17		0	2014.03.05	For Final	S.T. WOO	S.K. LEE	S.K. JUNG				
36		Wiring diagram		IM003-XX-AC-XAA/0P0-18		Rev.	Date	Description	Drawn	REV.	App.				

Special Comments :

PROJECT	THAIBINH 2 THERMAL POWER PLANT 2 x 600 MW
TAG NO.	11PAB52AA201/21PAB52AA201
Q'TY	2 Sets
CONTRACT	DAELIM INDUSTRIAL CO., LTD.
DATE	2014. 07. 17
MR. No.	110180-44-406-001

1	Valve Condition	Type	BUTTERFLY	32	Motor	Three Thermal Switch	Yes
2		Size	1950	33		Motor Duty	S2
3		Rating Class	150#	34		Insulation Class	F Class
4		End Connection	AWWA C207 CLASS-D / FF	35		RPM	2875
5		Body Matl	A536-65-45-12 (DUCTILE)	36		Rated power	8.5 [kw]
6		Disc Material	A351-CF8M	37		Rated Current	18.7 [A]
7		Seat (Body / Disc)	316 / BUNA-N	38		Current Consumption	41.5 [A]
8		Stem Material	A276-T316	39		Starting Current	112.0 [A]
9		Open / Close Time	60 [sec]	40		Power Factor	0.82 [cosφ]
10		Turn per stroke	90.0 °	41		Efficiency	81.5 [%]
11		Required torque [N.m]	57790	42		Power Supply	400 VAC, 3PH, 50Hz
12		Manufacture	DUKWON Valve	43	Accessory	Control Voltage	DC 24V
13	Actuator	Version	i-Matic / DREHMO	44		Electric Wiring	iM003-XX-AC-XAA_0P0-18
14		Mode of Operation	ON-OFF	45		Potentiometer	Yes
15		Model	DiM1000-B3	46		Position Transmitter	N/A
16		Max. Torque [N.m]	Open : 1000 Close : 1000	47		Positioner	No
17		Setting Torque [N.m]	Open : 800 Close : 800	48		Local Switch (Open / Stop / Close)	Yes
18		Limit Switch	2 NC 4 NO	49		Selector SW (Local / Off / Remote)	Yes
19		Intermediate Switch	- NC - NO	50		Ind. Lamp (Open[R]/Fault[Y]/Close[G])	Yes
20		Torque Switch	- NC 1 NO	51		Transformer	Yes
21		Rotation	Clock wise Close	52		Reversing Contactor	Yes
22		Output / Max bore size	"B3" FORM	53		Auto.Phases Correction	Yes
23		Output Flange	ISO 5210 F16	54		Torque Failue	Yes
24		Stem Cover	YES	55		Interposing Relay	Yes
25		Handwheel	Yes (Side)	56		Monitor Relay	Yes
26		Space Heater	Anti Condensation	57		Drain plug	Yes
27		Position Indicator	LCD indicator	58			
28		Output RPM / Actuator	80	59			
29		Enclosure Class	IP 67	60			
30		Ambient Temp.	-25 °C to +70 °C	61			
31		Cable Entry	1 x M32, 2 x NPT 1"	62			
	Notes	1. The dry contact for remote selected and trouble signal to be provied refer to electric wiring diagram.	Rev.	Date	Description	Oring	App.
			1	2015.01.23	For Final	H.K.BAEK	Y. K. CHO
			0	2014.09.30	For Final	H.K.BAEK	Y. K. CHO



TECHNICAL DATASHEET

Client : DAELIM INDUSTRIAL CO., LTD.

Project : THAIBINH 2 THERMAL POWER PLANT 2 x 600 MW

MOTOR OPERATED VALVES FOR BUTTERFLY

1	SERVICE CONDITION	Fluid		RIVER (BRACKISH) WATER				Survive		DEBRIS FILTER-D INL MV					
2				Unit	Max.	Nor.	Min.	TAG NO.	11PAB53AA201/21PAB53AA201						
3		Flow Rate		m3/h	29200	23350	15000	PID No.	01PAB-M-M4-PID-0003						
4		Specific Gravity		-	1.029 @ 30.5℃			Molecular Weight	N/A						
5		Operating Pressure		Bar g	3.72	1.90	1.37								
6		Operating Temperature		℃	33.6	26	12.4	Viscosity (Cp)	0.86 @ 30.5oC						
7		Diff. Press. open&close		BAR	6 / Vac.										
8		Design Press. / Temp.		Bar G	6 & FV / 50			Q'TY	2 EA						
9	LINE	Pipe Line No.		-		36	ACTUATOR	Type		"see electric actuator data sheet"					
10		Pipe Line Size & Sch.		1950 / JXD / 16.66		37		Mfgr. / Type							
11	VALVE SPECIFICATION	Type		Butterfly valve		38		Model							
12		Size		1950 A		39		Operating Mode							
13		Leakage Class		ANSI CLASS IV		40		Power Source							
14		End Connection	Inlet		AWWA C 207-D / FF			41	Operating Time						
15			Outlet		AWWA C 207-D / FF			42	Output Speed						
16		MATERIAL	Body		A536-65-45-12(DUCTILE) & RUBBER LINED			43	Control Power						
17								44	Cable Connection						
18								45	Enclosure						
19								46	Motor Power						
20								Disc Seat	BUNA-N			47	Limit Switch(es)		
21									A276-T316			48	Torque Switch(es)		
22	Exterior		N/A (RUBBER LINNING)		49	Space Heater									
23	PAINT	Interior		SILICONE MODIFIED (SILVER)		50		Transformer							
24		Type		WORM GEAR BOX		51		Reversing Contactor							
25	GEAR	Model		TM-W8SDM		52		Potentiometer							
26		Allowable Torque		11918	kgf.m	53		Position Transmitter							
27		Ratio		324.1	: 1	54		Positioner							
28		Number of Turn		81.025		55		Position Indicator							
29	TEST	Examination Standard		"According to ITP"		56		Indication Lamp							
30		Shell	Test Press.			57		Selector Switch							
31			Test Medium			58		Cable Connection							
32		Seat	Test Press.			59		Manual Hand Wheel							
33			Test Medium												
34	DWG.	Assembly DWG.		TB2-SDC.VP406-00100-I-I1-DSU-0001-7		1	2015.01.23	For Final	S.T. WOO	S.K. LEE	S.K. JUNG				
35		Actuator DWG.		TB2-SDC.VP406-00100-I-I1-DSU-0001-17		0	2014.03.05	For Final	S.T. WOO	S.K. LEE	S.K. JUNG				
36		Wiring diagram		IM003-XX-AC-XAA/0P0-18		Rev.	Date	Description	Drawn	REV.	App.				

Special Comments :

PROJECT	THAIBINH 2 THERMAL POWER PLANT 2 x 600 MW
TAG NO.	11PAB53AA201/21PAB53AA201
Q'TY	2 Sets
CONTRACT	DAELIM INDUSTRIAL CO., LTD.
DATE	2014. 07. 17
MR. No.	110180-44-406-001

1	Valve Condition	Type	BUTTERFLY		32	Motor	Three Thermal Switch		Yes	
2		Size	1950		33		Motor Duty		S2	
3		Rating Class	150#		34		Insulation Class		F Class	
4		End Connection	AWWA C207 CLASS-D / FF		35		RPM		2875	
5		Body Matl	A536-65-45-12 (DUCTILE)		36		Rated power		8.5 [kw]	
6		Disc Material	A351-CF8M		37		Rated Current		18.7 [A]	
7		Seat (Body / Disc)	316 / BUNA-N		38		Current Consumption		41.5 [A]	
8		Stem Material	A276-T316		39		Starting Current		112.0 [A]	
9		Open / Close Time	60 [sec]		40		Power Factor		0.82 [cosφ]	
10		Turn per stroke	90.0 °		41		Efficiency		81.5 [%]	
11		Required torque [N.m]	57790		42		Power Supply		400 VAC, 3PH, 50Hz	
12		Manufacture	DUKWON Valve		43		Accessory	Control Voltage		DC 24V
13	Actuator	Version	i-Matic / DREHMO		44	Electric Wiring		iM003-XX-AC-XAA_0P0-18		
14		Mode of Operation	ON-OFF		45	Potentiometer		Yes		
15		Model	DiM1000-B3		46	Position Transmitter		N/A		
16		Max. Torque [N.m]	Open : 1000 Close : 1000		47	Positioner		No		
17		Setting Torque [N.m]	Open : 800 Close : 800		48	Local Switch (Open / Stop / Close)		Yes		
18		Limit Switch	2 NC 4 NO		49	Selector SW (Local / Off / Remote)		Yes		
19		Intermediate Switch	- NC - NO		50	Ind. Lamp (Open[R]/Fault[Y]/Close[G])		Yes		
20		Torque Switch	- NC 1 NO		51	Transformer		Yes		
21		Rotation	Clock wise Close		52	Reversing Contactor		Yes		
22		Output / Max bore size	"B3" FORM		53	Auto.Phases Correction		Yes		
23		Output Flange	ISO 5210 F16		54	Torque Failue		Yes		
24		Stem Cover	YES		55	Interposing Relay		Yes		
25		Handwheel	Yes (Side)		56	Monitor Relay		Yes		
26		Space Heater	Anti Condensation		57	Drain plug		Yes		
27		Position Indicator	LCD indicator		58					
28	Output RPM / Actuator	80		59						
29	Enclosure Class	IP 67		60						
30	Ambient Temp.	-25 °C to +70 °C		61						
31	Cable Entry	1 x M32, 2 x NPT 1"		62						
	Notes	1. The dry contact for remote selected and trouble signal to be provied refer to electric wiring diagram.			Rev.	Date	Description	Oring	App.	
					1	2015.01.23	For Final	H.K.BAEK	Y. K. CHO	
					0	2014.09.30	For Final	H.K.BAEK	Y. K. CHO	



TECHNICAL DATASHEET

Client : DAELIM INDUSTRIAL CO., LTD.

Project : THAIBINH 2 THERMAL POWER PLANT 2 x 600 MW

MOTOR OPERATED VALVES FOR BUTTERFLY

1	SERVICE CONDITION	Fluid		RIVER (BRACKISH) WATER				Survive		BALL STRN-A OUTL MV							
2				Unit	Max.	Nor.	Min.	TAG NO.	11PAB70AA251/21PAB70AA251								
3		Flow Rate		m3/h	29000	22400	13800	PID No.	01PAB-M-M4-PID-0005								
4		Specific Gravity		-	1.029 @ 30.5℃			Molecular Weight	N/A								
5		Operating Pressure		Bar g	3.72	1.90	1.37										
6		Operating Temperature		℃	40.6	26	12.4	Viscosity (Cp)	0.86 @ 30.5oC								
7		Diff. Press. open&close		BAR	6 / Vac.												
8		Design Press. / Temp.		Bar G	6 & FV / 50			Q'TY	2 EA								
9	LINE	Pipe Line No.		-			36	ACTUATOR	Type		"see electric actuator data sheet"						
10		Pipe Line Size & Sch.		1950 / JXD / 16.66			37		Mfgr. / Type								
11	VALVE SPECIFICATION	Type		Butterfly valve			38		Model								
12		Size		1950 A			39		Operating Mode								
13		Leakage Class		ANSI CLASS IV			40		Power Source								
14		End Connection	Inlet	AWWA C 207-D / FF			41		Operating Time								
15			Outlet	AWWA C 207-D / FF			42		Output Speed								
16		MATERIAL	Body		A536-65-45-12(DUCTILE) & RUBBER LINED				43	Control Power							
17									44	Cable Connection							
18									45	Enclosure							
19									46	Motor Power							
20									Disc Seat	BUNA-N			47	Limit Switch(es)			
21										48			Torque Switch(es)				
22	PAINT	Exterior		N/A (RUBBER LINNING)			49			Space Heater							
23		Interior		SILICONE MODIFIED (SILVER)			50		Transformer								
24	GEAR	Type		WORM GEAR BOX			51		Reversing Contactor								
25		Model		TM-W8SDM			52		Potentiometer								
26		Allowable Torque		11918	kgf.m		53		Position Transmitter								
27		Ratio		324.1	: 1		54		Positioner								
28		Number of Turn		81.025			55		Position Indicator								
29	TEST	Examination Standard		"According to ITP"			56		Indication Lamp								
30		Shell	Test Press.				57		Selector Switch								
31			Test Medium				58		Cable Connection								
32		Seat	Test Press.				59		Manual Hand Wheel								
33			Test Medium														
34		DWG.	Assembly DWG.				TB2-SDC.VP406-00100-I-I1-DSU-0001-7			1	2015.01.23	For Final	S.T. WOO	S.K. LEE	S.K. JUNG		
35	Actuator DWG.		TB2-SDC.VP406-00100-I-I1-DSU-0001-17			0	2014.03.05	For Final	S.T. WOO	S.K. LEE	S.K. JUNG						
36	Wiring diagram		IM003-XX-AC-XAA/0P0-18			Rev.	Date	Description	Drawn	REV.	App.						

Special Comments :

PROJECT	THAIBINH 2 THERMAL POWER PLANT 2 x 600 MW
TAG NO.	11PAB70AA251/21PAB70AA251
Q'TY	2 Sets
CONTRACT	DAELIM INDUSTRIAL CO., LTD.
DATE	2014. 07. 17
MR. No.	110180-44-406-001

1	Valve Condition	Type	BUTTERFLY	32	Motor	Three Thermal Switch	Yes
2		Size	1950	33		Motor Duty	S2
3		Rating Class	150#	34		Insulation Class	F Class
4		End Connection	AWWA C207 CLASS-D / FF	35		RPM	2875
5		Body Matl	A536-65-45-12 (DUCTILE)	36		Rated power	8.5 [kw]
6		Disc Material	A351-CF8M	37		Rated Current	18.7 [A]
7		Seat (Body / Disc)	316 / BUNA-N	38		Current Consumption	41.5 [A]
8		Stem Material	A276-T316	39		Starting Current	112.0 [A]
9		Open / Close Time	60 [sec]	40		Power Factor	0.82 [cosφ]
10		Turn per stroke	90.0 °	41		Efficiency	81.5 [%]
11		Required torque [N.m]	57790	42		Power Supply	400 VAC, 3PH, 50Hz
12		Manufacture	DUKWON Valve	43	Accessory	Control Voltage	DC 24V
13	Actuator	Version	i-Matic / DREHMO	44		Electric Wiring	iM003-XX-AC-XAA_0P0-18
14		Mode of Operation	INCHING	45		Potentiometer	Yes
15		Model	DiM1000-B3	46		Position Transmitter	Yes (4~20mA)
16		Max. Torque [N.m]	Open : 1000 Close : 1000	47		Positioner	No
17		Setting Torque [N.m]	Open : 800 Close : 800	48		Local Switch (Open / Stop / Close)	Yes
18		Limit Switch	2 NC 4 NO	49		Selector SW (Local / Off / Remote)	Yes
19		Intermediate Switch	- NC - NO	50		Ind. Lamp (Open[R]/Fault[Y]/Close[G])	Yes
20		Torque Switch	- NC 1 NO	51		Transformer	Yes
21		Rotation	Clock wise Close	52		Reversing Contactor	Yes
22		Output / Max bore size	"B3" FORM	53		Auto.Phases Correction	Yes
23		Output Flange	ISO 5210 F16	54		Torque Failue	Yes
24		Stem Cover	YES	55		Interposing Relay	Yes
25		Handwheel	Yes (Side)	56		Monitor Relay	Yes
26		Space Heater	Anti Condensation	57		Drain plug	Yes
27		Position Indicator	LCD indicator	58			
28		Output RPM / Actuator	80	59			
29		Enclosure Class	IP 67	60			
30		Ambient Temp.	-25 °C to +70 °C	61			
31		Cable Entry	1 x M32, 2 x NPT 1", 1/2" NPT(F)	62			

Notes	1. The dry contact for remote selected and trouble signal to be provied refer to electric wiring diagram.	Rev.	Date	Description	Oring	App.
		1	2015.01.23	For Final	H.K.BAEK	Y. K. CHO
		0	2014.09.30	For Final	H.K.BAEK	Y. K. CHO



TECHNICAL DATASHEET

Client : DAELIM INDUSTRIAL CO., LTD.

Project : THAIBINH 2 THERMAL POWER PLANT 2 x 600 MW

MOTOR OPERATED VALVES FOR BUTTERFLY

1	SERVICE CONDITION	Fluid		RIVER (BRACKISH) WATER				Survive		BALL STRN-B OUTL MV					
2				Unit	Max.	Nor.	Min.	TAG NO.	11PAB71AA251/21PAB71AA251						
3		Flow Rate		m3/h	29000	22400	13800	PID No.	01PAB-M-M4-PID-0005						
4		Specific Gravity		-	1.029 @ 30.5℃			Molecular Weight	N/A						
5		Operating Pressure		Bar g	3.72	1.90	1.37								
6		Operating Temperature		℃	40.6	26	12.4	Viscosity (Cp)	0.86 @ 30.5oC						
7		Diff. Press. open&close		BAR	6 / Vac.										
8		Design Press. / Temp.		Bar G	6 & FV / 50			Q'TY	2 EA						
9	LINE	Pipe Line No.		-		36	ACTUATOR	Type		"see electric actuator data sheet"					
10		Pipe Line Size & Sch.		1950 / JXD / 16.66		37		Mfgr. / Type							
11	VALVE SPECIFICATION	Type		Butterfly valve		38		Model							
12		Size		1950 A		39		Operating Mode							
13		Leakage Class		ANSI CLASS IV		40		Power Source							
14		End Connection	Inlet	AWWA C 207-D / FF		41		Operating Time							
15			Outlet	AWWA C 207-D / FF		42		Output Speed							
16		MATERIAL	Body		A536-65-45-12(DUCTILE) & RUBBER LINED			43	Control Power						
17								44	Cable Connection						
18								45	Enclosure						
19								46	Motor Power						
20								Disc Seat	BUNA-N			47	Limit Switch(es)		
21									48			Torque Switch(es)			
22	PAINT	Exterior		N/A (RUBBER LINNING)		49			Space Heater						
23		Interior		SILICONE MODIFIED (SILVER)		50		Transformer							
24	GEAR	Type		WORM GEAR BOX		51		Reversing Contactor							
25		Model		TM-W8SDM		52		Potentiometer							
26		Allowable Torque		11918	kgf.m	53		Position Transmitter							
27		Ratio		324.1	: 1	54		Positioner							
28		Number of Turn		81.025		55		Position Indicator							
29	TEST	Examination Standard		"According to ITP"		56		Indication Lamp							
30		Shell	Test Press.			57		Selector Switch							
31			Test Medium			58		Cable Connection							
32		Seat	Test Press.			59		Manual Hand Wheel							
33			Test Medium												
34	DWG.	Assembly DWG.		TB2-SDC.VP406-00100-I-I1-DSU-0001-7		1	2015.01.23	For Final	S.T. WOO	S.K. LEE	S.K. JUNG				
35		Actuator DWG.		TB2-SDC.VP406-00100-I-I1-DSU-0001-17		0	2014.03.05	For Final	S.T. WOO	S.K. LEE	S.K. JUNG				
36		Wiring diagram		IM003-XX-AC-XAA/0P0-18		Rev.	Date	Description	Drawn	REV.	App.				

Special Comments :

PROJECT	THAIBINH 2 THERMAL POWER PLANT 2 x 600 MW
TAG NO.	11PAB71AA251/ 21PAB71AA251
Q'TY	2 Sets
CONTRACT	DAELIM INDUSTRIAL CO., LTD.
DATE	2014. 07. 17
MR. No.	110180-44-406-001

1	Valve Condition	Type	BUTTERFLY	32	Motor	Three Thermal Switch	Yes
2		Size	1950	33		Motor Duty	S2
3		Rating Class	150#	34		Insulation Class	F Class
4		End Connection	AWWA C207 CLASS-D / FF	35		RPM	2875
5		Body Matl	A536-65-45-12 (DUCTILE)	36		Rated power	8.5 [kw]
6		Disc Material	A351-CF8M	37		Rated Current	18.7 [A]
7		Seat (Body / Disc)	316 / BUNA-N	38		Current Consumption	41.5 [A]
8		Stem Material	A276-T316	39		Starting Current	112.0 [A]
9		Open / Close Time	60 [sec]	40		Power Factor	0.82 [cosφ]
10		Turn per stroke	90.0 °	41		Efficiency	81.5 [%]
11		Required torque [N.m]	57790	42		Power Supply	400 VAC, 3PH, 50Hz
12		Manufacture	DUKWON Valve	43	Accessory	Control Voltage	DC 24V
13	Actuator	Version	i-Matic / DREHMO	44		Electric Wiring	iM003-XX-AC-XAA_0P0-18
14		Mode of Operation	INCHING	45		Potentiometer	Yes
15		Model	DiM1000-B3	46		Position Transmitter	Yes (4~20mA)
16		Max. Torque [N.m]	Open : 1000 Close : 1000	47		Positioner	No
17		Setting Torque [N.m]	Open : 800 Close : 800	48		Local Switch (Open / Stop / Close)	Yes
18		Limit Switch	2 NC 4 NO	49		Selector SW (Local / Off / Remote)	Yes
19		Intermediate Switch	- NC - NO	50		Ind. Lamp (Open[R]/Fault[Y]/Close[G])	Yes
20		Torque Switch	- NC 1 NO	51		Transformer	Yes
21		Rotation	Clock wise Close	52		Reversing Contactor	Yes
22		Output / Max bore size	"B3" FORM	53		Auto.Phases Correction	Yes
23		Output Flange	ISO 5210 F16	54		Torque Failue	Yes
24		Stem Cover	YES	55		Interposing Relay	Yes
25		Handwheel	Yes (Side)	56		Monitor Relay	Yes
26		Space Heater	Anti Condensation	57		Drain plug	Yes
27		Position Indicator	LCD indicator	58			
28		Output RPM / Actuator	80	59			
29		Enclosure Class	IP 67	60			
30		Ambient Temp.	-25 °C to +70 °C	61			
31		Cable Entry	1 x M32, 2 x NPT 1", 1/2" NPT(F)	62			
	Notes	1. The dry contact for remote selected and trouble signal to be provied refer to electric wiring diagram.	Rev.	Date	Description	Oring	App.
			1	2015.01.23	For Final	H.K.BAEK	Y. K. CHO
			0	2014.09.30	For Final	H.K.BAEK	Y. K. CHO



TECHNICAL DATASHEET

Client : DAELIM INDUSTRIAL CO., LTD.

Project : THAIBINH 2 THERMAL POWER PLANT 2 x 600 MW

MOTOR OPERATED VALVES FOR BUTTERFLY

1	SERVICE CONDITION	Fluid		RIVER (BRACKISH) WATER				Survive		BALL STRN-C OUTL MV				
2				Unit	Max.	Nor.	Min.	TAG NO.	11PAB72AA251/21PAB72AA251					
3		Flow Rate		m3/h	29000	22400	13800	PID No.	01PAB-M-M4-PID-0005					
4		Specific Gravity		-	1.029 @ 30.5℃			Molecular Weight	N/A					
5		Operating Pressure		Bar g	3.72	1.90	1.37							
6		Operating Temperature		℃	40.6	26	12.4	Viscosity (Cp)	0.86 @ 30.5oC					
7		Diff. Press. open&close		BAR	6 / Vac.									
8		Design Press. / Temp.		Bar G	6 & FV / 50			Q'TY	2 EA					
9	LINE	Pipe Line No.		-		36	ACTUATOR	Type		"see electric actuator data sheet"				
10		Pipe Line Size & Sch.		1950 / JXD / 16.66		37		Mfgr. / Type						
11	VALVE SPECIFICATION	Type		Butterfly valve		38		Model						
12		Size		1950 A		39		Operating Mode						
13		Leakage Class		ANSI CLASS IV		40		Power Source						
14		End Connection	Inlet	AWWA C 207-D / FF		41		Operating Time						
15			Outlet	AWWA C 207-D / FF		42		Output Speed						
16		MATERIAL	Body		A536-65-45-12(DUCTILE) & RUBBER LINED			43	Control Power					
17								44	Cable Connection					
18								45	Enclosure					
19								46	Motor Power					
20							Disc Seat	BUNA-N				47	Limit Switch(es)	
21								48	Torque Switch(es)					
22	PAINT	Exterior		N/A (RUBBER LINNING)		49		Space Heater						
23		Interior		SILICONE MODIFIED (SILVER)		50	Transformer							
24	GEAR	Type		WORM GEAR BOX		51	Reversing Contactor							
25		Model		TM-W8SDM		52	Potentiometer							
26		Allowable Torque		11918	kgf.m	53	Position Transmitter							
27		Ratio		324.1	: 1	54	Positioner							
28		Number of Turn		81.025		55	Position Indicator							
29	TEST	Examination Standard		"According to ITP"		56	Indication Lamp							
30		Shell	Test Press.			57	Selector Switch							
31			Test Medium			58	Cable Connection							
32		Seat	Test Press.			59	Manual Hand Wheel							
33			Test Medium											
34	DWG.	Assembly DWG.		TB2-SDC.VP406-00100-I-I1-DSU-0001-7		1	2015.01.23	For Final	S.T. WOO	S.K. LEE	S.K. JUNG			
35		Actuator DWG.		TB2-SDC.VP406-00100-I-I1-DSU-0001-17		0	2014.03.05	For Final	S.T. WOO	S.K. LEE	S.K. JUNG			
36		Wiring diagram		IM003-XX-AC-XAA/0P0-18		Rev.	Date	Description	Drawn	REV.	App.			

Special Comments :

PROJECT	THAIBINH 2 THERMAL POWER PLANT 2 x 600 MW
TAG NO.	11PAB72AA251/ 21PAB72AA251
Q'TY	2 Sets
CONTRACT	DAELIM INDUSTRIAL CO., LTD.
DATE	2014. 07. 17
MR. No.	110180-44-406-001

1	Valve Condition	Type	BUTTERFLY	32	Motor	Three Thermal Switch	Yes
2		Size	1950	33		Motor Duty	S2
3		Rating Class	150#	34		Insulation Class	F Class
4		End Connection	AWWA C207 CLASS-D / FF	35		RPM	2875
5		Body Matl	A536-65-45-12 (DUCTILE)	36		Rated power	8.5 [kw]
6		Disc Material	A351-CF8M	37		Rated Current	18.7 [A]
7		Seat (Body / Disc)	316 / BUNA-N	38		Current Consumption	41.5 [A]
8		Stem Material	A276-T316	39		Starting Current	112.0 [A]
9		Open / Close Time	60 [sec]	40		Power Factor	0.82 [cosφ]
10		Turn per stroke	90.0 °	41		Efficiency	81.5 [%]
11		Required torque [N.m]	57790	42		Power Supply	400 VAC, 3PH, 50Hz
12		Manufacture	DUKWON Valve	43	Accessory	Control Voltage	DC 24V
13	Actuator	Version	i-Matic / DREHMO	44		Electric Wiring	iM003-XX-AC-XAA_0P0-18
14		Mode of Operation	INCHING	45		Potentiometer	Yes
15		Model	DiM1000-B3	46		Position Transmitter	Yes (4~20mA)
16		Max. Torque [N.m]	Open : 1000 Close : 1000	47		Positioner	No
17		Setting Torque [N.m]	Open : 800 Close : 800	48		Local Switch (Open / Stop / Close)	Yes
18		Limit Switch	2 NC 4 NO	49		Selector SW (Local / Off / Remote)	Yes
19		Intermediate Switch	- NC - NO	50		Ind. Lamp (Open[R]/Fault[Y]/Close[G])	Yes
20		Torque Switch	- NC 1 NO	51		Transformer	Yes
21		Rotation	Clock wise Close	52		Reversing Contactor	Yes
22		Output / Max bore size	"B3" FORM	53		Auto.Phases Correction	Yes
23		Output Flange	ISO 5210 F16	54		Torque Failue	Yes
24		Stem Cover	YES	55		Interposing Relay	Yes
25		Handwheel	Yes (Side)	56		Monitor Relay	Yes
26		Space Heater	Anti Condensation	57		Drain plug	Yes
27		Position Indicator	LCD indicator	58			
28		Output RPM / Actuator	80	59			
29		Enclosure Class	IP 67	60			
30		Ambient Temp.	-25 °C to +70 °C	61			
31		Cable Entry	1 x M32, 2 x NPT 1", 1/2" NPT(F)	62			

Notes	1. The dry contact for remote selected and trouble signal to be provied refer to electric wiring diagram.	Rev.	Date	Description	Oring	App.
		1	2015.01.23	For Final	H.K.BAEK	Y. K. CHO
		0	2014.09.30	For Final	H.K.BAEK	Y. K. CHO



TECHNICAL DATASHEET

Client : DAELIM INDUSTRIAL CO., LTD.

Project : THAIBINH 2 THERMAL POWER PLANT 2 x 600 MW

MOTOR OPERATED VALVES FOR BUTTERFLY

1	SERVICE CONDITION	Fluid		RIVER (BRACKISH) WATER				Survive		BALL STRN-D OUTL MV							
2				Unit	Max.	Nor.	Min.	TAG NO.	11PAB73AA251/21PAB73AA251								
3		Flow Rate		m3/h	29000	22400	13800	PID No.	01PAB-M-M4-PID-0005								
4		Specific Gravity		-	1.029 @ 30.5℃			Molecular Weight	N/A								
5		Operating Pressure		Bar g	3.72	1.90	1.37										
6		Operating Temperature		℃	40.6	26	12.4	Viscosity (Cp)	0.86 @ 30.5oC								
7		Diff. Press. open&close		BAR	6 / Vac.												
8		Design Press. / Temp.		Bar G	6 & FV / 50			Q'TY	2 EA								
9	LINE	Pipe Line No.		-			36	ACTUATOR	Type		"see electric actuator data sheet"						
10		Pipe Line Size & Sch.		1950 / JXD / 16.66			37		Mfgr. / Type								
11	VALVE SPECIFICATION	Type		Butterfly valve			38		Model								
12		Size		1950 A			39		Operating Mode								
13		Leakage Class		ANSI CLASS IV			40		Power Source								
14		End Connection	Inlet	AWWA C 207-D / FF			41		Operating Time								
15			Outlet	AWWA C 207-D / FF			42		Output Speed								
16		MATERIAL	Body		A536-65-45-12(DUCTILE) & RUBBER LINED				43	Control Power							
17									44	Cable Connection							
18									45	Enclosure							
19									46	Motor Power							
20									Disc Seat	BUNA-N			47	Limit Switch(es)			
21										48			Torque Switch(es)				
22	PAINT	Exterior		N/A (RUBBER LINNING)			49			Space Heater							
23		Interior		SILICONE MODIFIED (SILVER)			50		Transformer								
24	GEAR	Type		WORM GEAR BOX			51		Reversing Contactor								
25		Model		TM-W8SDM			52		Potentiometer								
26		Allowable Torque		11918	kgf.m		53		Position Transmitter								
27		Ratio		324.1	: 1		54		Positioner								
28		Number of Turn		81.025			55		Position Indicator								
29	TEST	Examination Standard		"According to ITP"			56		Indication Lamp								
30		Shell	Test Press.				57		Selector Switch								
31			Test Medium				58		Cable Connection								
32		Seat	Test Press.				59		Manual Hand Wheel								
33			Test Medium														
34		DWG.	Assembly DWG.				TB2-SDC.VP406-00100-I-I1-DSU-0001-7			1	2015.01.23	For Final	S.T. WOO	S.K. LEE	S.K. JUNG		
35	Actuator DWG.		TB2-SDC.VP406-00100-I-I1-DSU-0001-17			0	2014.03.05	For Final	S.T. WOO	S.K. LEE	S.K. JUNG						
36	Wiring diagram		IM003-XX-AC-XAA/0P0-18			Rev.	Date	Description	Drawn	REV.	App.						

Special Comments :

PROJECT	THAIBINH 2 THERMAL POWER PLANT 2 x 600 MW
TAG NO.	11PAB73AA251/ 21PAB73AA251
Q'TY	2 Sets
CONTRACT	DAELIM INDUSTRIAL CO., LTD.
DATE	2014. 07. 17
MR. No.	110180-44-406-001

1	Valve Condition	Type	BUTTERFLY	32	Motor	Three Thermal Switch	Yes
2		Size	1950	33		Motor Duty	S2
3		Rating Class	150#	34		Insulation Class	F Class
4		End Connection	AWWA C207 CLASS-D / FF	35		RPM	2875
5		Body Matl	A536-65-45-12 (DUCTILE)	36		Rated power	8.5 [kw]
6		Disc Material	A351-CF8M	37		Rated Current	18.7 [A]
7		Seat (Body / Disc)	316 / BUNA-N	38		Current Consumption	41.5 [A]
8		Stem Material	A276-T316	39		Starting Current	112.0 [A]
9		Open / Close Time	60 [sec]	40		Power Factor	0.82 [cosφ]
10		Turn per stroke	90.0 °	41		Efficiency	81.5 [%]
11		Required torque [N.m]	57790	42		Power Supply	400 VAC, 3PH, 50Hz
12		Manufacture	DUKWON Valve	43	Accessory	Control Voltage	DC 24V
13	Actuator	Version	i-Matic / DREHMO	44		Electric Wiring	iM003-XX-AC-XAA_0P0-18
14		Mode of Operation	INCHING	45		Potentiometer	Yes
15		Model	DiM1000-B3	46		Position Transmitter	Yes (4~20mA)
16		Max. Torque [N.m]	Open : 1000 Close : 1000	47		Positioner	No
17		Setting Torque [N.m]	Open : 800 Close : 800	48		Local Switch (Open / Stop / Close)	Yes
18		Limit Switch	2 NC 4 NO	49		Selector SW (Local / Off / Remote)	Yes
19		Intermediate Switch	- NC - NO	50		Ind. Lamp (Open[R]/Fault[Y]/Close[G])	Yes
20		Torque Switch	- NC 1 NO	51		Transformer	Yes
21		Rotation	Clock wise Close	52		Reversing Contactor	Yes
22		Output / Max bore size	"B3" FORM	53		Auto.Phases Correction	Yes
23		Output Flange	ISO 5210 F16	54		Torque Failue	Yes
24		Stem Cover	YES	55		Interposing Relay	Yes
25		Handwheel	Yes (Side)	56		Monitor Relay	Yes
26		Space Heater	Anti Condensation	57		Drain plug	Yes
27		Position Indicator	LCD indicator	58			
28		Output RPM / Actuator	80	59			
29		Enclosure Class	IP 67	60			
30		Ambient Temp.	-25 °C to +70 °C	61			
31		Cable Entry	1 x M32, 2 x NPT 1", 1/2" NPT(F)	62			

Notes	1. The dry contact for remote selected and trouble signal to be provied refer to electric wiring diagram.	Rev.	Date	Description	Oring	App.
		1	2015.01.23	For Final	H.K.BAEK	Y. K. CHO
		0	2014.09.30	For Final	H.K.BAEK	Y. K. CHO



TECHNICAL DATASHEET

Client : DAELIM INDUSTRIAL CO., LTD.

Project : THAIBINH 2 THERMAL POWER PLANT 2 x 600 MW

MOTOR OPERATED VALVES FOR BUTTERFLY

1	SERVICE CONDITION	Fluid		UNSATURATED STEAM / STEAM				Survive		BFPT-A EXHAUST OUTL MV		
2				Unit	Max.	Nor.	Min.	TAG NO.	11LBD15AA201/21LBD15AA201			
3		Flow Rate		T/h	40.31	35.00	4.85	PID No.	01LBD-M-M1B-PID-0004			
4		Specific Volume		-	26.13	18.85	19.51	Molecular Weight	18			
5		Operating Pressure		Bar A	0.073							
6		Operating Temperature		℃	137.64	39.68	39.68	Viscosity (Cp)	0.013753			
7		Diff. Press. open&close		BAR	0.1 / Vac.							
8		Design Press. / Temp.		Bar G	3.5 & FV / 150			Q'TY	2 EA			
9	LINE	Pipe Line No.		-		36	ACTUATOR	Type		"see electric actuator data sheet"		
10		Pipe Line Size & Sch.		2100 / HBD / 15.88		37		Mfgr. / Type				
11	VALVE SPECIFICATION	Type		Butterfly valve		38		Model				
12		Size		2100 A		39		Operating Mode				
13		Leakage Class		ANSI CLASS IV		40		Power Source				
14		End Connection	Inlet	AWWA C 207-D / RF		41		Operating Time				
15			Outlet	AWWA C 207-D / RF		42		Output Speed				
16		MATERIAL	Body		A216-WCB			43	Control Power			
17			Body Seat		A240-304			44	Cable Connection			
18			Disc		A217-CA15			45	Enclosure			
19			Disc Seat		VITON			46	Motor Power			
20			Stem		A276-T304			47	Limit Switch(es)			
21								48	Torque Switch(es)			
22	PAINT	Exterior		INORGANIC ZINC		49		Space Heater				
23		Interior		SILICONE MODIFIED (SILVER)		50		Transformer				
24	GEAR	Type		WORM GEAR BOX		51		Reversing Contactor				
25		Model		TM-W8SDM		52		Potentiometer				
26		Allowable Torque		11918	kgf.m	53		Position Transmitter				
27		Ratio		473.9	: 1	54		Positioner				
28	Number of Turn		118.475		55	Position Indicator						
29	TEST	Examination Standard		"According to ITP"		56		Indication Lamp				
30		Shell	Test Press.			57		Selector Switch				
31			Test Medium			58		Cable Connection				
32		Seat	Test Press.			59		Manual Hand Wheel				
33			Test Medium									
34	DWG.	Assembly DWG.		TB2-SDC.VP406-00100-I-I1-DSU-0001-8		1	2015.01.23	For Final	S.T. WOO	S.K. LEE	S.K. JUNG	
35		Actuator DWG.		TB2-SDC.VP406-00100-I-I1-DSU-0001-16		0	2014.03.05	For Final	S.T. WOO	S.K. LEE	S.K. JUNG	
36		Wiring diagram		IM003-XX-AC-XAA/OP0-18		Rev.	Date	Description	Drawn	REV.	App.	

Special Comments : WATER SEAL REQUIRED

PROJECT	THAIBINH 2 THERMAL POWER PLANT 2 x 600 MW
TAG NO.	11LBD15AA201/ 21LBD15AA201
Q'TY	2 Sets
CONTRACT	DAELIM INDUSTRIAL CO., LTD.
DATE	2014. 07. 17
MR. No.	110180-44-406-001

1	Valve Condition	Type	BUTTERFLY		32	Motor	Three Thermal Switch		Yes		
2		Size	2100		33		Motor Duty		S2		
3		Rating Class	150#		34		Insulation Class		F Class		
4		End Connection	AWWA C207 CLASS-D / RF		35		RPM		2875		
5		Body Matl	A216-WCB		36		Rated power		8.5 [kw]		
6		Disc Material	A217-CA15		37		Rated Current		18.7 [A]		
7		Seat (Body / Disc)	304 / VITON		38		Current Consumption		29.0 [A]		
8		Stem Material	A276-T304		39		Starting Current		112.0 [A]		
9		Open / Close Time	60 [sec]		40		Power Factor		0.82 [cosφ]		
10		Turn per stroke	90.0 °		41		Efficiency		81.5 [%]		
11		Required torque [N.m]	37657		42		Power Supply		400 VAC, 3PH, 50Hz		
12		Manufacture	DUKWON Valve		43		Accessory	Control Voltage		DC 24V	
13	Actuator	Version	i-Matic / DREHMO		44	Electric Wiring		iM003-XX-AC-XAA_0P0-18			
14		Mode of Operation	ON-OFF		45	Potentiometer		Yes			
15		Model	DiM500-B3		46	Position Transmitter		N/A			
16		Max. Torque [N.m]	Open : 500	Close : 500	47	Positioner		No			
17		Setting Torque [N.m]	Open : 350	Close : 350	48	Local Switch (Open / Stop / Close)		Yes			
18		Limit Switch	2 NC	4 NO	49	Selector SW (Local / Off / Remote)		Yes			
19		Intermediate Switch	- NC	- NO	50	Ind. Lamp (Open[R]/Fault[Y]/Close[G])		Yes			
20		Torque Switch	- NC	1 NO	51	Transformer		Yes			
21		Rotation	Clock wise Close		52	Reversing Contactor		Yes			
22		Output / Max bore size	"B3" FORM		53	Auto.Phases Correction		Yes			
23		Output Flange	ISO 5210 F14		54	Torque Failue		Yes			
24		Stem Cover	YES		55	Interposing Relay		Yes			
25		Handwheel	Yes (Side)		56	Monitor Relay		Yes			
26		Space Heater	Anti Condensation		57	Drain plug		Yes			
27		Position Indicator	LCD indicator		58						
28		Output RPM / Actuator	120		59						
29		Enclosure Class	IP 67		60						
30		Ambient Temp.	-25 °C to +70 °C		61						
31	Cable Entry	1 x M32, 2 x NPT 1"		62							
	Notes	1. The dry contact for remote selected and trouble signal to be provied refer to electric wiring diagram.			Rev.	Date	Description	Oring	App.		
					1	2015.01.23	For Final	H.K.BAEK	Y. K. CHO		
					0	2014.09.30	For Final	H.K.BAEK	Y. K. CHO		



TECHNICAL DATASHEET

Client : DAELIM INDUSTRIAL CO., LTD.

Project : THAIBINH 2 THERMAL POWER PLANT 2 x 600 MW

MOTOR OPERATED VALVES FOR BUTTERFLY

1	SERVICE CONDITION	Fluid		UNSATURATED STEAM / STEAM				Survive		BFPT-B EXHAUST OUTL MV			
2				Unit	Max.	Nor.	Min.	TAG NO.	11LBD15AA202/21LBD15AA202				
3		Flow Rate		T/h	40.31	35.00	4.85	PID No.	01LBD-M-M1B-PID-0004				
4		Specific Volume		-	26.13	18.85	19.51	Molecular Weight	18				
5		Operating Pressure		Bar A	0.073								
6		Operating Temperature		℃	137.64	39.68	39.68	Viscosity (Cp)	0.013753				
7		Diff. Press. open&close		BAR	0.1 / Vac.								
8		Design Press. / Temp.		Bar G	3.5 & FV / 150			Q'TY	2 EA				
9	LINE	Pipe Line No.		-		36	ACTUATOR	Type		"see electric actuator data sheet"			
10		Pipe Line Size & Sch.		2100 / HBD / 15.88		37		Mfgr. / Type					
11	VALVE SPECIFICATION	Type		Butterfly valve		38		Model					
12		Size		2100 A		39		Operating Mode					
13		Leakage Class		ANSI CLASS IV		40		Power Source					
14		End Connection	Inlet	AWWA C 207-D / RF		41		Operating Time					
15			Outlet	AWWA C 207-D / RF		42		Output Speed					
16		MATERIAL	Body		A216-WCB			43	Control Power				
17			Body Seat		A240-304			44	Cable Connection				
18			Disc		A217-CA15			45	Enclosure				
19			Disc Seat		VITON			46	Motor Power				
20			Stem		A276-T304			47	Limit Switch(es)				
21								48	Torque Switch(es)				
22	PAINT	Exterior		INORGANIC ZINC		49		ACCESSORIES	Space Heater				
23		Interior		SILICONE MODIFIED (SILVER)		50			Transformer				
24	GEAR	Type		WORM GEAR BOX		51			Reversing Contactor				
25		Model		TM-W8SDM		52			Potentiometer				
26		Allowable Torque		11918	kgf.m	53			Position Transmitter				
27		Ratio		473.9	: 1	54			Positioner				
28	Number of Turn		118.475		55	Position Indicator							
29	TEST	Examination Standard		"According to ITP"		56			Indication Lamp				
30		Shell	Test Press.			57			Selector Switch				
31			Test Medium			58			Cable Connection				
32		Seat	Test Press.			59			Manual Hand Wheel				
33			Test Medium										
34	DWG.	Assembly DWG.		TB2-SDC.VP406-00100-I-I1-DSU-0001-8		1	2015.01.23	For Final	S.T. WOO	S.K. LEE	S.K. JUNG		
35		Actuator DWG.		TB2-SDC.VP406-00100-I-I1-DSU-0001-16		0	2014.03.05	For Final	S.T. WOO	S.K. LEE	S.K. JUNG		
36		Wiring diagram		IM003-XX-AC-XAA/0P0-18		Rev.	Date	Description	Drawn	REV.	App.		

Special Comments : WATER SEAL REQUIRED

PROJECT	THAIBINH 2 THERMAL POWER PLANT 2 x 600 MW
TAG NO.	11LBD15AA202/ 21LBD15AA202
Q'TY	2 Sets
CONTRACT	DAELIM INDUSTRIAL CO., LTD.
DATE	2014. 07. 17
MR. No.	110180-44-406-001

1	Valve Condition	Type	BUTTERFLY		32	Motor	Three Thermal Switch		Yes		
2		Size	2100		33		Motor Duty		S2		
3		Rating Class	150#		34		Insulation Class		F Class		
4		End Connection	AWWA C207 CLASS-D / RF		35		RPM		2875		
5		Body Matl	A216-WCB		36		Rated power		8.5 [kw]		
6		Disc Material	A217-CA15		37		Rated Current		18.7 [A]		
7		Seat (Body / Disc)	304 / VITON		38		Current Consumption		29.0 [A]		
8		Stem Material	A276-T304		39		Starting Current		112.0 [A]		
9		Open / Close Time	60 [sec]		40		Power Factor		0.82 [cosφ]		
10		Turn per stroke	90.0 °		41		Efficiency		81.5 [%]		
11		Required torque [N.m]	37657		42		Power Supply		400 VAC, 3PH, 50Hz		
12		Manufacture	DUKWON Valve		43		Accessory	Control Voltage		DC 24V	
13	Actuator	Version	i-Matic / DREHMO		44	Electric Wiring		iM003-XX-AC-XAA_0P0-18			
14		Mode of Operation	ON-OFF		45	Potentiometer		Yes			
15		Model	DiM500-B3		46	Position Transmitter		N/A			
16		Max. Torque [N.m]	Open : 500	Close : 500	47	Positioner		No			
17		Setting Torque [N.m]	Open : 350	Close : 350	48	Local Switch (Open / Stop / Close)		Yes			
18		Limit Switch	2 NC	4 NO	49	Selector SW (Local / Off / Remote)		Yes			
19		Intermediate Switch	- NC	- NO	50	Ind. Lamp (Open[R]/Fault[Y]/Close[G])		Yes			
20		Torque Switch	- NC	1 NO	51	Transformer		Yes			
21		Rotation	Clock wise Close		52	Reversing Contactor		Yes			
22		Output / Max bore size	"B3" FORM		53	Auto.Phases Correction		Yes			
23		Output Flange	ISO 5210 F14		54	Torque Failue		Yes			
24		Stem Cover	YES		55	Interposing Relay		Yes			
25		Handwheel	Yes (Side)		56	Monitor Relay		Yes			
26		Space Heater	Anti Condensation		57	Drain plug		Yes			
27		Position Indicator	LCD indicator		58						
28		Output RPM / Actuator	120		59						
29		Enclosure Class	IP 67		60						
30		Ambient Temp.	-25 °C to +70 °C		61						
31	Cable Entry	1 x M32, 2 x NPT 1"		62							
	Notes	1. The dry contact for remote selected and trouble signal to be provied refer to electric wiring diagram.			Rev.	Date	Description	Oring	App.		
					1	2015.01.23	For Final	H.K.BAEK	Y. K. CHO		
					0	2014.09.30	For Final	H.K.BAEK	Y. K. CHO		



TECHNICAL DATASHEET

Client : DAELIM INDUSTRIAL CO., LTD.

Project : THAIBINH 2 THERMAL POWER PLANT 2 x 600 MW

MOTOR OPERATED VALVES FOR BUTTERFLY

1	SERVICE CONDITION	Fluid		RIVER (BRACKISH) WATER				Survive		CWP-B DISCH MV					
2				Unit	Max.	Nor.	Min.	TAG NO.	18PAB10AA251/ 28PAB10AA251						
3		Flow Rate		m3/h	58375	46700	30000	PID No.	01PAB-M-M4-PID-0001						
4		Specific Gravity		-	1.029 @ 30.5℃			Molecular Weight	N/A						
5		Operating Pressure		Bar g	3.72	1.90	1.37								
6		Operating Temperature		℃	33.6	26	12.4	Viscosity (Cp)	0.86 @ 30.5oC						
7		Diff. Press. open&close		BAR	6 / Vac.										
8		Design Press. / Temp.		Bar G	6 & FV / 50			Q'TY	2 EA						
9	LINE	Pipe Line No.		-		36	ACTUATOR	Type		"see electric actuator data sheet"					
10		Pipe Line Size & Sch.		2700 / JXD / 20.62		37		Mfgr. / Type							
11	VALVE SPECIFICATION	Type		Butterfly valve		38		Model							
12		Size		2700 A		39		Operating Mode							
13		Leakage Class		ANSI CLASS IV		40		Power Source							
14		End Connection	Inlet		AWWA C 207-D / FF			41	Operating Time						
15			Outlet		AWWA C 207-D / FF			42	Output Speed						
16		MATERIAL	Body		A536-65-45-12(DUCTILE) & RUBBER LINED			43	Control Power						
17								44	Cable Connection						
18								45	Enclosure						
19								46	Motor Power						
20								Disc Seat	BUNA-N			47	Limit Switch(es)		
21									A276-T316			48	Torque Switch(es)		
22	Exterior		N/A (RUBBER LINNING)		49	Space Heater									
23	PAINT	Interior		SILICONE MODIFIED (SILVER)		50		Transformer							
24		Type		WORM GEAR BOX		51		Reversing Contactor							
25	GEAR	Model		TM-W10SDM		52		Potentiometer							
26		Allowable Torque		28060	kgf.m	53		Position Transmitter							
27		Ratio		589.5	: 1	54		Positioner							
28		Number of Turn		147.375		55		Position Indicator							
29	TEST	Examination Standard		"According to ITP"		56		Indication Lamp							
30		Shell	Test Press.			57		Selector Switch							
31			Test Medium			58		Cable Connection							
32		Seat	Test Press.			59		Manual Hand Wheel							
33			Test Medium												
34	DWG.	Assembly DWG.		TB2-SDC.VP406-00100-I-I1-DSU-0001-10		1	2015.01.23	For Final	S.T. WOO	S.K. LEE	S.K. JUNG				
35		Actuator DWG.		TB2-SDC.VP406-00100-I-I1-DSU-0001-18		0	2014.03.05	For Final	S.T. WOO	S.K. LEE	S.K. JUNG				
36		Wiring diagram		IM003-XX-AC-XAA/0P0-18		Rev.	Date	Description	Drawn	REV.	App.				

Special Comments :

PROJECT	THAIBINH 2 THERMAL POWER PLANT 2 x 600 MW
TAG NO.	18PAB10AA251/28PAB10AA251
Q'TY	2 Sets
CONTRACT	DAELIM INDUSTRIAL CO., LTD.
DATE	2014. 07. 17
MR. No.	110180-44-406-001

1	Valve Condition	Type	BUTTERFLY	32	Motor	Three Thermal Switch	Yes
2		Size	2700	33		Motor Duty	S2
3		Rating Class	150#	34		Insulation Class	F Class
4		End Connection	AWWA C207 CLASS-D / FF	35		RPM	2900
5		Body Matl	A536-65-45-12 (DUCTILE)	36		Rated power	14 [kw]
6		Disc Material	A351-CF8M	37		Rated Current	26.5 [A]
7		Seat (Body / Disc)	316 / BUNA-N	38		Current Consumption	86.0 [A]
8		Stem Material	A276-T316	39		Starting Current	170.0 [A]
9		Open / Close Time	60 [sec]	40		Power Factor	0.83 [cosφ]
10		Turn per stroke	90.0 °	41		Efficiency	87 [%]
11		Required torque [N.m]	128727	42		Power Supply	400 VAC, 3PH, 50Hz
12		Manufacture	DUKWON Valve	43	Accessory	Control Voltage	DC 24V
13	Actuator	Version	i-Matic / DREHMO	44		Electric Wiring	iM003-XX-AC-XAA_0P0-18
14		Mode of Operation	INCHING	45		Potentiometer	Yes
15		Model	DiM2000-B3	46		Position Transmitter	Yes (4~20mA)
16		Max. Torque [N.m]	Open : 2000 Close : 2000	47		Positioner	No
17		Setting Torque [N.m]	Open : 1210 Close : 1210	48		Local Switch (Open / Stop / Close)	Yes
18		Limit Switch	2 NC 4 NO	49		Selector SW (Local / Off / Remote)	Yes
19		Intermediate Switch	- NC - NO	50		Ind. Lamp (Open[R]/Fault[Y]/Close[G])	Yes
20		Torque Switch	- NC 1 NO	51		Transformer	Yes
21		Rotation	Clock wise Close	52		Reversing Contactor	Yes
22		Output / Max bore size	"B3" FORM	53		Auto.Phases Correction	Yes
23		Output Flange	ISO 5210 F25	54		Torque Failue	Yes
24		Stem Cover	YES	55		Interposing Relay	Yes
25		Handwheel	Yes (Side)	56		Monitor Relay	Yes
26		Space Heater	Anti Condensation	57		Drain plug	Yes
27		Position Indicator	LCD indicator	58			
28		Output RPM / Actuator	160	59			
29		Enclosure Class	IP 67	60			
30		Ambient Temp.	-25 °C to +70 °C	61			
31		Cable Entry	1 x M32, 2 x NPT 1", 1/2" NPT(F)	62			
	Notes	1. The dry contact for remote selected and trouble signal to be provied refer to electric wiring diagram.	Rev.	Date	Description	Oring	App.
			1	2015.01.23	For Final	H.K.BAEK	Y. K. CHO
			0	2014.09.30	For Final	H.K.BAEK	Y. K. CHO



TECHNICAL DATASHEET

Client : DAELIM INDUSTRIAL CO., LTD.

Project : THAIBINH 2 THERMAL POWER PLANT 2 x 600 MW

MOTOR OPERATED VALVES FOR BUTTERFLY

1	SERVICE CONDITION	Fluid		RIVER (BRACKISH) WATER				Survive		CWP-A DISCH MV		
2				Unit	Max.	Nor.	Min.	TAG NO.	18PAB11AA251/ 28PAB11AA251			
3		Flow Rate		m3/h	58375	46700	30000	PID No.	01PAB-M-M4-PID-0001			
4		Specific Gravity		-	1.029 @ 30.5℃			Molecular Weight	N/A			
5		Operating Pressure		Bar g	3.72	1.90	1.37					
6		Operating Temperature		℃	33.6	26	12.4	Viscosity (Cp)	0.86 @ 30.5oC			
7		Diff. Press. open&close		BAR	6 / Vac.							
8		Design Press. / Temp.		Bar G	6 & FV / 50			Q'TY	2 EA			
9	LINE	Pipe Line No.		-		36	ACTUATOR	Type		"see electric actuator data sheet"		
10		Pipe Line Size & Sch.		2700 / JXD / 20.62		37		Mfgr. / Type				
11	VALVE SPECIFICATION	Type		Butterfly valve		38		Model				
12		Size		2700 A		39		Operating Mode				
13		Leakage Class		ANSI CLASS IV		40		Power Source				
14		End Connection	Inlet		AWWA C 207-D / FF			41	Operating Time			
15			Outlet		AWWA C 207-D / FF			42	Output Speed			
16		MATERIAL	Body		A536-65-45-12(DUCTILE) & RUBBER LINED			43	Control Power			
17								Cable Connection				
18			Body Seat		A240-316			45	Enclosure			
19			Disc		A351-CF8M			46	Motor Power			
20			Disc Seat		BUNA-N			47	Limit Switch(es)			
21								Torque Switch(es)				
22	PAINT	Exterior		N/A (RUBBER LINNING)		49		Space Heater				
23		Interior		SILICONE MODIFIED (SILVER)		50		Transformer				
24	GEAR	Type		WORM GEAR BOX		51		Reversing Contactor				
25		Model		TM-W10SDM		52		Potentiometer				
26		Allowable Torque		28060	kgf.m	53		Position Transmitter				
27		Ratio		589.5	: 1	54		Positioner				
28		Number of Turn		147.375		55		Position Indicator				
29	TEST	Examination Standard		"According to ITP"		56		Indication Lamp				
30		Shell	Test Press.			57		Selector Switch				
31			Test Medium			58		Cable Connection				
32		Seat	Test Press.			59		Manual Hand Wheel				
33			Test Medium									
34		DWG.	Assembly DWG.			TB2-SDC.VP406-00100-I-I1-DSU-0001-10		1	2015.01.23	For Final	S.T. WOO	S.K. LEE
35	Actuator DWG.		TB2-SDC.VP406-00100-I-I1-DSU-0001-18		0	2014.03.05	For Final	S.T. WOO	S.K. LEE	S.K. JUNG		
36	Wiring diagram		IM003-XX-AC-XAA/0P0-18		Rev.	Date	Description	Drawn	REV.	App.		

Special Comments :

PROJECT	THAIBINH 2 THERMAL POWER PLANT 2 x 600 MW
TAG NO.	18PAB11AA251/ 28PAB11AA251
Q'TY	2 Sets
CONTRACT	DAELIM INDUSTRIAL CO., LTD.
DATE	2014. 07. 17
MR. No.	110180-44-406-001

1	Valve Condition	Type	BUTTERFLY		32	Motor	Three Thermal Switch		Yes		
2		Size	2700		33		Motor Duty		S2		
3		Rating Class	150#		34		Insulation Class		F Class		
4		End Connection	AWWA C207 CLASS-D / FF		35		RPM		2900		
5		Body Matl	A536-65-45-12 (DUCTILE)		36		Rated power		14 [kw]		
6		Disc Material	A351-CF8M		37		Rated Current		26.5 [A]		
7		Seat (Body / Disc)	316 / BUNA-N		38		Current Consumption		86.0 [A]		
8		Stem Material	A276-T316		39		Starting Current		170.0 [A]		
9		Open / Close Time	60 [sec]		40		Power Factor		0.83 [cosφ]		
10		Turn per stroke	90.0 °		41		Efficiency		87 [%]		
11		Required torque [N.m]	128727		42		Power Supply		400 VAC, 3PH, 50Hz		
12		Manufacture	DUKWON Valve		43		Accessory	Control Voltage		DC 24V	
13	Actuator	Version	i-Matic / DREHMO		44	Electric Wiring		iM003-XX-AC-XAA_0P0-18			
14		Mode of Operation	INCHING		45	Potentiometer		Yes			
15		Model	DiM2000-B3		46	Position Transmitter		Yes (4~20mA)			
16		Max. Torque [N.m]	Open : 2000 Close : 2000		47	Positioner		No			
17		Setting Torque [N.m]	Open : 1210 Close : 1210		48	Local Switch (Open / Stop / Close)		Yes			
18		Limit Switch	2 NC 4 NO		49	Selector SW (Local / Off / Remote)		Yes			
19		Intermediate Switch	- NC - NO		50	Ind. Lamp (Open[R]/Fault[Y]/Close[G])		Yes			
20		Torque Switch	- NC 1 NO		51	Transformer		Yes			
21		Rotation	Clock wise Close		52	Reversing Contactor		Yes			
22		Output / Max bore size	"B3" FORM		53	Auto.Phases Correction		Yes			
23		Output Flange	ISO 5210 F25		54	Torque Failue		Yes			
24		Stem Cover	YES		55	Interposing Relay		Yes			
25		Handwheel	Yes (Side)		56	Monitor Relay		Yes			
26		Space Heater	Anti Condensation		57	Drain plug		Yes			
27		Position Indicator	LCD indicator		58						
28		Output RPM / Actuator	160		59						
29		Enclosure Class	IP 67		60						
30		Ambient Temp.	-25 °C to +70 °C		61						
31	Cable Entry	1 x M32, 2 x NPT 1", 1/2" NPT(F)		62							
	Notes	1. The dry contact for remote selected and trouble signal to be provied refer to electric wiring diagram.			Rev.	Date	Description	Oring	App.		
					1	2015.01.23	For Final	H.K.BAEK	Y. K. CHO		
					0	2014.09.30	For Final	H.K.BAEK	Y. K. CHO		



DOCUMENT SUBMISSION STATUS: **AP**

NOTE:

**ISSUE TO PVC
FOR REFERENCE**

E	16-Dec-14	FOR APPROVAL	S.T. WOO	S.K. LEE	-	S.K. JUNG
D	26-Sep-14	FOR APPROVAL	S.T. WOO	S.K. LEE	-	S.K. JUNG
C	5-Aug-14	FOR APPROVAL	S.T. WOO	S.K. LEE	-	S.K. JUNG
B	13-May-14	FOR APPROVAL	S.T. WOO	S.K. LEE	-	S.K. JUNG
A	5-Mar-14	FOR APPROVAL	S.T. WOO	S.K. LEE	-	S.K. JUNG
REV.	DATE	DESCRIPTION	DRAWN	CHECKED	APPROVED	APPROVED

OWNER



VIETNAM OIL AND GAS GROUP (PVN)

OWNER'S CONSULTANT

FICHTNER
GmbH & Co. KG

FICHTNER



PVPOWER PCC

EPC CONTRACTOR



PETROVIETNAM CONSTRUCTION JOINT
STOCK CORPORATION (PVC)

EPC CONTRACTOR'S CONSULTANT



WORLEYPARSONS

POWER ISLAND PACKAGE SUPPLIER



SOJITZ CORPORATION



DAELIM INDUSTRIAL CO., LTD.

PROJECT TITLE

THAI BINH 2 THERMAL POWER PLANT 2 x 600MW

DRAWING / DOCUMENT TITLE

G.A DRAWING FOR BUTTERFLY VALVE



FUNCTION	NAME	SIGN	DATE
DRWN	S.T. WOO		16-Dec-14
CHKD	S.K. LEE		16-Dec-14
APPD	S.K. JUNG		16-Dec-14

DOCUMENT NO: **TB2-SDC.VP406-00100-I-11-DSU-0001**

No of page:

Scale

Rev. E



P.O NO. (MR NO.)	MR-110180-44-406-001-REV.1
ITEM NO.	ALL
ITEM DESCRIPTION	BUTTERFLY VALVE
DOCUMENT NO.	TB2-SDC.VP406-00100-I-I1-DSU-0001
DOCUMENT TITLE	G.A DRAWING FOR BUTTERFLY VALVE
REV NO.	E

Daelim's Approval Status

Daelim Industrial Co., Ltd.	
Job No.	110180
	A - APPROVED
	B - APPROVED WITH COMMENTS
	C - RETURNED FOR CORRECTION
	D - REJECTED
	N - NOT APPLICABLE(REFERENCE ONLY)
SIGNED BY :	DATE :
DIC'S PERMISSION TO PROCEED OR REVIEW TAKEN ON VENDOR PRINTS SHALL NOT RELIEVE VENDOR FROM ITS RESPONSIBILITIES OR LIABILITIES UNDER THE PURCHASE ORDER.	

DUKWON
VALVES



Document Review Comment Sheet

PEB Ref. No : TB2-PEB-SDC-I1-TVI-06757

No.	Document No.	Rev	Title	Purpose	Review Status	
					In	Out
1	TB2-SDC.VP406-00100-I-I1-DSU-0001	D	G.A DRAWING FOR BUTTERFLY VALVE	RE		R
No.	Owner/PMC's Comments	Item status	Contractor's Response			
I	General comments					
	The information on G.A Drawing of all valves shall be designed be compliable with operating condition on application.		Noted.			
II	Detail comments					
2.1	Vendor shall ensure that material A536-65-45-12 for body valves are lined with rubber. Refer to drawing TB2-SDC.VP406-00100-I-I1-DSU-0001-1; TB2-SDC.VP406-00100-I-I1-DSU-0001-2, why material A536-65-45-12 for body valves are not lined with rubber?		The valves are covered with rubber on inside.			
2.2	To add nameplate, tag No. drawings for all valve. Please note information on nameplate, tag No. shall be accordance with information of GA drawing.		The drawing of nameplate & Tag No. is reference, also it is accordance with G.A drawing.			
2.3	To add drawing for motor operated butterfly orientation position with updating position for manual handwheel of all valve have an easier manual operation (Valve 11/21 PGB21 & 11/21 PGB23 AA201 (DN750) M2->M1		CONFORM			
2.4	To attach drawing of actuator in this document.		CONFORM			

* Legend

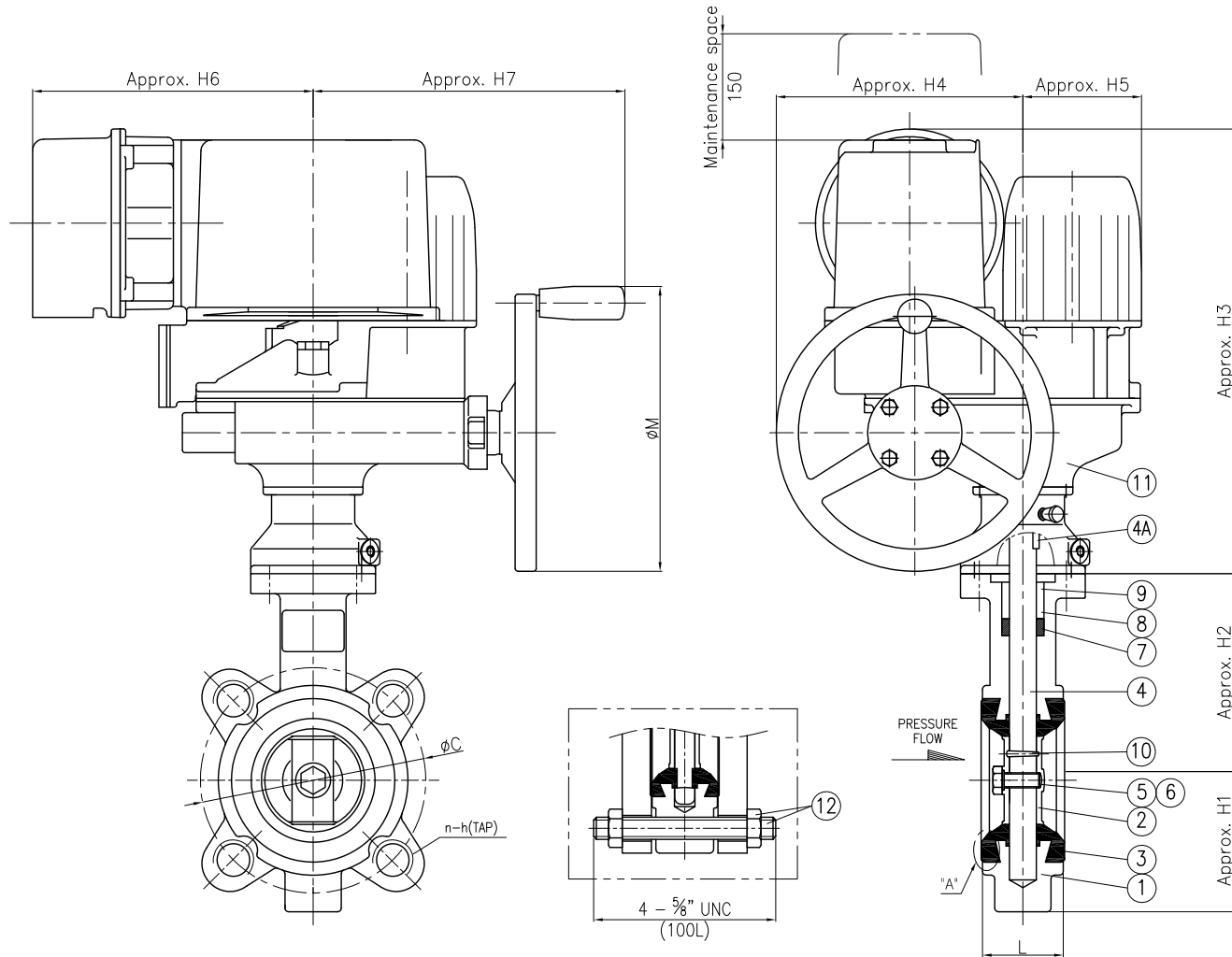
Contractor Purpose:

AP - For Approval
 RE - For Reference
 FC - For Construction
 AB - As Built
 INFO - For Information

Approval Status:

A - Approved
 B - Approved with Comments
 C - Returned for Correction
 D - Rejected
 I - Accepted for Reference / IB - Accepted for Reference with Comments / R - Returned for Correction





D I M E N S I O N S											UNIT:mm	Q'TY (EA)	FLUID
NOMINAL DIAMETER	L	FLANGE(ASME #150)		 H1	 H2	H3	H4	H5	H6	H7	øM		
		øC	n-h(TAP)										
DN80(3")	46	152.4	4 - 5/8" UNC	 90	 150	377	223	107	253	281	250	4	RIVER (BRACKISH) WATER

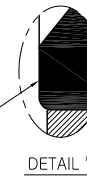
TAG NO.	ORIENTATION POSITION
11PAB70AA201/21PAB70AA201/11PAB71AA201/21PAB71AA201	M2

NO.	PART NAME	MAT'L	Q'TY	REMARKS
1	BODY	A536-65-45-12	1	DUCTILE
2	DISC	A351-CF8M	1	
3	SEAT	BUNA-N	1	
4	STEM	A276-T316	1	
4A	KEY	A576-1045	1	or. EQ
5	DISC BOLT	A193-B8M	1	
6	O-RING	NBR	1	
7	PACKING	NBR	1SET	
8	PACKING RING	ACETAL	1	
9	PACKING GLAND	A283-C	1	
10	PIN	A276-T316	1	
11	ELEC. ACTUATOR	ASS'Y	1SET	SEE NOTE. 5
12	STUD BLOT/NUT	A193-B7/2H	4SET	BY VENDOR

NOTE

- FACE TO FACE DIM : MSS SP-67 (TABLE 3)
- FLANGE RATING : ASME B 16.5 CL.150 (LUG--FF)
- DESIGN PRESSURE : 7 BARG & FV
- DESIGN TEMP. : 50°C
- ACTUATOR
 - MODEL / MAKER : DREHMO / DPIM119
 - POWER SUPPLY : 400VAC, 50Hz, 3PH
 - OPERATING TIME : 24 Sec. (Actuator Data sheet)
- INSPECTION & TEST : MSS SP-61
 - BODY : 10.5 bar
 - SEAT : 7.7 bar
- LEAKAGE CLASS : ANSI CLASS IV
- WITH OUT GASKET
- TOTAL WEIGHT : APPROX. 29Kg

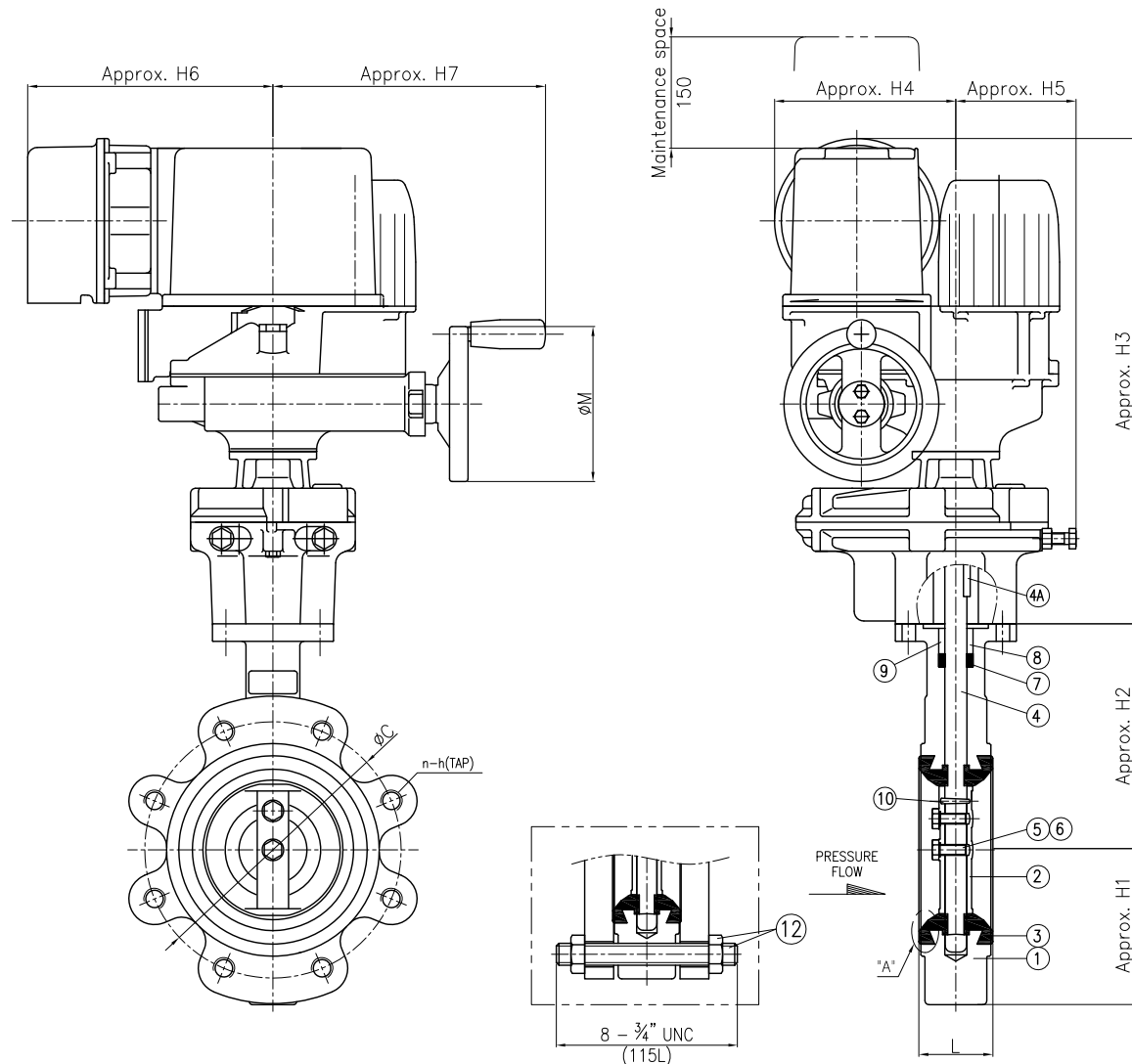
the body seat carry out a function as a gasket.



DETAIL "A"

DOCUMENT SUBMISSION STATUS:									
NOTE:									
REV	DATE	DESCRIPTION	PREP	CHKD	APRD	APRD			
1	26.Sep.2014	FOR APPROVAL	SK. WOO	SK. LEE			SK. JUNG		
2	05.Aug.2014	FOR APPROVAL	SK. WOO	SK. LEE			SK. JUNG		
3	23.Apr.2014	FOR APPROVAL	SK. WOO	SK. LEE			SK. JUNG		
4	27.Jan.2014	FOR APPROVAL	SK. WOO	SK. LEE			SK. JUNG		
OWNER: VIETNAM OIL AND GAS GROUP (PVC)									
OWNER'S CONSULTANT: FICHTNER									
EPC CONTRACTOR: PETROVIETNAM CONSTRUCTION JOINT STOCK CORPORATION (PVC)									
EPC CONTRACTOR'S CONSULTANT: WorleyParsons									
POWER ISLAND PACKAGE SUPPLIER: solitz									
DARLIM INDUSTRIAL CO., LTD.									
PROJECT TITLE: THAI BINH2 THERMAL POWER PLANT 2 x 600MW									
DRAWING TITLE: MOTOR OPERATED BUTTERFLY VALVE, LUG TYPE, DN80									
VENDOR NAME: DUKWON									
FUNCTION NAME: VALVE									
DRAWING NO: TB2-SDC.VP406-00100-I-11-DSU-0001-1									
JOB NO: 110180									
SCALE: 1/1									
REV. NO: 1									
FILE NAME: 110180-44-49-001-401									

Darlum Industrial Co., Ltd.	
Job No.	110180
A - APPROVED	
B - APPROVED WITH COMMENTS	
C - RETURNED FOR CORRECTION	
D - REJECTED	
N - NOT APPLICABLE (REFERENCE ONLY)	
SIGNED BY :	DATE :
DUC'S PERMISSION TO PROCEED OR REVIEW TAKEN ON VENDOR PRINTS SHALL NOT RELIEVE VENDOR FROM ITS RESPONSIBILITIES OR LIABILITIES UNDER THE PURCHASE ORDER.	



D I M E N S I O N S											UNIT:mm		Q'TY (EA)	FLUID
NOMINAL DIAMETER	L	FLANGE(ASME #150)		H1	H2	H3	H4	H5	H6	H7	øM			
		øC	n-h(TAP)											
DN150(6")	56	241.3	8 - ¾" UNC	145	198	501	187	124	253	281	160	1	RIVER (BRACKISH) WATER	

TAG NO.	ORIENTATION POSITION
07GNK11AA201	M2

NO.	PART NAME	MAT'L	Q'TY	REMARKS
1	BODY	A536-65-45-12	1	DUCTILE
2	DISC	A351-CF8M	1	
3	SEAT	BUNA-N	1	
4	STEM	A276-T316	1	
4A	KEY	A576-1045	1	or. EQ
5	DISC BOLT	A193-B8M	2	
6	O-RING	NBR	2	
7	PACKING	NBR	1SET	
8	PACKING RING	ACETAL	1	
9	PACKING GLAND	A283-C	1	
10	PIN	A276-T316	1	
11	ELEC. ACTUATOR	ASS'Y	1SET	SEE NOTE. 5
12	STUD BLOT/NUT	A193-B7/2H	4SET	BY VENDOR

NOTE

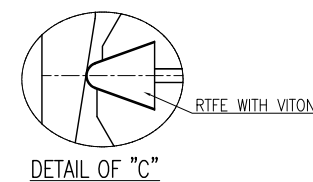
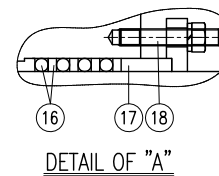
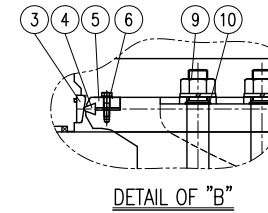
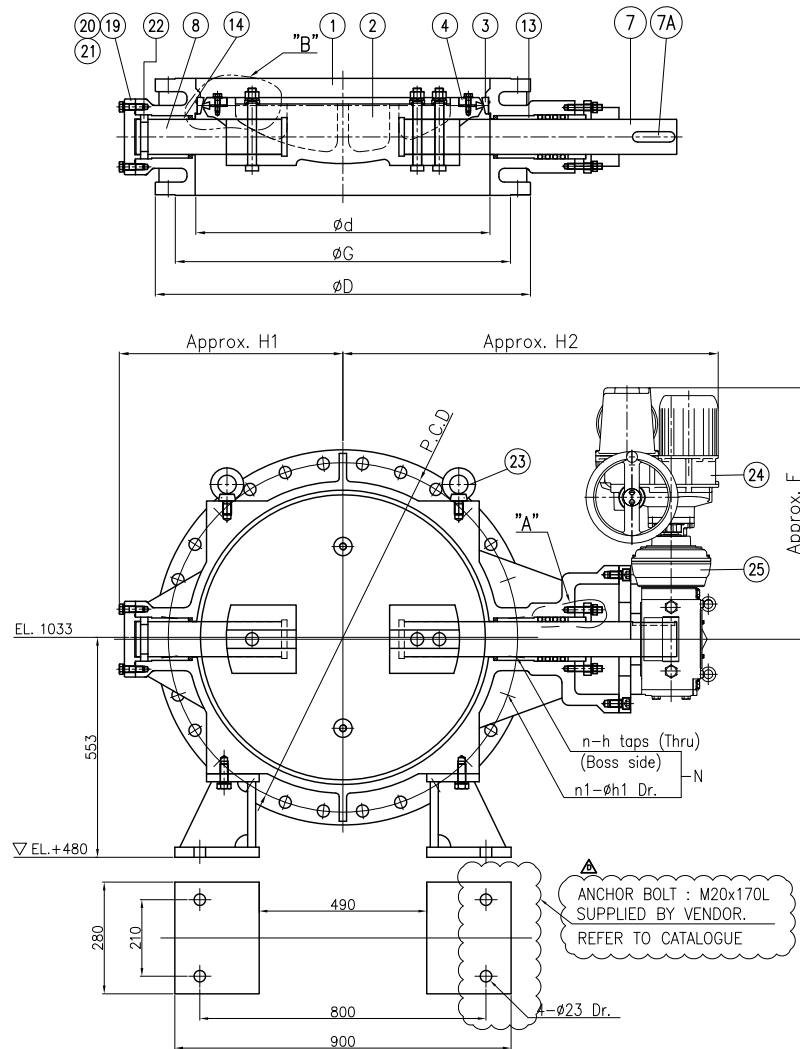
- FACE TO FACE DIM : MSS SP-67 (TABLE 3)
- FLANGE RATING : ASME B 16.5 CL.150 (LUG-FF)
- DESIGN PRESSURE : 6 bar
- DESIGN TEMP. : 50°C
- ACTUATOR
 - MODEL / MAKER : DREHMO / DPIM319
 - POWER SUPPLY : 400VAC, 50Hz, 3PH
 - OPERATING TIME : 24 Sec. (Actuator Data sheet)
- INSPECTION & TEST : MSS SP-61
 - BODY : 9.0 bar
 - SEAT : 6.6 bar
- LEAKAGE CLASS : ANSI CLASS IV
- WITH OUT GASKET
- TOTAL WEIGHT : APPROX. 51Kg

the body seat carry out a function as a gasket.

DETAIL "A"

Job No. 110180 A - APPROVED B - APPROVED WITH COMMENTS C - RETURNED FOR CORRECTION D - REJECTED N - NOT APPLICABLE (REFERENCE ONLY)		FUNCTION NAME SGN DRWN S.T. WOO CHKD S.K. LEE APPD S.K. JUNG DATE 27-Jun-2014	
SIGNED BY : DATE : DCS PERMISSION TO PROCEED OR REVIEW TAKEN ON VENDOR PRINTS SHALL NOT RELIEVE VENDOR FROM ITS RESPONSIBILITIES OR LIABILITIES UNDER THE PURCHASE ORDER.		DUKWON VALVE	
PROJECT TITLE THAI BINH2 THERMAL POWER PLANT 2 x 600MW		DRAWING TITLE MOTOR OPERATED BUTTERFLY VALVE, LUG TYPE, DN150	
VENDOR NAME DUKWON		SCALE 1/1	
DRAWING NO. TB2-SDC.VP406-00100-I-11-DSU-0001-2		JOB NO. 110180	
FILE NAME 110180-44-49-001-401		REV. NO. 1	

DOCUMENT SUBMISSION STATUS:				
NOTE:				
REV	DATE	DESCRIPTION	PREP	CHKD
1	26-Sep-2014	FOR APPROVAL	ST.WOO	SK.LEE
2	05-Aug-2014	FOR APPROVAL	ST.WOO	SK.LEE
3	23-Jul-2014	FOR APPROVAL	ST.WOO	SK.LEE
4	27-Jun-2014	FOR APPROVAL	ST.WOO	SK.LEE
OWNER: VIETNAM OIL AND GAS GROUP (PWO)				
OWNER'S CONSULTANT: FICHTNER				
EPC CONTRACTOR: PETROVIETNAM CONSTRUCTION JOINT STOCK CORPORATION (PVC)				
EPC CONTRACTOR'S CONSULTANT: WorleyParsons				
POWER ISLAND PACKAGE SUPPLIER: solitz				
DAHLIM INDUSTRIAL CO., LTD.				



D I M E N S I O N S																[Unit:mm]	Q'TY (EA)	FLUID
NOMINAL DIAMETER	ød	F L A N G E								L	R E F E R E N C E							
		øD	PCD	øG	f	N	n1-øh1 Dr.	n-h taps	t		H1	H2	H3	H4	F	øM		
DN 750 (30")	750	984	914.5	857	2	28	24-ø35	4-1¼" 8UN	37	305	590	1020	465	185	683	250	4	CCW

TAG NO.		ORIENTATION POSITION
11PGB21AA201/21PGB21AA201/11PGB23AA201/21PGB23AA201		M1

7. ACTUATOR
= MODEL / MAKER : DIM120 / DRE

NOTE

- BASIC DESIGN ; AWWA C504
- FLANGE DRILLING ; ASME B 16.47, CL.150 SERIES "A" / RF
- FLANGE THICKNESS ; AWWA C207 CLASS-D
- FACE TO FACE DIMENSION ; MSS SP-67 (TABLE 2)
- DESIGN PRESSURE ; 10 barG
- DESIGN TEMP. ; 50°C

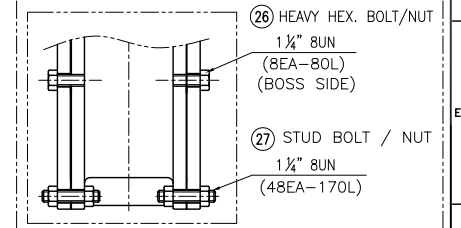
- ACTUATOR
 - MODEL / MAKER ; DIM120 / DREHMO
 - POWER SUPPLY : 400VAC , 50Hz , 3PH
 - OPERATING TIME : ≤ 45 Sec.
- GEAR BOX
 - MODEL / MAKER ; TMG / TM-W4SDM
 - GEAR RATIO : 357.9 : 1

- INSPECTION & TEST : MSS SP-61
 - BODY : 15 barG
 - SEAT : 11 barG
- LEAKAGE CLASS : ANSI CLASS IV
- TOTAL WEIGHT : APPROX. 840 Kg

Daelim Industrial Co., Ltd.	
Job No.	110180
A - APPROVED	
B - APPROVED WITH COMMENTS	
C - RETURNED FOR CORRECTION	
D - REJECTED	
N - NOT APPLICABLE (REFERENCE ONLY)	
SIGNED BY :	DATE :
D/C'S PERMISSION TO PROCEED OR REVIEW TAKEN ON VENDOR PRINTS SHALL NOT RELIEVE VENDOR FROM ITS RESPONSIBILITIES OR LIABILITIES UNDER THE PURCHASE ORDER.	

NO.	PART NAME	MAT'L	Q'TY	REMARKS
1	BODY	A216-WCB	1	
2	DISC	A351-CF8M	1	
3	BODY SEAT	A240-316	1	
4	DISC SEAT	VITON+RTFE	1	
5	DISC GLAND	A240-T316	1	
6	HEX.BOLT/WASHER	A193-B8M	24SET	
7	MAIN STEM	A276-T316	1	
7A	KEY	A576-1045	1	
8	STUB STEM	A276-T316	1	
9	LOCK PIN	A276-T316	3	
10	O-RING	NBR	3	
13	MAIN BUSH	OILLESS B/R	1	
14	STUB BUSH	OILLESS B/R	1	
16	PACKING	B584-C86300 +NBR	1SET	
17	PACKING GLAND	A283-C/B62	1SET	
18	STUD BOLT/NUT/PW	A193-B7/2H	4SET	
19	END COVER	A216-WCB	1	
20	O-RING	NBR	1	
21	HEX.BOLT / S.W	A193-B7	6SET	
22	COLLAR	CAC304	1	
23	I-BOLT	A193-B7	2	
24	ELEC.ACTUATOR	ASS'Y	1SET	SEE NOTE. 7
25	GEAR BOX	ASS'Y	1SET	SEE NOTE. 8

FLANGE BOLT/NUT MATERIAL : A193-B7/A194-2H
SUPPLIED BY VENDOR.

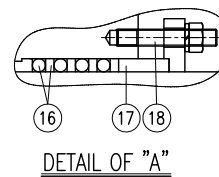
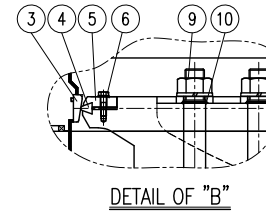
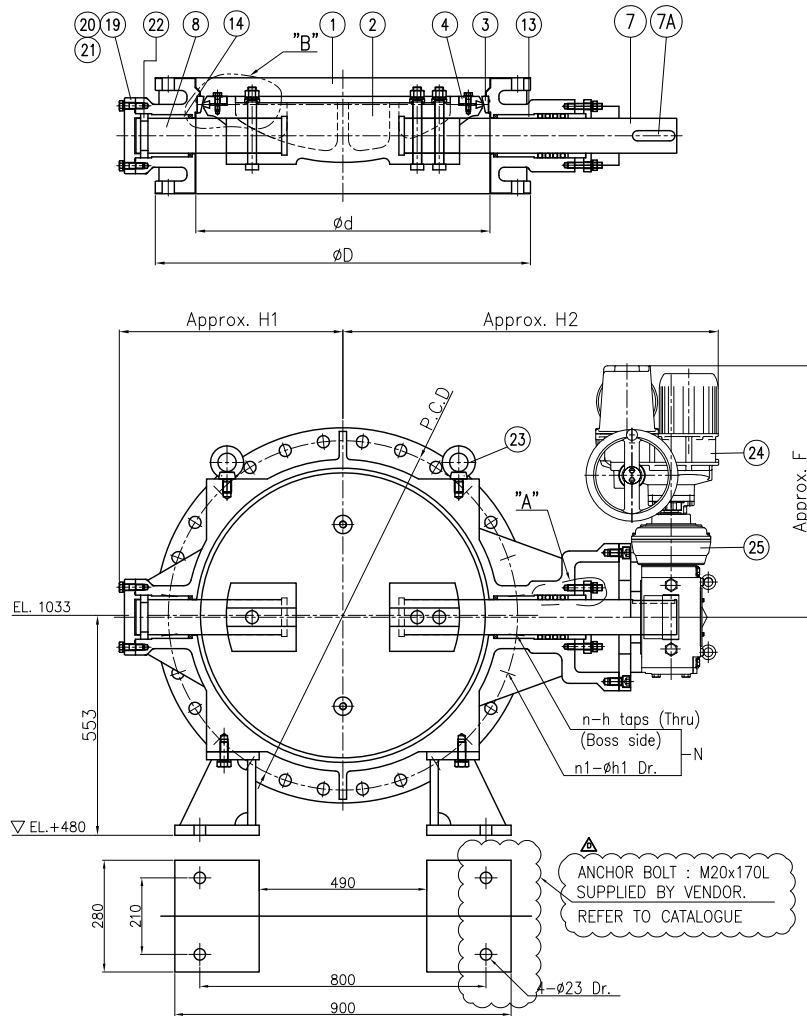


DOCUMENT SUBMISSION STATUS:

REV	DATE	DESCRIPTION	PREP	CHKD	APRD	APRD
Δ	26.Sep.2014	FOR APPROVAL	S.T.WOO	S.K.LEE		S.K.JUNG
Δ	05.Aug.2014	FOR APPROVAL	S.T.WOO	S.K.LEE		S.K.JUNG
Δ	23.Apr.2014	FOR APPROVAL	S.T.WOO	S.K.LEE		S.K.JUNG
Δ	27.Jan.2014	FOR APPROVAL	S.T.WOO	S.K.LEE		S.K.JUNG

OWNER	Vietnam Oil and Gas Group (VNG)	OWNER'S CONSULTANT	FIGHTNER	OWNER'S CONSULTANT	PV POWER PCC
EPC CONTRACTOR	PETROVIETNAM CONSTRUCTION JOINT STOCK CORPORATION (PCC)	EPC CONTRACTOR'S CONSULTANT	WorleyParsons		
POWER ISLAND PACKAGE SUPPLIER	SOJITZ CORPORATION				

PROJECT TITLE	THAI BINH2 THERMAL POWER PLANT 2 x 600MW				
DRAWING TITLE	MOTOR OPERATED RUBBER SEAT BUTTERFLY VALVE FLANGE DN750				
VENDOR NAME	DUKWON				
FUNCTION	NAME	SIGN	DATE		
CHKD	S.T. WOO		27-Jan-2014		
APPD	S.K. LEE		27-Jan-2014		
APPD	S.K. JUNG		27-Jan-2014		
DRAWING NO.	TB2-SDC.VP406-00100-I-11-DSU-0001-3				FILE NAME : 110180-44 -09-001-001



D I M E N S I O N S															[Unit:mm]		Q'TY (EA)	FLUID
NOMINAL DIAMETER	ød	F L A N G E						L	R E F E R E N C E									
		øD	PCD	N	n1-øh1 Dr.	n-h taps	t		H1	H2	H3	H4	F	øM				
DN 750 (30")	750	984	914.5	28	24-ø35	4-1¼" 8UN	37	305	590	1020	465	185	683	250	4	RIVER(Brackish)WATER		

TAG NO.								ORIENTATION POSITION							
11PAB73AA201/21PAB73AA201/11PAB77AA201/21PAB77AA201								M1							

7. ACTUATOR
MODEL / MAKER : DWA1

TAG NO.	ORIENTATION POSITION
11PAB73AA201/21PAB73AA201/11PAB77AA201/21PAB77AA201	M1

NOTE

- BASIC DESIGN ; AWWA C504
- FLANGE DRILLING ; ASME B 16.47, CL150 SERIES "A" / FF
- FLANGE THICKNESS ; AWWA C207 CLASS-D

- FACE TO FACE DIMENSION ; MSS SP-67 (TABLE 2)

- DESIGN PRESSURE ; 10 barG & FV
- DESIGN TEMP. ; 50°C

7. ACTUATOR

- MODEL / MAKER ; DIM120 / DREHMO
- POWER SUPPLY : 400VAC , 50Hz , 3PH
- OPERATING TIME : ≤45 Sec.

8. GEAR BOX

- MODEL / MAKER ; TMG / TM-W4SDM
- GEAR RATIO : 357.9 : 1

RUBBER LINNING MATERIAL : N/R
RUBBER LINNING THICKNESS : 3mm
RUBBER LINNING HARDNESS
- 95±5 SHORE A

9. INSPECTION & TEST : MSS SP-61

- BODY : 15 barG
- SEAT : 11 barG

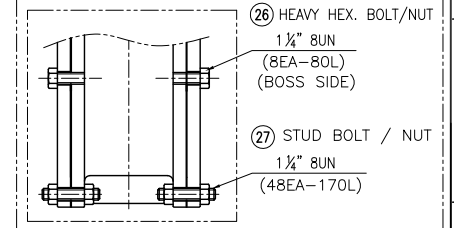
10. LEAKAGE CLASS : ANSI CLASS IV

11. TOTAL WEIGHT : APPROX. 840 Kg

Daelim Industrial Co., Ltd.	
Job No.	110180
A - APPROVED	
B - APPROVED WITH COMMENTS	
C - RETURNED FOR CORRECTION	
D - REJECTED	
N - NOT APPLICABLE (REFERENCE ONLY)	
SIGNED BY :	DATE :
DICS'S PERMISSION TO PROCEED OR REVIEW TAKEN ON VENDOR PRINTS SHALL NOT RELIEVE VENDOR FROM ITS RESPONSIBILITIES OR LIABILITIES UNDER THE PURCHASE ORDER.	

NO.	PART NAME	MAT'L	Q'TY	REMARKS
1	BODY	A536 Gr.65-45-12	1	RUBBER LINNING
2	DISC	A351-CF8M	1	
3	BODY SEAT	A240-316	1	
4	DISC SEAT	BUNA-N	1	
5	DISC GLAND	A240-T316	1	
6	HEX.BOLT/WASHER	A193-B8M	24SET	
7	MAIN STEM	A276-T316	1	
7A	KEY	A576-1045	1	
8	STUB STEM	A276-T316	1	
9	LOCK PIN	A276-T316	3	
10	O-RING	NBR	3	
13	MAIN BUSH	OILLESS B/R	1	
14	STUB BUSH	OILLESS B/R	1	
16	PACKING	B584-C86300 +NBR	1SET	
17	PACKING GLAND	A283-C/B62	1SET	
18	STUD BOLT/NUT/PW	A193-B7/2H	4SET	
19	END COVER	A536 Gr.65-45-12	1	
20	O-RING	NBR	1	
21	HEX.BOLT / S.W	A193-B7	6SET	
22	COLLAR	CAC304	1	
23	I-BOLT	A193-B7	2	
24	ELEC.ACTUATOR	ASS'Y	1SET	SEE NOTE. 7
25	GEAR BOX	ASS'Y	1SET	SEE NOTE. 8

FLANGE BOLT/NUT MATERIAL : A193-B7/A194-2H
SUPPLIED BY VENDOR.



DOCUMENT SUBMISSION STATUS:

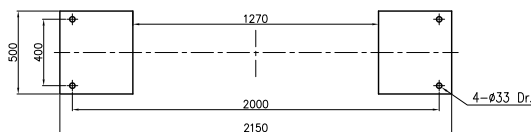
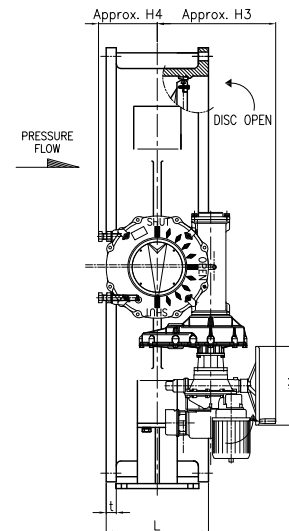
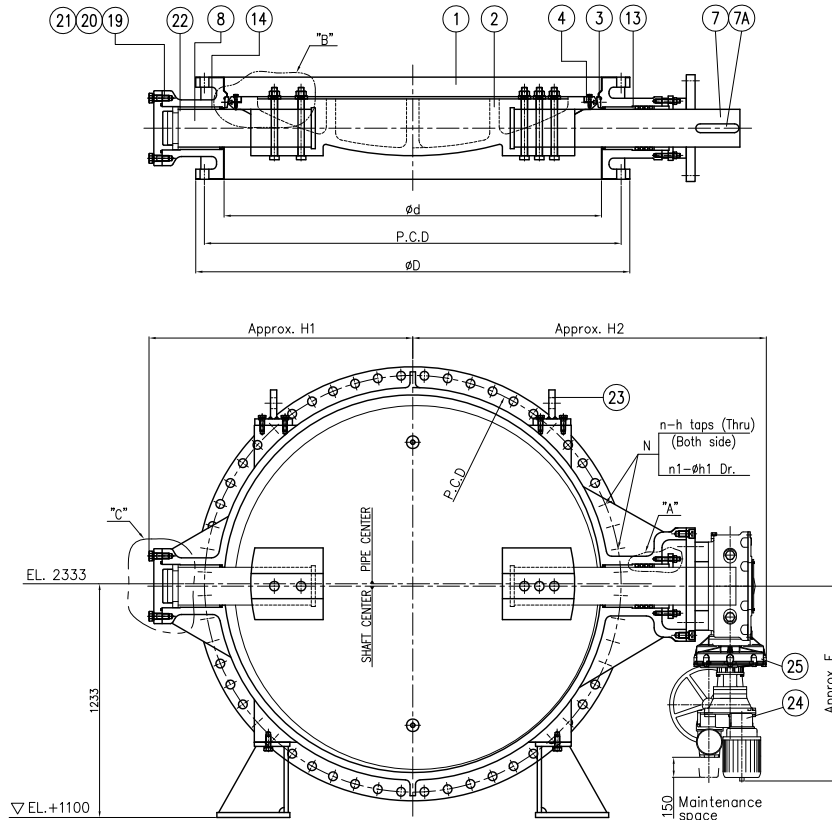
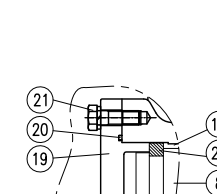
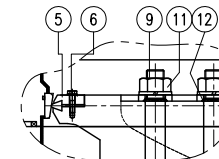
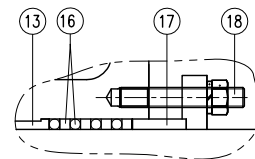
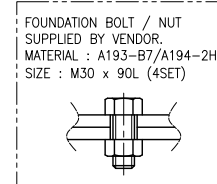
REV	DATE	DESCRIPTION	PREP	CHKD	APRD	APRD
Δ	26.Sep.2014	FOR APPROVAL	S.T.WOO	S.K.LEE		S.K.JUNG
Δ	05.Aug.2014	FOR APPROVAL	S.T.WOO	S.K.LEE		S.K.JUNG
Δ	23.Apr.2014	FOR APPROVAL	S.T.WOO	S.K.LEE		S.K.JUNG
Δ	27.Jan.2014	FOR APPROVAL	S.T.WOO	S.K.LEE		S.K.JUNG

OWNER	Vietnam Oil and Gas Group (VNG)	OWNER'S CONSULTANT	FIGHTNER	PV POWER PCC
EPC CONTRACTOR	PETROVIETNAM CONSTRUCTION JOINT STOCK CORPORATION (PCC)	EPC CONTRACTOR'S CONSULTANT	WorleyParsons	WOLEYPARSONS
POWER ISLAND PACKAGE SUPPLIER	SOJITZ			
	SOJITZ CORPORATION			

PROJECT TITLE	THAI BINH2 THERMAL POWER PLANT 2 x 600MW			
DRAWING TITLE	MOTOR OPERATED RUBBER SEAT BUTTERFLY VALVE FLANGE DN750			
VENDOR NAME	DUKWON			
FUNCTION	NAME	SIGN	DATE	
CHKD	S.T. WOO		27-Jan-2014	
APPD	S.K. LEE		27-Jan-2014	
APPD	S.K. JUNG		27-Jan-2014	
DRAWING NO.	110180			SCALE
TB2-SDC.VP406-00100-1-I1-DSU-0001-4				1/1
JOB NO.	110180			REVNO.
				Δ

D I M E N S I O N S [Unit:mm]														Q'TY (EA)	FLUID	
NOMINAL DIAMETER	ød	F L A N G E						L	R E F E R E N C E							
		øD	PCD	N	n1-øh1 Dr.	n-h taps	t		H1	H2	H3	H4	F			øM
DN1950 (78")	1950	2362	2260.6	64	60-ø54	4-2" 8UN	70	550	1390	2050	375	750	1240	500	4	RIVER(Brackish) WATER

TAG NO.	ORIENTATION POSITION
11PAB50AA201/21PAB50AA201/11PAB52AA201/21PAB52AA201	M3



NOTE

- BASIC DESIGN ; AWWA C504
- FLANGE DRILLING ; AWWA C207 CLASS-D / FF
- FACE TO FACE DIMENSION ; MAKER STANDARD
- DESIGN PRESSURE ; 6 barG & FV

- DESIGN TEMP. ; 50°C

- ACTUATOR
 - MODEL / MAKER ; DIM1000 / DREHMO
 - POWER SUPPLY : 400VAC, 50Hz, 3PH
 - OPERATING TIME : ≤ 60 Sec.

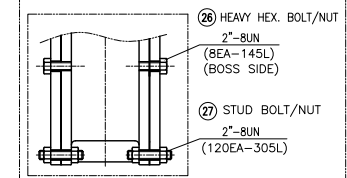
- GEAR BOX
 - MODEL / MAKER ; TMG / TM-W8SDM
 - GEAR RATIO : 324.1 : 1
- INSPECTION & TEST : MSS SP-61
 - BODY : 9 barG
 - SEAT : 6.6 barG
- LEAKAGE CLASS : ANSI CLASS IV
- TOTAL WEIGHT : APPROX. 6430 Kg

RUBBER LINING MATERIAL : N/R
RUBBER LINING THICKNESS : 3mm
RUBBER LINING HARDNESS : 95±5 SHORE A

Daelim Industrial Co., Ltd.	
Job No.	110180
A - APPROVED	
B - APPROVED WITH COMMENTS	
C - RETURNED FOR CORRECTION	
D - REJECTED	
N - NOT APPLICABLE (REFERENCE ONLY)	
SIGNED BY :	DATE :
DIE'S PERMISSION TO PROCEED OR REVIEW TAKEN ON VENDOR PRINTS SHALL NOT RELIEVE VENDOR FROM ITS RESPONSIBILITIES OR LIABILITIES UNDER THE PURCHASE ORDER.	

NO.	PART NAME	MAT'L	Q'TY	REMARKS
1	BODY(RUBBER LINING)	A536 Gr.65-45-12	1	DUCTILE
2	DISC	A351-CF8M	1	
3	BODY SEAT	A240-316	1	
4	DISC SEAT	BUNA-N	1	
5	DISC GLAND	A240-T316	1	
6	HEX.BOLT/WASHER	A193-B8M	52SET	
7	MAIN STEM	A276-T316	1	
7A	KEY	A576-1045	1	
8	STUB STEM	A276-T316	1	
9	LOCK PIN	A276-T316	5	
11	HEX.NUT	A194-Gr.8	5	
12	O-RING	NBR	5	
13	MAIN BUSH	OILLESS B/R	1	
14	STUB BUSH	OILLESS B/R	1	
16	PACKING	B584-C86300 +NBR	1SET	
17	PACKING GLAND	A283-C+B62	1SET	
18	STUD BOLT/NUT/PW	A193-B7	4SET	
19	END COVER	A536 Gr.65-45-12	1	
20	O-RING	NBR	1	
21	HEX.BOLT / S.W	A193-B7	8SET	
22	COLLAR	B584-C86300	1	
23	LIFTING LUG	A283-C	2	
24	ELEC. ACUTAOIR	ASS'Y	1SET	SEE NOTE. 6
25	GEAR BOX	ASS'Y	1SET	SEE NOTE. 6

FLANGE BOLT/NUT MATERIAL : A193-B7/A194-2H
SUPPLIED BY VENDOR.



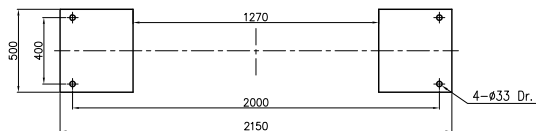
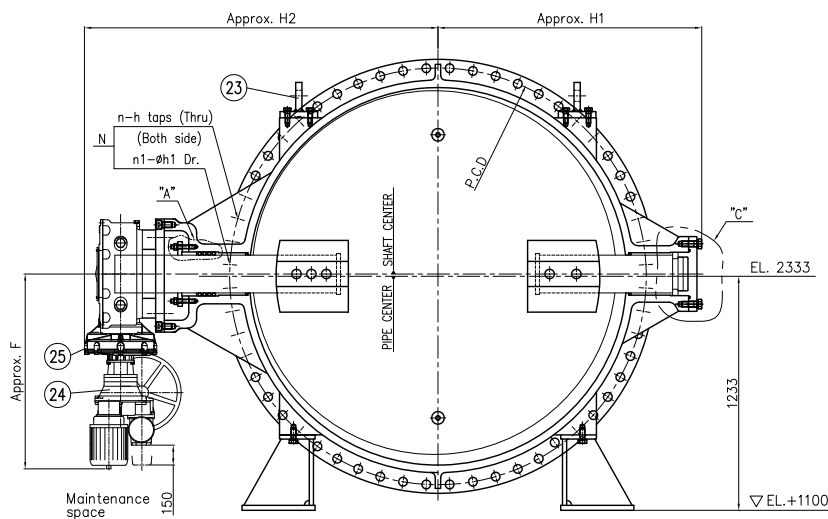
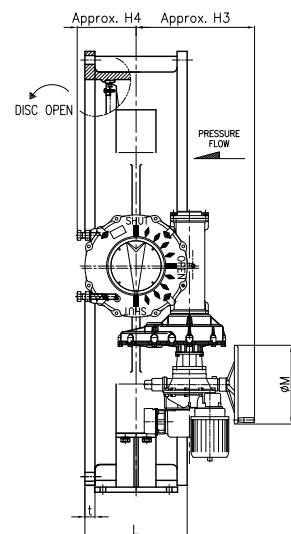
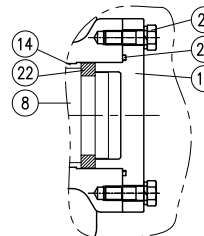
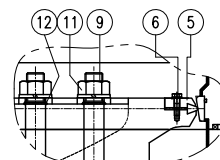
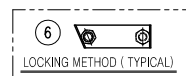
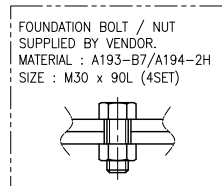
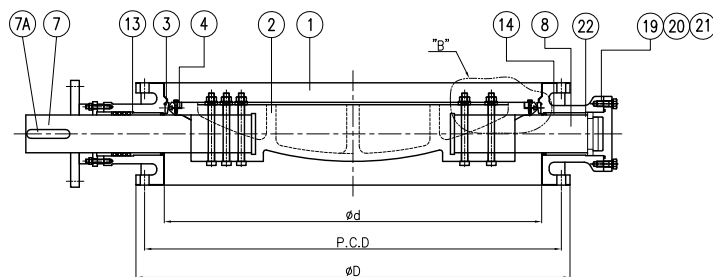
DOCUMENT SUBMISSION STATUS:

NOTE:

	05.Aug.2014	FOR APPROVAL	S.T.WOO	S.K.LEE	S.K.JUNG	
	23.Aug.2014	FOR APPROVAL	S.T.WOO	S.K.LEE	S.K.JUNG	
	27.Jan.2014	FOR APPROVAL	S.T.WOO	S.K.LEE	S.K.JUNG	
REV	DATE	DESCRIPTION	PREP	CHKD	APRD	APRD
OWNER			OWNER'S CONSULTANT			
 VIETNAM OIL AND GAS GROUP (VNG)			 FICHTNER GmbH & Co. FICHTNER			
EPC CONTRACTOR			EPC CONTRACTOR'S CONSULTANT			
 PETROVIETNAM CONSTRUCTION JOINT STOCK CORPORATION (PJC) POWER ISLAND PACKAGE SUPPLIER			 WorleyParsons WORLDWYNSONS			
 sojitz SOJITZ CORPORATION			 DAELIM DAEILIM INDUSTRIAL CO., LTD.			

PROJECT TITLE		THAI BINH2 THERMAL POWER PLANT 2 x 600MW	
DRAWING TITLE		MOTOR OPERATED RUBBER SEAT BUTTERFLY VALVE FLANGE DN1950	
VENDOR NAME		DUKWON	
FUNCTION		NAME	
CHKD		S.T. WOO	
APPD		S.K. LEE	
APPD		S.K. JUNG	
JOB NO.		110180	
SCALE		1/1	
REVNO.		1	

TAG NO.	ORIENTATION POSITION
11PAB51AA201/21PAB51AA201/11PAB53AA201/21PAB53AA201	M7



1. BASIC DESIGN ; AWWA C504
2. FLANGE DRILLING ; AWWA C207 CLASS-D / FF
3. FACE TO FACE DIMENSION ; MAKER STANDARD
4. DESIGN PRESSURE ; 6 barG & FV
5. DESIGN TEMP. ; 50°C
6. ACTUATOR
 - MODEL / MAKER ; DIM1000 / DREHMO
 - POWER SUPPLY : 400VAC, 50Hz, 3PH
 - OPERATING TIME : ≤60 Sec.

- MODEL / MAKER ; TMG / TM-W8SDM
- GEAR RATIO : 324.1 : 1

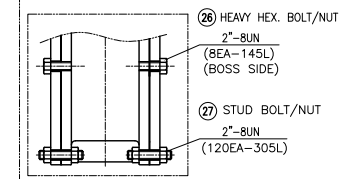
8. INSPECTION & TEST : MSS SP-61
- BODY : 9.0 barG
- SEAT : 6.6 barG
9. LEAKAGE CLASS : ANSI CLASS IV
10. TOTAL WEIGHT : APPROX. 6430 Kg

RUBBER LINNING MATERIAL : N/R
RUBBER LINNING THICKNESS : 3mm
RUBBER LINNING HARDNESS
- 95±5 SHORE A

Doellm Industrial Co., Ltd.	
Job No.	110180
	A - APPROVED
	B - APPROVED WITH COMMENTS
	C - RETURNED FOR CORRECTION
	D - REJECTED
	N - NOT APPLICABLE (REFERENCE ONLY)
SIGNED BY :	DATE :

DIC'S PERMISSION TO PROCEED OR REVIEW TAKEN ON VENDOR PRINTS SHALL NOT RELIEVE VENDOR FROM ITS RESPONSIBILITY OR LIABILITIES UNDER THE PURCHASE ORDER.

FLANGE BOLT/NUT MATERIAL : A193-B7/A194-2H
SUPPLIED BY VENDOR.



DOCUMENT SUBMISSION STATUS:
NOTE:

[illegible]

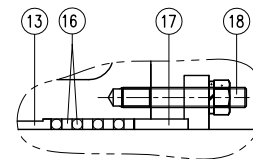
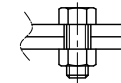
OWNER		OWNER'S CONSULTANT	
	VIETNAM OIL AND GAS GROUP (VNG)		FV POWER PCC
EPC CONTRACTOR		EPC CONTRACTOR'S CONSULTANT	
	PETROVIETNAM CONSTRUCTION JOINT STOCK CORPORATION (PVC)		WORLEYPARSONS
POWER ISLAND PACKAGE SUPPLIER			
	SOLTIZ CORPORATION		
			
			DAELIM INDUSTRIAL CO., LTD.

PROJECT TITLE		THAI BINH2 THERMAL POWER PLANT 2 x 600MW									
DRAWING TITLE											
MOTOR OPERATED RUBBER SEAT BUTTERFLY VALVE FLANGE DN1950											
VENDOR NAME				FUNCTION		NAME		SIGN		DATE	
DUKWON VALVES 두쿠원밸브				DRWN		S.T. MOO				27-Jan-2014	
				CHD		S.K. LEE				27-Jan-2014	
				APPD		-		-		-	
				APPD		S.K. JUNG				27-Jan-2014	
DRAWING NO.				JOB NO.				SCALE		REVNO.	
KSC-ISO-9001:2009 / KMS-QMS-9001:2008				11010801							

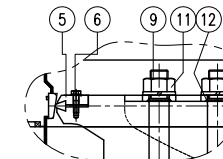
D I M E N S I O N S [Unit:mm]															Q'TY (EA)	FLUID
NOMINAL DIAMETER	ød	F L A N G E						L	R E F E R E N C E							
		øD	PCD	N	n1-øh1 Dr.	n-h taps	t		H1	H2	H3	H4	F	øM		
DN1950 (78")	1950	2362	2260.6	64	60-ø54	4-2" 8UN	70	550	1390	2050	750	375	1240	500	8	RIVER(Brackish) WATE

TAG NO.	ORIENTATION POSITION
11PAB70AA251/21PAB70AA251/11PAB71AA251/21PAB71AA251 11PAB72AA251/21PAB72AA251/11PAB73AA251/21PAB73AA251	M1

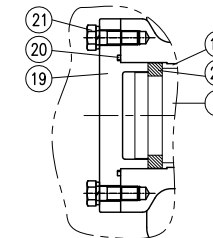
FOUNDATION BOLT / NUT
SUPPLIED BY VENDOR.
MATERIAL : A193-B7/A194-2H
SIZE : M30 x 90L (4SET)



DETAIL OF "A"



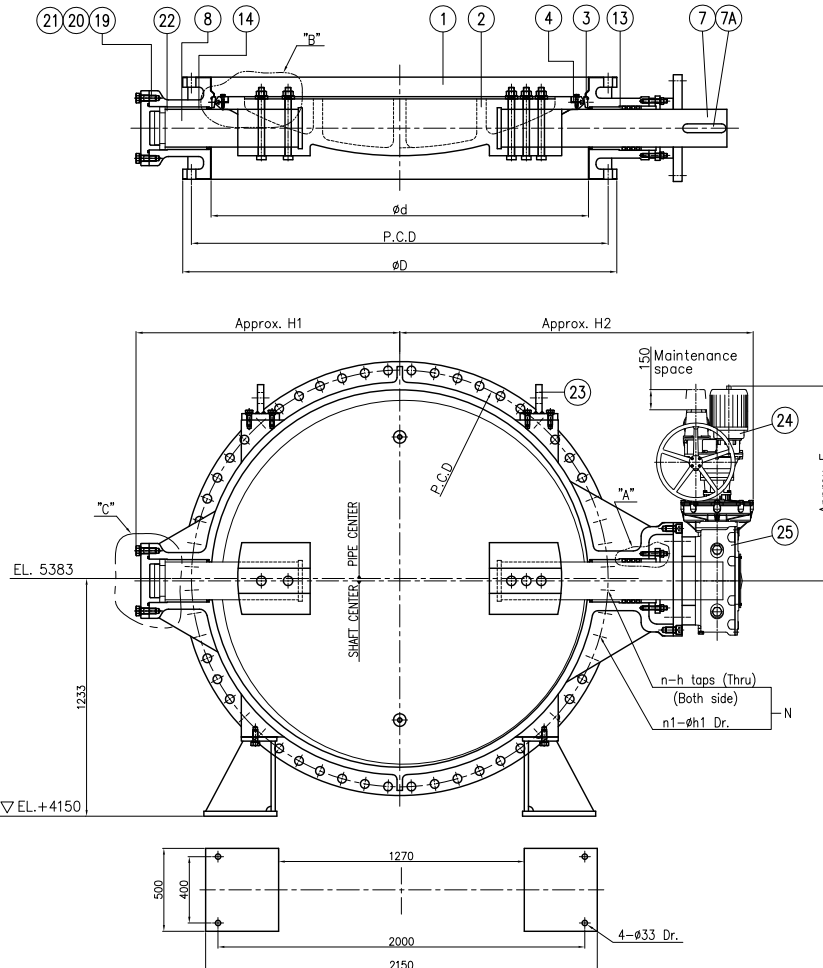
DETAIL OF "B"



DETAIL OF "C"

RUBBER LINING MATERIAL : N/R
RUBBER LINING THICKNESS : 3mm
RUBBER LINING HARDNESS
- 95±5 SHORE A

7. GEAR BOX
- MODEL / MAKER : TMG / TM-W8SDM
- GEAR RATIO : 324.1 : 1
8. INSPECTION & TEST : MSS SP-61
- BODY : 9.0 barG
- SEAT : 6.6 barG
9. LEAKAGE CLASS : ANSI CLASS IV
10. TOTAL WEIGHT : APPROX. 6430 Kg



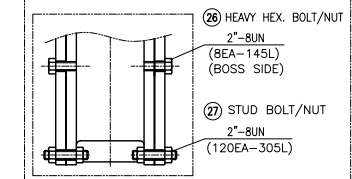
NOTE

- BASIC DESIGN ; AWWA C504
- FLANGE DRILLING ; AWWA C207 CLASS-D / FF
- FACE TO FACE DIMENSION ; MAKER STANDARD
- DESIGN PRESSURE ; 6 barG & FV

- DESIGN TEMP. ; 50°C
- ACTUATOR
- MODEL / MAKER : DIM1000 / DREHMO
- POWER SUPPLY : 400VAC, 50Hz, 3PH
- OPERATING TIME : ≤60 Sec.

NO.	PART NAME	MAT'L	Q'TY	REMARKS
1	BODY(RUBBER LINING)	A536 Gr.65-45-12	1	DUCTILE
2	DISC	A351-CF8M	1	
3	BODY SEAT	A240-316	1	
4	DISC SEAT	BUNA-N	1	
5	DISC GLAND	A240-T316	1	
6	HEX.BOLT/WASHER	A193-B8M	52SET	
7	MAIN STEM	A276-T316	1	
7A	KEY	A576-1045	1	
8	STUB STEM	A276-T316	1	
9	LOCK PIN	A276-T316	5	
11	HEX.NUT	A194-Gr.8	5	
12	O-RING	NBR	5	
13	MAIN BUSH	OILLESS B/R	1	
14	STUB BUSH	OILLESS B/R	1	
16	PACKING	B584-C86300 +NBR	1SET	
17	PACKING GLAND	A283-C+B62	1SET	
18	STUD BOLT/NUT/PW	A193-B7	4SET	
19	END COVER	A536 Gr.65-45-12	1	
20	O-RING	NBR	1	
21	HEX.BOLT / S.W	A193-B7	8SET	
22	COLLAR	B584-C86300	1	
23	LIFTING LUG	A283-C	2	
24	ELEC. ACUTAOIR	ASS'Y	1SET	SEE NOTE. 6
25	GEAR BOX	ASS'Y	1SET	SEE NOTE. 6

FLANGE BOLT/NUT MATERIAL : A193-B7/A194-2H
SUPPLIED BY VENDOR.



DOCUMENT SUBMISSION STATUS:

NOTE:

REV	DATE	DESCRIPTION	PREP	CHKD	APRD	APRD
1	05.Aug.2014	FOR APPROVAL	ST.WOO	SK.LEE	SK.JUNG	
2	23.Aug.2014	FOR APPROVAL	ST.WOO	SK.LEE	SK.JUNG	
3	27.Jan.2014	FOR APPROVAL	ST.WOO	SK.LEE	SK.JUNG	

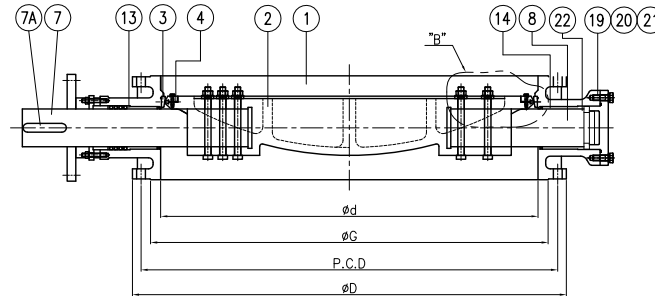
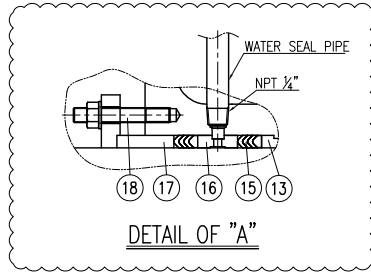
OWNER	Vietnam Oil and Gas Group (VNG)	OWNER'S CONSULTANT	FIGHTNER	OWNER'S CONSULTANT	PV POWER PCC
EPC CONTRACTOR	PETROVIETNAM CONSTRUCTION JOINT STOCK CORPORATION (PCC)	EPC CONTRACTOR'S CONSULTANT	WorleyParsons		
POWER ISLAND PACKAGE SUPPLIER	SOJITZ CORPORATION				

PROJECT TITLE	THAI BINH2 THERMAL POWER PLANT 2 x 600MW				
DRAWING TITLE	MOTOR OPERATED RUBBER SEAT BUTTERFLY VALVE FLANGE DN1950				
VENDOR NAME	DUKWON				
FUNCTION	DRWN	S.T. WOO	NAME	SIGN	DATE
CHKD	S.K. LEE				27-Jan-2014
APPR	S.K. JUNG				27-Jan-2014
DRAWING NO.	TB2-SDC.VP406-00100-I-11-DSU-0001-7				
JOB NO.	110180				
SCALE	1/1				
REVNO.	1				

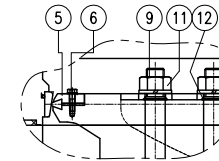
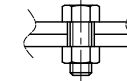
Job No.	110180
A - APPROVED	
B - APPROVED WITH COMMENTS	
C - RETURNED FOR CORRECTION	
D - REJECTED	
N - NOT APPLICABLE (REFERENCE ONLY)	
SIGNED BY :	DATE :
DUC'S PERMISSION TO PROCEED OR REVIEW TAKEN ON VENDOR PRINTS SHALL NOT RELIEVE VENDOR FROM ITS RESPONSIBILITIES OR LIABILITIES UNDER THE PURCHASE ORDER.	

D I M E N S I O N S																[Unit:mm]	Q'TY (EA)	FLUID
NOMINAL DIAMETER	ød	F L A N G E								L	R E F E R E N C E							
		øD	PCD	øG	f	N	n1-h1 Dr.	n-h taps	t		H1	H2	H3	H4	F	øM		
DN2100 (84")	2100	2533.6	2425.7	2270	5	64	60-ø54	4-2" 8UN	73	550	1450	2110	750	375	1240	400	4	UNSATURATED STEM

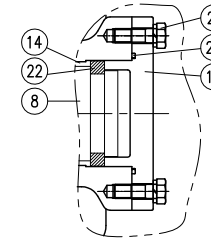
TAG NO.	ORIENTATION POSITION
11LBD15AA201/21LBD15AA201	M5



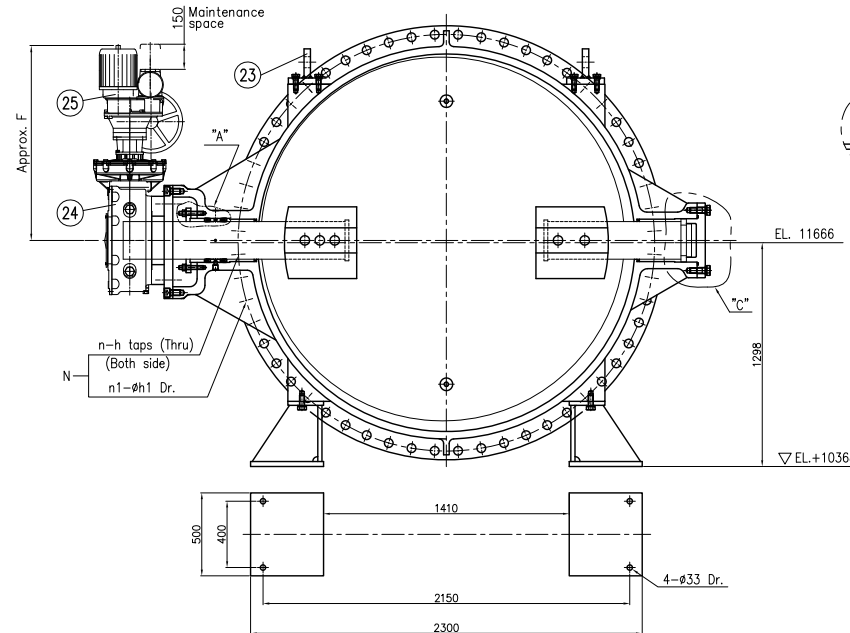
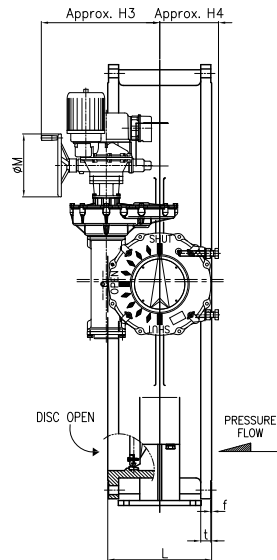
FOUNDATION BOLT / NUT
SUPPLIED BY VENDOR.
MATERIAL : A193-B7/A194-2H
SIZE : M30 x 90L (4SET)



DETAIL OF "B"

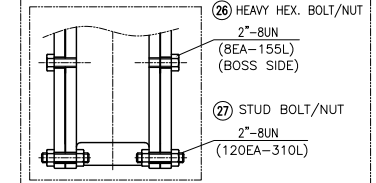


DETAIL OF "C"



NO.	PART NAME	MAT'L	Q'TY	REMARKS
1	BODY	A216-WCB	1	
2	DISC	A217-CA15	1	
3	BODY SEAT	A240-304	1	
4	DISC SEAT	VITON	1	DAI-EL G-901 (B&S04 formulation)
5	DISC GLAND	A240-T304	1	
6	HEX.BOLT / WASHER	A193-B8M	52SET	
7	MAIN STEM	A276-T304	1	
7A	KEY	A576-1045	1	
8	STUB STEM	A276-T304	1	
9	LOCK PIN	A276-T304	5	
11	HEX.NUT	A194-Gr.8	5	
12	O-RING	VITON	5	
13	MAIN BUSH	OILLESS B/R	1	
14	STUB BUSH	OILLESS B/R	1	
15	V-PACKING	P.T.F.E	1SET	
16	LANTERN RING	CAC304	1	
17	PACKING GLAND	A283-C+B62	1SET	
18	STUD BOLT/NUT/PW	A193-B7	4SET	
19	END COVER	A216-WCB	1	
20	O-RING	NBR	1	
21	HEX.BOLT / S.W	A193-B7	8SET	
22	COLLAR	B584-C86300	1	
23	LIFTING LUG	A283-C	2	
24	ELEC. ACUTAOTR	ASS'Y	1SET	SEE NOTE. 6
25	GEAR BOX	ASS'Y	1SET	SEE NOTE. 7

FLANGE BOLT/NUT MATERIAL : A193-B7/A194-2H
SUPPLIED BY VENDOR.



DOCUMENT SUBMISSION STATUS:

REV	DATE	DESCRIPTION	PREP	CHKD	APRD	APRD
1	05.Aug.2014	FOR APPROVAL	S.T.WOO	S.K.LEE		S.K.JANG
2	23.Aug.2014	FOR APPROVAL	S.T.WOO	S.K.LEE		S.K.JANG
3	27.Jan.2014	FOR APPROVAL	S.T.WOO	S.K.LEE		S.K.JANG

OWNER	Vietnam Oil and Gas Group (VNG)	OWNER'S CONSULTANT	FIGHTNER	PV POWER PCC
EPC CONTRACTOR	PETROVIETNAM CONSTRUCTION JOINT STOCK CORPORATION (PCC)	EPC CONTRACTOR'S CONSULTANT	WorleyParsons	WorleyParsons
POWER ISLAND PACKAGE SUPPLIER	SOJITZ CORPORATION			

PROJECT TITLE	THAI BINH2 THERMAL POWER PLANT 2 x 600MW			
DRAWING TITLE	MOTOR OPERATED RUBBER SEAT BUTTERFLY VALVE FLANGE DN2100			
VENDOR NAME	DUKWON	FUNCTION	NAME	SIGN
		CHKD	S.T.WOO	27-Jan-2014
		APPD	S.K.LEE	27-Jan-2014
		APPD	S.K.JANG	27-Jan-2014
DRAWING NO.	TB2-SOC.VP406-00100-I-I1-DSU-0001-8	JOB NO.	110180	SCALE
				1/1
				REV. NO.
				1

NOTE

1. BASIC DESIGN ; AWWA C504
2. FLANGE DRILLING ; AWWA C207 CLASS-D / RF - RF DIMENSION ; MAKER STANDARD
3. FACE TO FACE DIMENSION ; MAKER STANDARD
4. DESIGN PRESSURE ; 3.5 barG & FV
5. DESIGN TEMP. ; 150°C

6. ACTUATOR

- MODEL / MAKER ; DIM500 / DREHMO
- POWER SUPPLY : 400VAC, 50Hz, 3PH
- OPERATING TIME : ≤ 60 Sec.

7. GEAR BOX

- MODEL / MAKER ; TMG / TM-W8SDM
- GEAR RATIO : 473.9 : 1

8. INSPECTION & TEST : MSS SP-61

- BODY : 5.5 bar
- SEAT : 4.0 bar

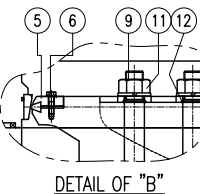
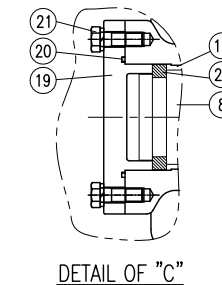
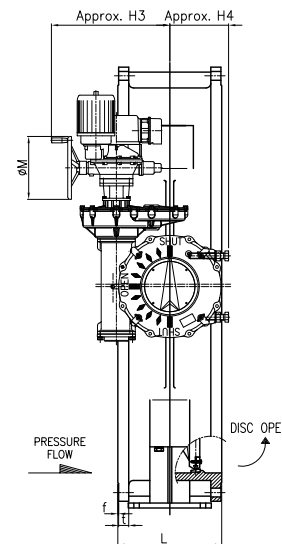
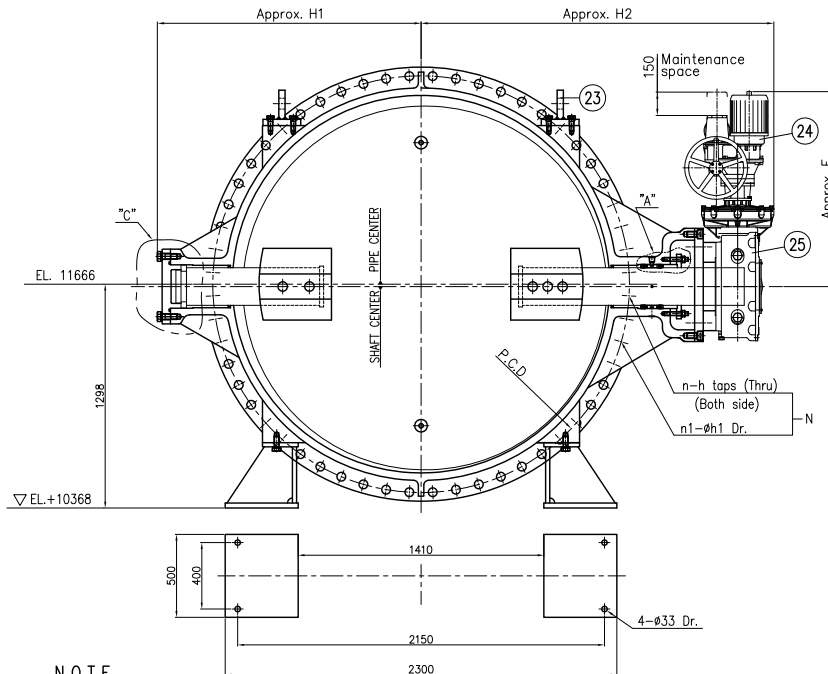
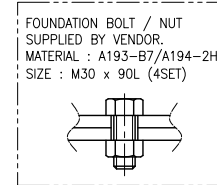
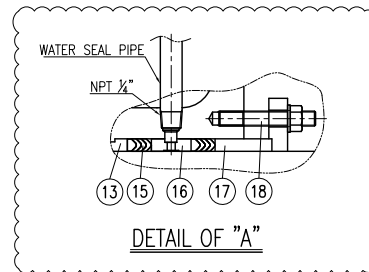
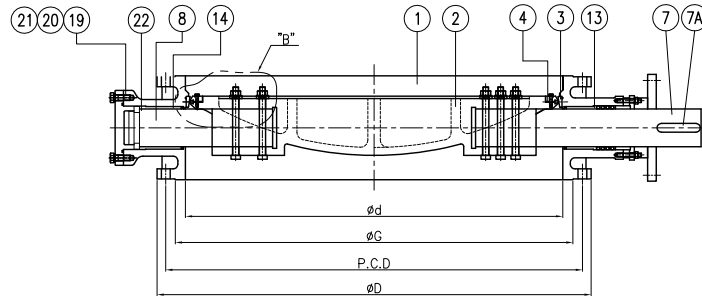
9. LEAKAGE CLASS : ANSI CLASS IV

- 10. TOTAL WEIGHT : APPROX. 7440 Kg

Job No.	110180
A - APPROVED	
B - APPROVED WITH COMMENTS	
C - RETURNED FOR CORRECTION	
D - REJECTED	
N - NOT APPLICABLE (REFERENCE ONLY)	
SIGNED BY :	DATE :
DUC'S PERMISSION TO PROCEED OR REVIEW TAKEN ON VENDOR PRINTS SHALL NOT RELIEVE VENDOR FROM ITS RESPONSIBILITIES OR LIABILITIES UNDER THE PURCHASE ORDER.	

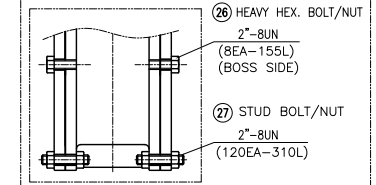
D I M E N S I O N S																[Unit:mm]	Q'TY (EA)	FLUID
NOMINAL DIAMETER	ød	F L A N G E								L	R E F E R E N C E							
		øD	PCD	øG	f	N	n1-øh1 Dr.	n-h taps	t		H1	H2	H3	H4	F	øM		
DN2100 (84")	2100	2533.6	2425.7	2270	5	64	60-ø54	4-2" 8UN	73	550	1450	2110	750	375	1240	400	4	UNSATURATED STEM

TAG NO.	ORIENTATION POSITION
11LBD15AA202/21LBD15AA202	M1



NO.	PART NAME	MAT'L	Q'TY	REMARKS
1	BODY	A216-WCB	1	
2	DISC	A217-CA15	1	
3	BODY SEAT	A240-304	1	
4	DISC SEAT	VITON	1	
5	DISC GLAND	A240-T304	1	
6	HEX.BOLT / WASHER	A193-B8M	52SET	
7	MAIN STEM	A276-T304	1	
7A	KEY	A576-1045	1	
8	STUB STEM	A276-T304	1	
9	LOCK PIN	A276-T304	5	
11	HEX.NUT	A194-Gr.8	5	
12	O-RING	VITON	5	
13	MAIN BUSH	OILLESS B/R	1	
14	STUB BUSH	OILLESS B/R	1	
15	V-PACKING	P.T.F.E	1SET	
16	LANTERN RING	CAC304	1	
17	PACKING GLAND	A283-C+B62	1SET	
18	STUD BOLT/NUT/PW	A193-B7	4SET	
19	END COVER	A216-WCB	1	
20	O-RING	NBR	1	
21	HEX.BOLT / S.W	A193-B7	8SET	
22	COLLAR	B584-C86300	1	
23	LIFTING LUG	A283-C	2	
24	ELEC. ACUTAOTR	ASS'Y	1SET	SEE NOTE. 6
25	GEAR BOX	ASS'Y	1SET	SEE NOTE. 7

FLANGE BOLT/NUT MATERIAL : A193-B7/A194-2H
SUPPLIED BY VENDOR.



DOCUMENT SUBMISSION STATUS:

REV	DATE	DESCRIPTION	PREP	CHKD	APRD	APRD
1	05.Aug.2014	FOR APPROVAL	S.T.WOO	S.K.LEE		S.K.JUNG
2	23.Apr.2014	FOR APPROVAL	S.T.WOO	S.K.LEE		S.K.JUNG
3	27.Jan.2014	FOR APPROVAL	S.T.WOO	S.K.LEE		S.K.JUNG

OWNER	Vietnam Oil and Gas Group (VNG)	OWNER'S CONSULTANT	FIGHTNER	OWNER'S CONSULTANT	FIGHTNER	PV POWER PCC
EPC CONTRACTOR	PETROVIETNAM CONSTRUCTION JOINT STOCK COMPANY (PCC)	EPC CONTRACTOR'S CONSULTANT	WorleyParsons	EPC CONTRACTOR'S CONSULTANT	WorleyParsons	WorleyParsons
POWER ISLAND PACKAGE SUPPLIER	SOJITZ CORPORATION	POWER ISLAND PACKAGE SUPPLIER	SOJITZ CORPORATION	POWER ISLAND PACKAGE SUPPLIER	SOJITZ CORPORATION	SOJITZ CORPORATION

PROJECT TITLE	THAI BINH2 THERMAL POWER PLANT 2 x 600MW
DRAWING TITLE	MOTOR OPERATED RUBBER SEAT BUTTERFLY VALVE FLANGE DN2100
VENDOR NAME	DUKWON
FUNCTION	DRIN
NAME	S.T. WOO
DATE	27-Jan-2014
CHKD	S.K. LEE
DATE	27-Jan-2014
APPD	S.K. JUNG
DATE	27-Jan-2014
SCALE	1/1
REVNO.	1

NOTE

- BASIC DESIGN ; AWWA C504
- FLANGE DRILLING ; AWWA C207 CLASS-D / RF
- RF DIMENSION ; MAKER STANDARD
- FACE TO FACE DIMENSION ; MAKER STANDARD
- DESIGN PRESSURE ; 3.5 barG & FV
- DESIGN TEMP. ; 150°C
- ACTUATOR
- MODEL / MAKER ; DIM500 / DREHMO
- POWER SUPPLY : 400VAC, 50Hz, 3PH
- OPERATING TIME : ≤ 60 Sec.
- GEAR BOX
- MODEL / MAKER ; TMG / TM-W8SDM
- GEAR RATIO : 473.9 : 1
- INSPECTION & TEST : MSS SP-61
- BODY : 5.5 bar
- SEAT : 4.0 bar
- LEAKAGE CLASS : ANSI CLASS IV
- TOTAL WEIGHT : APPROX. 7440 Kg

- GEAR BOX
- MODEL / MAKER ; TMG / TM-W8SDM
- GEAR RATIO : 473.9 : 1
- INSPECTION & TEST : MSS SP-61
- BODY : 5.5 bar
- SEAT : 4.0 bar
- LEAKAGE CLASS : ANSI CLASS IV
- TOTAL WEIGHT : APPROX. 7440 Kg

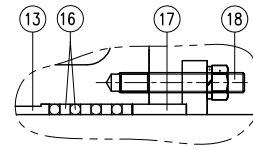
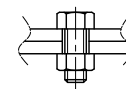
Job No.	110180
A - APPROVED	
B - APPROVED WITH COMMENTS	
C - RETURNED FOR CORRECTION	
D - REJECTED	
N - NOT APPLICABLE (REFERENCE ONLY)	
SIGNED BY :	DATE :
DUC'S PERMISSION TO PROCEED OR REVIEW TAKEN ON VENDOR PRINTS SHALL NOT RELIEVE VENDOR FROM ITS RESPONSIBILITIES OR LIABILITIES UNDER THE PURCHASE ORDER.	

DRIVING NO.	TB2-SDC.VP406-00100-I-11-DSU-0001-9
JOB NO.	110180
SCALE	1/1
REVNO.	1

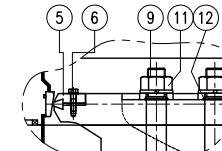
D I M E N S I O N S														[Unit:mm]	Q'TY (EA)	FLUID
NOMINAL DIAMETER	ød	F L A N G E						L	R E F E R E N C E							
		øD	PCD	N	n1-øh1 Dr.	n-h taps	t		H1	H2	H3	H4	F	øM		
DN2700 (108")	2700	3219.5	3067	72	68-ø68	4-2 ½" 8UN	85.7	750	1800	2580	965	560	1380	500	4	RIVER(Brackish) WATER

TAG NO.	ORIENTATION POSITION
18PAB10AA251/28PAB10AA251	M1

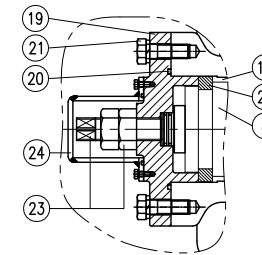
FOUNDATION BOLT / NUT
SUPPLIED BY VENDOR.
MATERIAL : A193-B7/A194-2H
SIZE : M36 x 110L (4SET)



DETAIL OF "A"



DETAIL OF "B"



DETAIL OF "C"

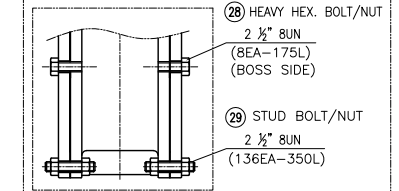
RUBBER LINING MATERIAL : N/R
RUBBER LINING THICKNESS : 3mm
RUBBER LINING HARDNESS
- 95 $\pm$ 5 SHORE A

- GEA BOX
- MODEL / MAKER : TMG / TM-W10SDM
- GEAR RATIO : 589.5 : 1
- INSPECTION & TEST : MSS SP-61
- BODY : 9.0 barG
- SEAT : 6.6 barG
- LEAKAGE CLASS : ANSI CLASS IV
- TOTAL WEIGHT : APPROX. 14320 Kg

Dualim Industrial Co., Ltd.	
Job No.	110180
A - APPROVED	
B - APPROVED WITH COMMENTS	
C - RETURNED FOR CORRECTION	
D - REJECTED	
N - NOT APPLICABLE (REFERENCE ONLY)	
SIGNED BY :	DATE :
D/C'S PERMISSION TO PROCEED OR REVIEW TAKEN ON VENDOR PRINTS SHALL NOT RELIEVE VENDOR FROM ITS RESPONSIBILITIES OR LIABILITIES UNDER THE PURCHASE ORDER.	

NO.	PART NAME	MAT'L	Q'TY	REMARKS
1	BODY(RUBBER LINING)	A536 Gr.65-45-12	1	DUCTILE
2	DISC	A351-CF8M	1	
3	BODY SEAT	A240-316	1	
4	DISC SEAT	BUNA-N	1	
5	DISC GLAND	A240-T316	1	
6	HEX.BOLT/WASHER	A193-B8M	56SET	
7	MAIN STEM	A276-T316	1	
7A	KEY	A576-1045	1	
8	STUB STEM	A276-T316	1	
9	LOCK PIN	A276-T316	5	
11	HEX.NUT	A194-Gr.8M	5	
12	O-RING	NBR	5	
13	MAIN BUSH	OILLESS B/R	1	
14	STUB BUSH	OILLESS B/R	1	
16	PACKING	B584-C86300 +NBR	1SET	
17	PACKING GLAND	A283-C+B62	1SET	
18	STUD BOLT/NUT/PW	A193-B7	65SET	
19	END COVER	A536 Gr.65-45-12	1	
20	O-RING	NBR	1	
21	HEX.BOLT / S.W	A193-B7	8SET	
22	COLLAR	B584-C86300	1	
23	CONTROL SHAFT/NUT	STS304	1SET	
24	CONTROL SHAFT COVER	A283-C	1	
25	LIFTING LUG	A283-C	2	
26	ELEC. ACUTAOIR	ASS'Y	1SET	SEE NOTE. 6
27	GEAR BOX	ASS'Y	1SET	SEE NOTE. 7

FLANGE BOLT/NUT MATERIAL : A193-B7/A194-2H
SUPPLIED BY VENDOR.



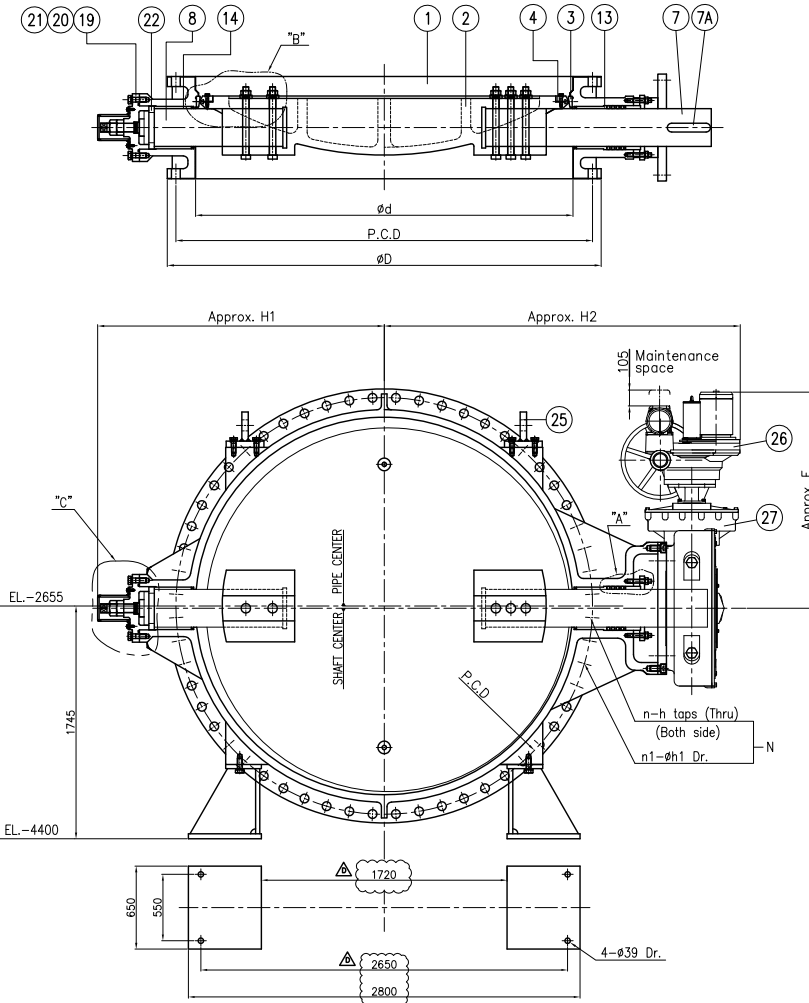
DOCUMENT SUBMISSION STATUS:

NOTE:

REV	DATE	DESCRIPTION	PREP	CHKD	APRD	APRD
1	26.Sep.2014	FOR APPROVAL	ST.WOO	SK.LEE		SK.JUNG
2	05.Aug.2014	FOR APPROVAL	ST.WOO	SK.LEE		SK.JUNG
3	23.Apr.2014	FOR APPROVAL	ST.WOO	SK.LEE		SK.JUNG
4	27.Jan.2014	FOR APPROVAL	ST.WOO	SK.LEE		SK.JUNG

OWNER	Vietnam Oil and Gas Group (PJV)	OWNER'S CONSULTANT	FIGHTNER GmbH & Co. KG	PV POWER PCC
EPC CONTRACTOR	PETROVIETNAM CONSTRUCTION JOINT STOCK CORPORATION (PCC)	EPC CONTRACTOR'S CONSULTANT	WorleyParsons	WorleyParsons
POWER ISLAND PACKAGE SUPPLIER	sojitz SOJITZ CORPORATION			

PROJECT TITLE		THAI BINH2 THERMAL POWER PLANT 2 x 600MW	
DRAWING TITLE		MOTOR OPERATED RUBBER SEAT BUTTERFLY VALVE FLANGE DN2700	
VENDOR NAME		DUKWON	
FUNCTION		NAME	
CHKD		S.K. LEE	
APRD		-	
APRD		S.K. JUNG	
SCALE		1/1	
REVNO.		110180	
JOB NO.		110180	
FILE NAME		110180-44-409-001-001	



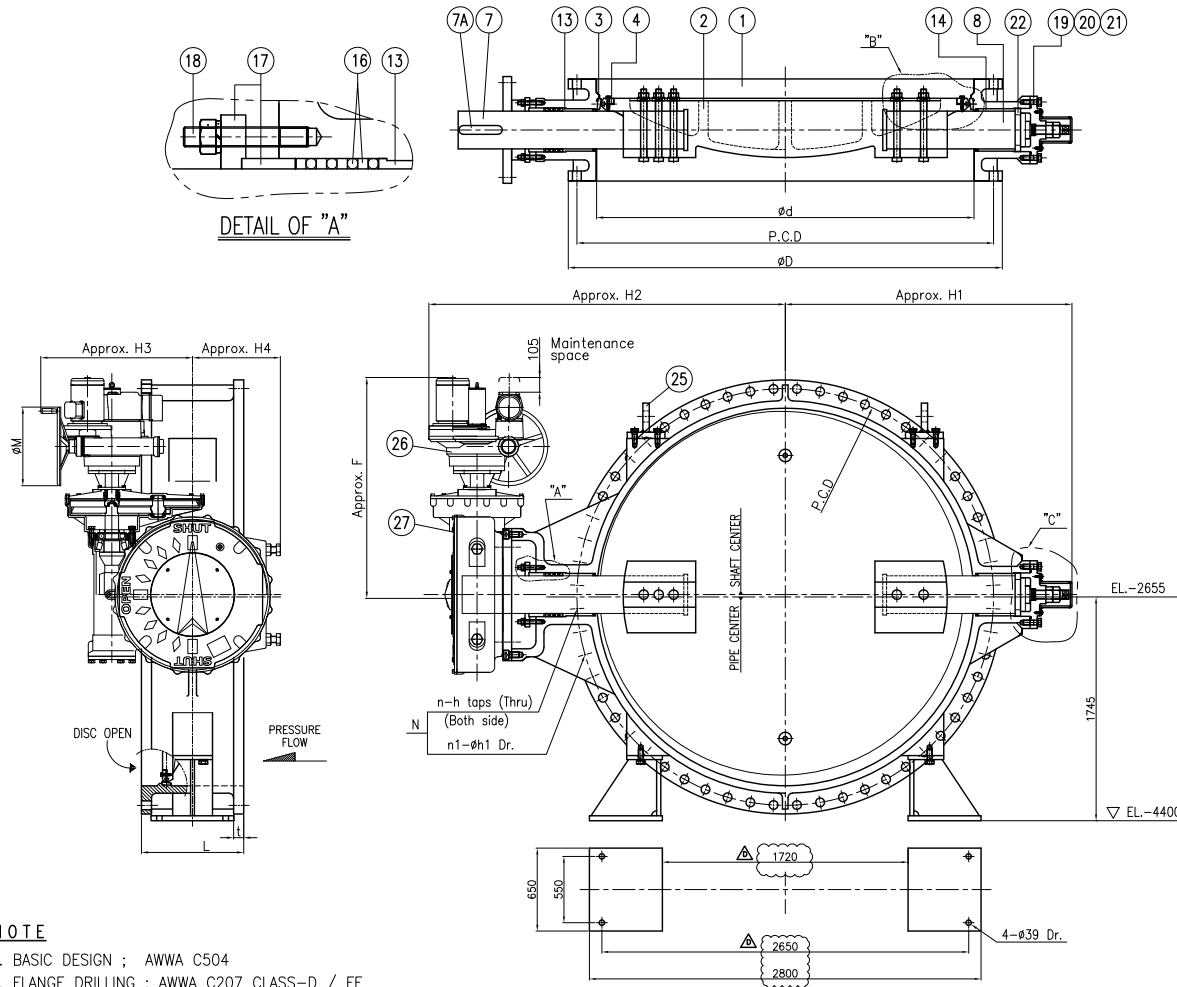
NOTE

- BASIC DESIGN ; AWWA C504
- FLANGE DRILLING ; AWWA C207 CLASS-D / FF
- FACE TO FACE DIMENSION ; MAKER STANDARD
- DESIGN PRESSURE ; 6 barG & FV

- DESIGN TEMP. ; 50°C
- ACTUATOR
- MODEL / MAKER : DIM2000 / DREHMO
- POWER SUPPLY : 400VAC, 50Hz, 3PH
- OPERATING TIME : $\leq$ 60 Sec.

D I M E N S I O N S															[Unit:mm]	Q'TY (EA)	FLUID
NOMINAL DIAMETER	ød	F L A N G E						L	R E F E R E N C E								
		øD	PCD	N	n1-øh1 Dr.	n-h taps	t			H1	H2	H3	H4	F	øM		
DN2700 (108")	2700	3219.5	3067	72	68-ø68	4-2 ½" 8UN	85.7	750	1800	2580	965	560	1380	500	4	RIVER(Brackish) WATER	

TAG NO.	ORIENTATION POSITION
18PAB11AA251/28PAB11AA251	M5



NOTE

- BASIC DESIGN ; AWWA C504
- FLANGE DRILLING ; AWWA C207 CLASS-D / FF
- FACE TO FACE DIMENSION ; MAKER STANDARD
- DESIGN PRESSURE ; 6 barG & FV
- DESIGN TEMP. ; 50°C
- ACTUATOR
 - MODEL / MAKER ; DIM2000 / DREHMO
 - POWER SUPPLY ; 400VAC, 50Hz, 3PH
 - OPERATING TIME ; ≤ 60 Sec.

7. GEAR BOX

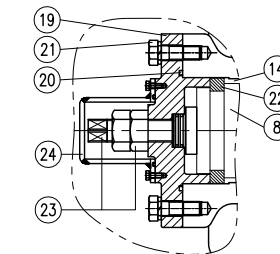
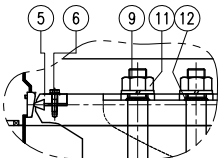
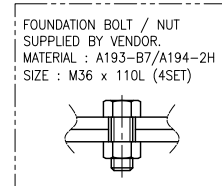
- MODEL / MAKER ; TMG / TM-W10SDM
- GEAR RATIO ; 589.5 : 1

8. INSPECTION & TEST : MSS SP-61

- BODY : 9.0 barG
- SEAT : 6.6 barG

9. LEAKAGE CLASS : ANSI CLASS IV

10. TOTAL WEIGHT : APPROX. 14320 Kg



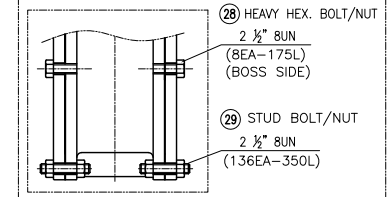
DETAIL OF "C"

RUBBER LINING MATERIAL : N/R
RUBBER LINING THICKNESS : 3mm
RUBBER LINING HARDNESS : 95±5 SHORE A

Job No.	110180
DATE	27-Jan-2014
DESIGNED BY	DATE
CHECKED BY	DATE
APPROVED BY	DATE
SCALE	1/1
REVISION	

NO.	PART NAME	MAT'L	Q'TY	REMARKS
1	BODY(RUBBER LINING)	A536 Gr.65-45-12	1	DUCTILE
2	DISC	A351-CF8M	1	
3	BODY SEAT	A240-316	1	
4	DISC SEAT	BUNA-N	1	
5	DISC GLAND	A240-T316	1	
6	HEX.BOLT/WASHER	A193-B8M	56SET	
7	MAIN STEM	A276-T316	1	
7A	KEY	A576-1045	1	
8	STUB STEM	A276-T316	1	
9	LOCK PIN	A276-T316	5	
11	HEX.NUT	A194-Gr.8M	5	
12	O-RING	NBR	5	
13	MAIN BUSH	OILLESS B/R	1	
14	STUB BUSH	OILLESS B/R	1	
16	PACKING	B584-C86300 1NBR	1SET	
17	PACKING GLAND	A283-C+B62	1SET	
18	STUD BOLT/NUT/PW	A193-B7	6SET	
19	END COVER	A536 Gr.65-45-12	1	
20	O-RING	NBR	1	
21	HEX.BOLT / S.W	A193-B7	8SET	
22	COLLAR	B584-C86300	1	
23	CONTROL SHAFT/NUT	STS304	1SET	
24	CONTROL SHAFT COVER	A283-C	1	
25	LIFTING LUG	A283-C	2	
26	ELEC. ACUATOR	ASS'Y	1SET	SEE NOTE. 6
27	GEAR BOX	ASS'Y	1SET	SEE NOTE. 7

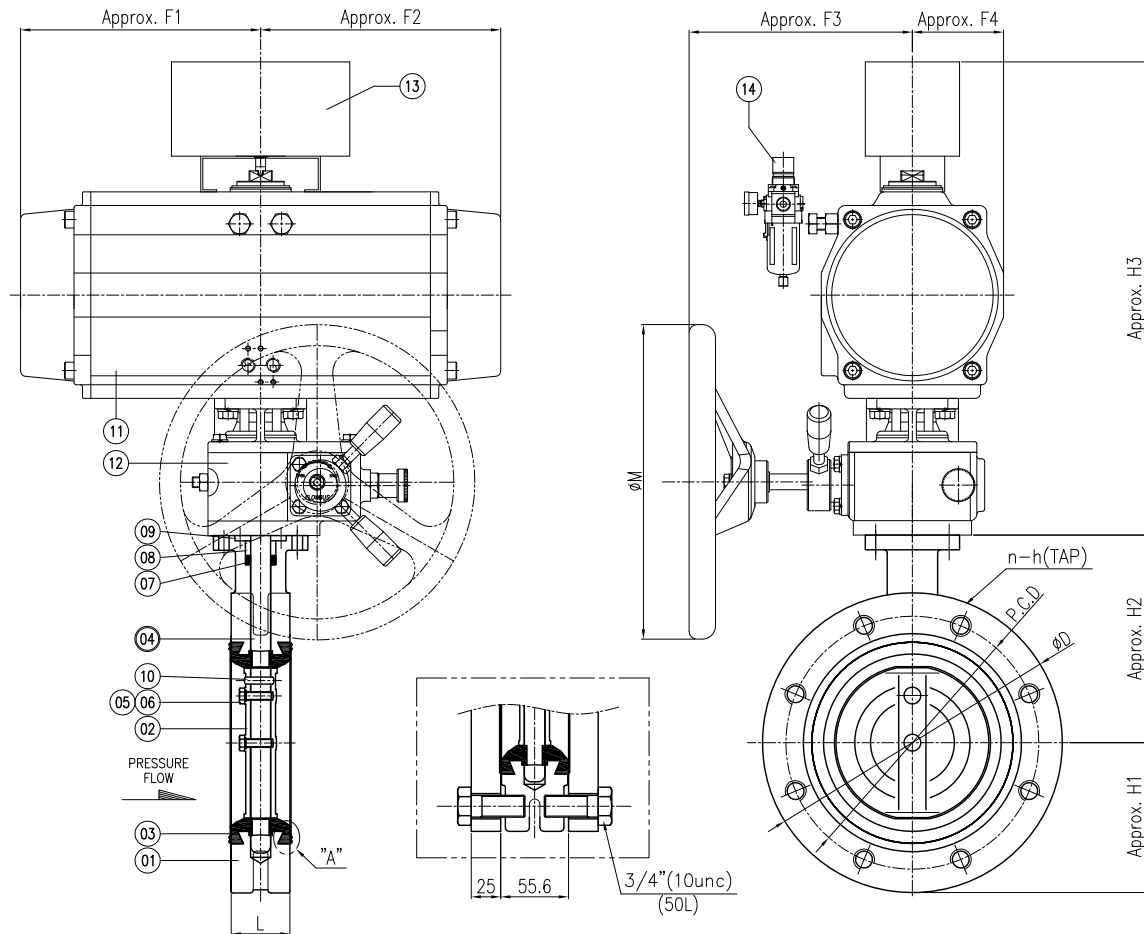
FLANGE BOLT/NUT MATERIAL : A193-B7/A194-2H
SUPPLIED BY VENDOR.



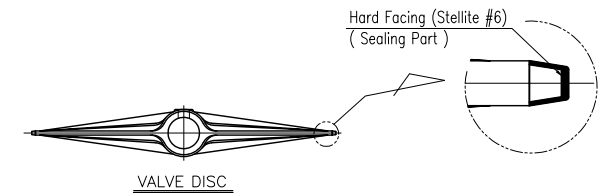
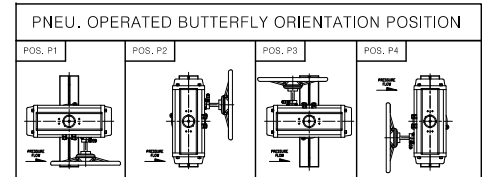
DOCUMENT SUBMISSION STATUS:

NOTE						
△	26.Sep.2014	FOR APPROVAL	S.T.WOO	S.K.LEE		S.K.JUNG
	05.Aug.2014	FOR APPROVAL	S.T.WOO	S.K.LEE		S.K.JUNG
	23.Apr.2014	FOR APPROVAL	S.T.WOO	S.K.LEE		S.K.JUNG
	27.Jan.2014	FOR APPROVAL	S.T.WOO	S.K.LEE		S.K.JUNG
REV	DATE	DESCRIPTION	PREP	CHKD	APRD	APRD
OWNER		OWNER'S CONSULTANT				
						
VIETNAM OIL AND GAS GROUP (P)VN		FICHTNER		PV POWER POC		
EPC CONTRACTOR		EPC CONTRACTOR'S CONSULTANT				
						
PETROVIETNAM CONSTRUCTION JOINT STOCK CORPORATION (PVCJ)		WorleyParsons				
POWER ISLAND PROJECT SUPPLIER		WORLEYPARSONS				
		DAELIM				
SOJITZ CORPORATION		DAELIM INDUSTRIAL CO., LTD.				
PROJECT TITLE						
THAI BINH2 THERMAL POWER PLANT 2 x 600MW						
DRAWING TITLE						
MOTOR OPERATED RUBBER SEAT BUTTERFLY VALVE FLANGE DN2700						
VENDOR NAME		FUNCTION	NAME	SIGN	DATE	
		DRIN	S.T. WOO		27-Jan-2014	
		CHKD	S.K. LEE		27-Jan-2014	
		APPD			-	
		APPD	S.K. JUNG		27-Jan-2014	
DRAWING NO.		JOB NO.	SCALE	REVNO.		
TB2-SDC.VP406-00100-I-11-DSU-0001-11		110180	1/1			
1.0		1.1	FILE NAME : 110180-44 -09-001-001			

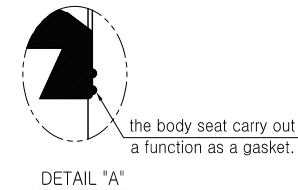
D I M E N S I O N S											UNIT : mm	Q'TY (EA)	FLUID	TAG NO.	ORIENTATING POSITION
NOMINAL DIAMETER	L	FLANGE (ASME #150)				H1	H2	H3	F1	F2	F3				
		ØD	P.C.D	n	h (TAP)										
DN150 (6")	55.6±1.5	279	241.3	8	3/4"(10unc)	143	198	475	229	229	215	90	300	3	FILTERED WTR (LIQUID)
															07GHB10AA001 / 002 / 003
															P1



NO.	PART NAME	MAT'L	Q'TY	REMARKS
1	BODY	A216-WCB	1	
2	DISC	A351-CF8M	1	Sealing Part Hard Facing (Stellite #6)
3	BODY SEAT	BUNA-N	1	
4	STEM	A276-T316	1	
5	DISC BOLT	A193-B8M	2	
6	O-RING	NBR	2	
7	PACKING	NBR	1SET	
8	PACKING RING	ACETAL	1	
9	PACKING GLAND	A283-C	1	
10	PIN	A276-T316	1	
11	PNEUMATIC ACTUATOR	ASS'Y	1SET	SEE NOTE. 5
12	DECLUTCH GEAR BOX	ASS'Y	1SET	
13	POSITIONER	ASS'Y	1SET	With Position Transmitter
14	AIR FILTER AND REGULATOR	ASS'Y	1SET	

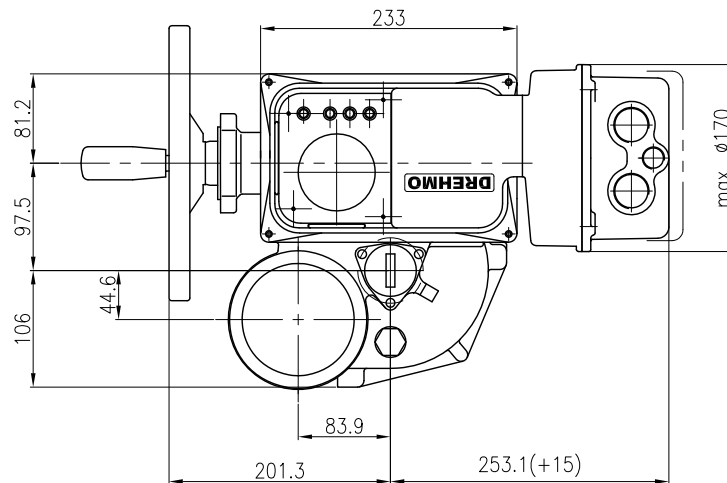
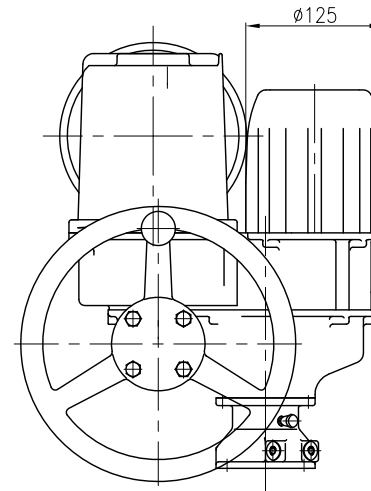
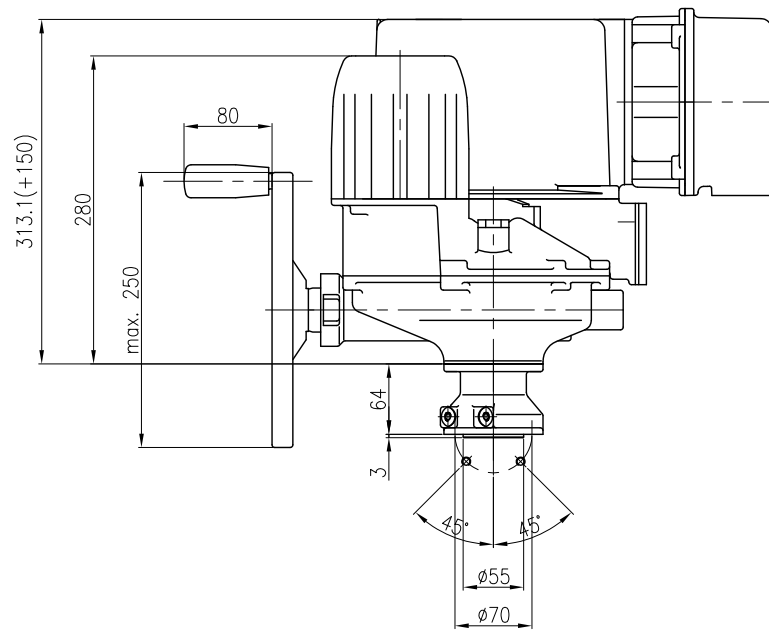
**NOTE**

- FACE TO FACE DIM : MSS SP-67, TABLE 3
- FLANGE RATING : ASME B 16.5 CL.150_RF
- DESIGN PRESSURE : 5 bar
- DESIGN TEMP. : 38°C
- PNEUMATIC ACTUATOR (SINGLE ACTING)
 - MODEL / MAKER : EPR160-SR08 / FLOWBUS
 - FAIL POSITION : FAIL OPEN
 - OPERATING AIR PRESS. : 4.5 Bar(g)
- POSITIONER (With Position Transmitter)
 - MODEL / MAKER : 6DR5110-ONG00-OAA0 / SIEMENS
 - SIGNAL, INPUT / OUTPUT : 4~20mA DC / 0.2~0.98 bar(g)
 - TYPE : SMART HART PROTOCOL
 - Cable connection Elec./Pneu. : 1/2"NPT(F) / 3/8"NPT(F)
- AIR FILTER & REGULATOR
 - MODEL / MAKER : AW30-03BG-2-A / SMC
 - AIR CONNECTION SIZE : 3/8"
- INSPECTION & TEST : MSS SP-61
 - BODY : 7.5 bar(g) - 60 sec.
 - SEAT : 5.5 bar(g) - 30 sec.
- LEAKAGE CLASS : ANSI CLASS IV
- Our valves should be installed without gasket.
- TOTAL WEIGHT : APPROX. 70Kg



Daelim Industrial Co., Ltd.	
Job No.	110180
A - APPROVED	
B - APPROVED WITH COMMENTS	
C - RETURNED FOR CORRECTION	
D - REJECTED	
N - NOT APPLICABLE (REFERENCE ONLY)	
SIGNED BY :	DATE :
DIC'S PERMISSION TO PROCEED OR REVIEW TAKEN ON VENDOR PRINTS SHALL NOT RELIEVE VENDOR FROM ITS RESPONSIBILITIES OR LIABILITIES UNDER THE PURCHASE ORDER.	

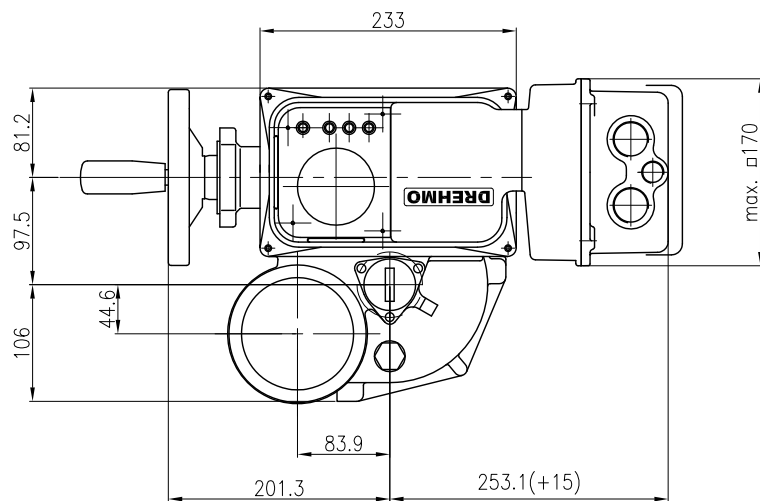
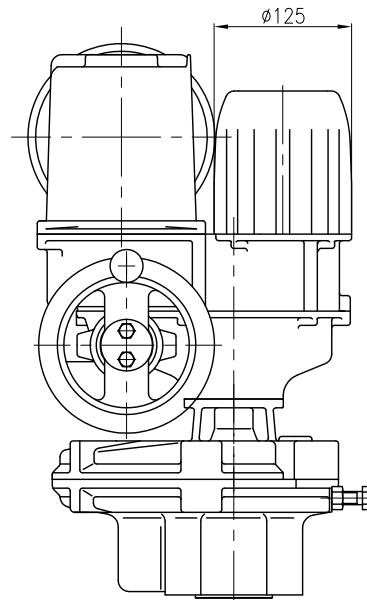
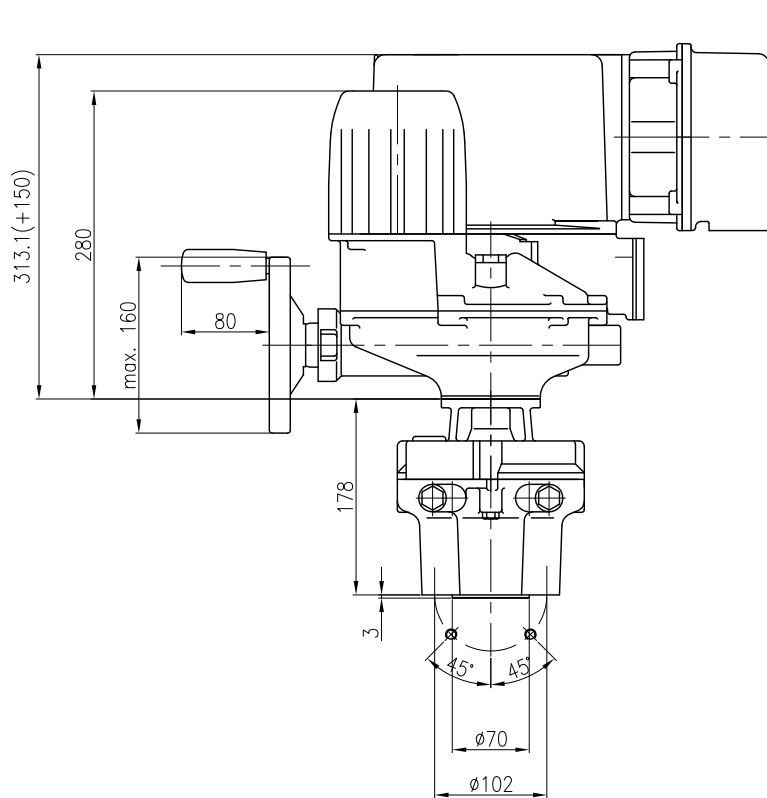
DOCUMENT SUBMISSION STATUS:									
NOTE:									



DREHMO / DPIM119

Job No.	110180
A - APPROVED	
B - APPROVED WITH COMMENTS	
C - RETURNED FOR CORRECTION	
D - REJECTED	
N - NOT APPLICABLE (REFERENCE ONLY)	
SIGNED BY :	DATE :
DUC'S PERMISSION TO PROCEED OR REVIEW TAKEN ON VENDOR PRINTS SHALL NOT RELIEVE VENDOR FROM ITS RESPONSIBILITIES OR LIABILITIES UNDER THE PURCHASE ORDER.	

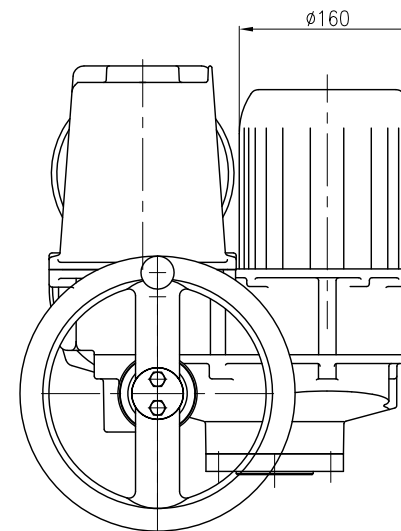
DOCUMENT SUBMISSION STATUS:											
NOTE:											



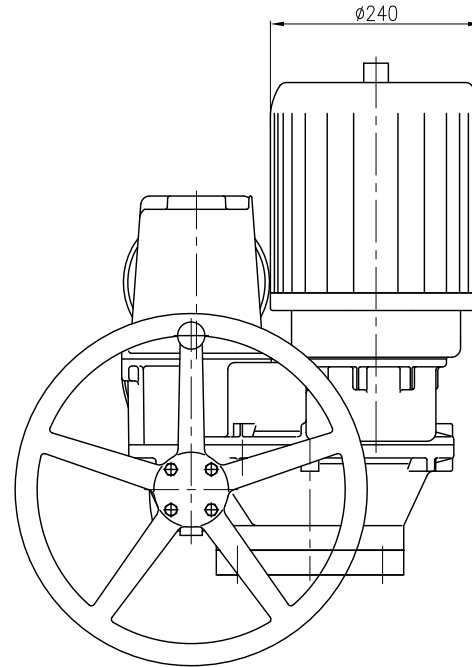
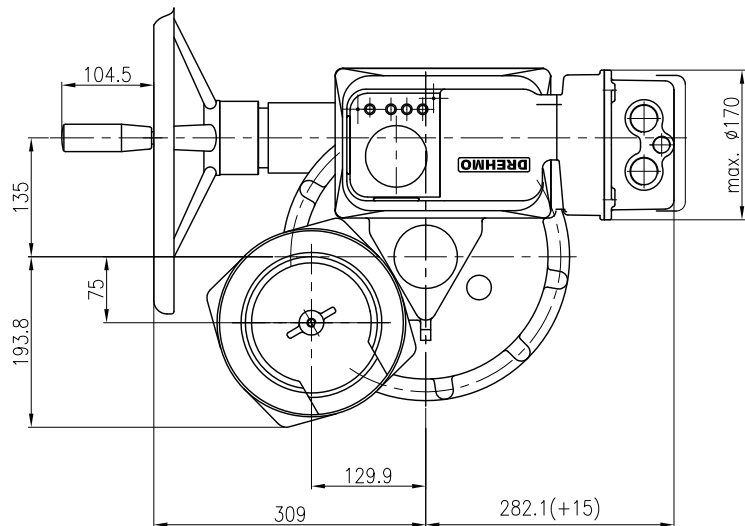
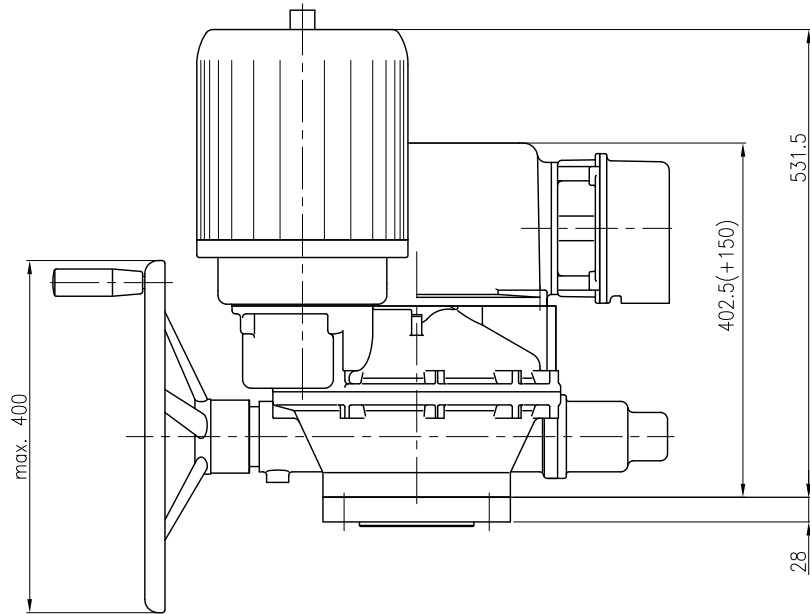
DREHMO / DPIM319

Drehmo Industrial Co., Ltd.	
Job No.	110180
A - APPROVED	
B - APPROVED WITH COMMENTS	
C - RETURNED FOR CORRECTION	
D - REJECTED	
N - NOT APPLICABLE (REFERENCE ONLY)	
SIGNED BY :	DATE :
D/C'S PERMISSION TO PROCEED OR REVIEW TAKEN ON VENDOR PRINTS SHALL NOT RELIEVE VENDOR FROM ITS RESPONSIBILITIES OR LIABILITIES UNDER THE PURCHASE ORDER.	

DOCUMENT SUBMISSION STATUS:									
NOTE:									



Doain Industrial Co., Ltd.		PROJECT TITLE		THAI BINH2 THERMAL POWER PLANT 2 x 600MW																					
Job No.	110180	DRAWING TITLE		MOTOR OPERATED RUBBER SEAT FOR ACTUATOR DRAWING																					
A - APPROVED		VENDOR NAME		<table><tr><th>FUNCTION</th><th>NAME</th><th>SIGN</th><th>DATE</th></tr><tr><td>CHRO</td><td>S.K. BOO</td><td></td><td>26-09-2019</td></tr><tr><td>CHRO</td><td>S.K. LEE</td><td></td><td>27-09-2019</td></tr><tr><td>APPO</td><td></td><td></td><td></td></tr><tr><td>APPO</td><td>S.K. JUNG</td><td></td><td>27-09-2019</td></tr></table>		FUNCTION	NAME	SIGN	DATE	CHRO	S.K. BOO		26-09-2019	CHRO	S.K. LEE		27-09-2019	APPO				APPO	S.K. JUNG		27-09-2019
FUNCTION	NAME	SIGN	DATE																						
CHRO	S.K. BOO		26-09-2019																						
CHRO	S.K. LEE		27-09-2019																						
APPO																									
APPO	S.K. JUNG		27-09-2019																						
B - APPROVED WITH COMMENTS		DRAWING NO.		110180																					
C - RETURNED FOR CORRECTION		JOB NO.		110180																					
D - REJECTED		SCALE		1/1																					
N - NOT APPLICABLE (REFERENCE ONLY)		FILE NAME		110180-4-00-0001-11																					
SIGNED BY:	DATE:	DUKWON 주덕원		REVISED																					
DIC'S PERMISSION TO PROCEED OR REVIEW TAKEN ON VENDOR PRINTS SHALL NOT RELIEVE VENDOR FROM ITS RESPONSIBILITIES OR LIABILITIES UNDER THE PURCHASE ORDER.		T82-S00VP406-00100-11-H0100-0001-15		4-00-0001-11																					

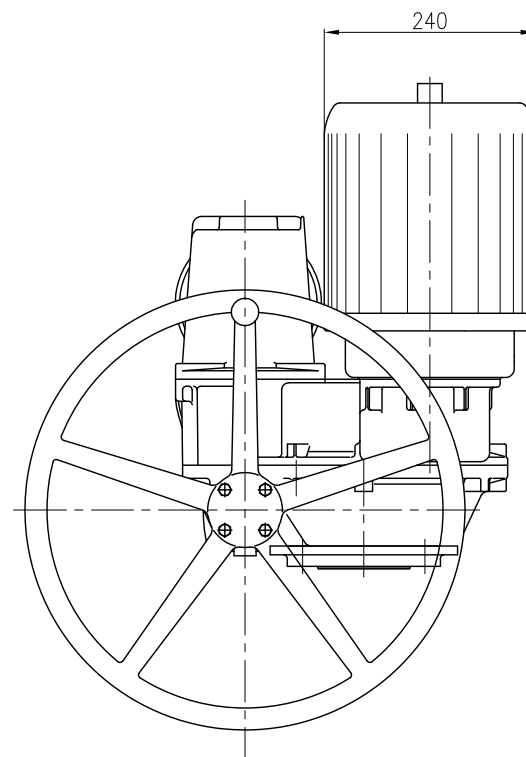


DREHMO / DIM500

Daelim Industrial Co., Ltd.	
Job No.	110180
A - APPROVED	
B - APPROVED WITH COMMENTS	
C - RETURNED FOR CORRECTION	
D - REJECTED	
N - NOT APPLICABLE (REFERENCE ONLY)	
SIGNED BY :	DATE :
D/C'S PERMISSION TO PROCEED OR REVIEW TAKEN ON VENDOR PRINTS SHALL NOT RELIEVE VENDOR FROM ITS RESPONSIBILITIES OR LIABILITIES UNDER THE PURCHASE ORDER.	

DOCUMENT SUBMISSION STATUS:									
NOTE:									
15.Aug.2014	FOR APPROVAL	S.T.WOO	S.K.LEE	S.K.JUNG					
REV	DATE	DESCRIPTION	PREP	CHKD	APRD	APRD			
OWNER		OWNER'S CONSULTANT							
		FICHTNER							
		WorleyParsons							
EPC CONTRACTOR		EPC CONTRACTOR'S CONSULTANT							
		WorleyParsons							
PROJECT TITLE									
THAI BINH2 THERMAL POWER PLANT 2 x 600MW									
DRAWING TITLE									
MOTOR OPERATED RUBBER SEAT FOR ACTUATOR DRAWING									
VENDOR NAME									
FUNCTION NAME SIGN DATE									
DRWN	S.T. WOO								
CHKD	S.K. LEE								
APPD	S.K. JUNG								
DRAWING NO.									
TB2-SOC.VP406-00100-I-I1-DSU-0001-16									
JOB NO.									
110180									
SCALE									
1/1									
REVNO.									
1									
FILE NAME									
110180-44 -408-001-401									





DOCUMENT SUBMISSION STATUS:

NOTE:

05.Aug.2014

FOR APPROVAL

S.T.BOO

S.K.LEE

S.KIM

REV

DATE

DESCRIPTION

PREP

CHKD

APRD

APP

OWNER

VIETNAM OIL AND GAS GROUP (PAC)

OWNER'S CONSULTANT

FICHTNER

GmbH & Co. KG

FICHTNER

PV POWER PCC

EPC CONTRACTOR

PETROVIETNAM CONSTRUCTION JOINT
STOCK CORPORATION (PVC)

POWER ISLAND PACKAGE SUPPLIER

SOOJITZ CORPORATION

EPC CONSTRUCTION'S CONSULTANT

WorkleyParsons

CONSULTANTS

WOLFFSPRINGER

DAELIM

DAELIM INDUSTRIAL, CO., LTD.

PROJECT TITLE

THAI BINH2 THERMAL POWER PLANT 2 x 600MW

DRAWING TITLE

**MOTOR OPERATED RUBBER SEAT
FOR ACTUATOR DRAWING**

VENDOR NAME

DUKWON **주식회사**
DAEWON

FUNCTION

NAME

SIGN

DATE

DRAWN

S.T. WOO

27-Jan-2014

CHKD

S.K. LEE

27-Jan-2014

APPD

-

-

-

APPD

S.K. JUNG

27-Jan-2014

JOB NO.

10

FILE NAME

11

SCALE

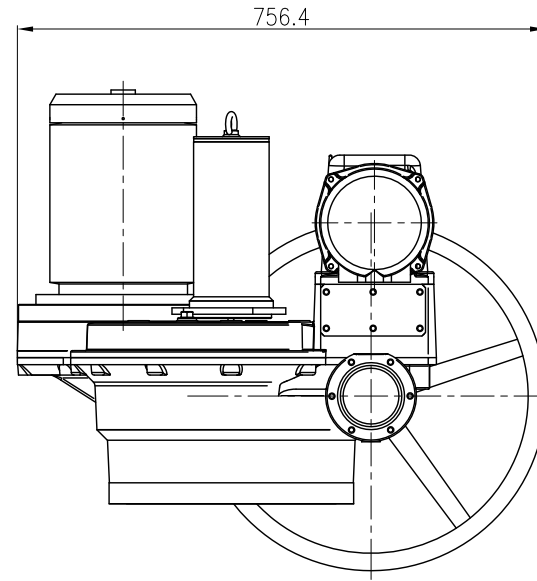
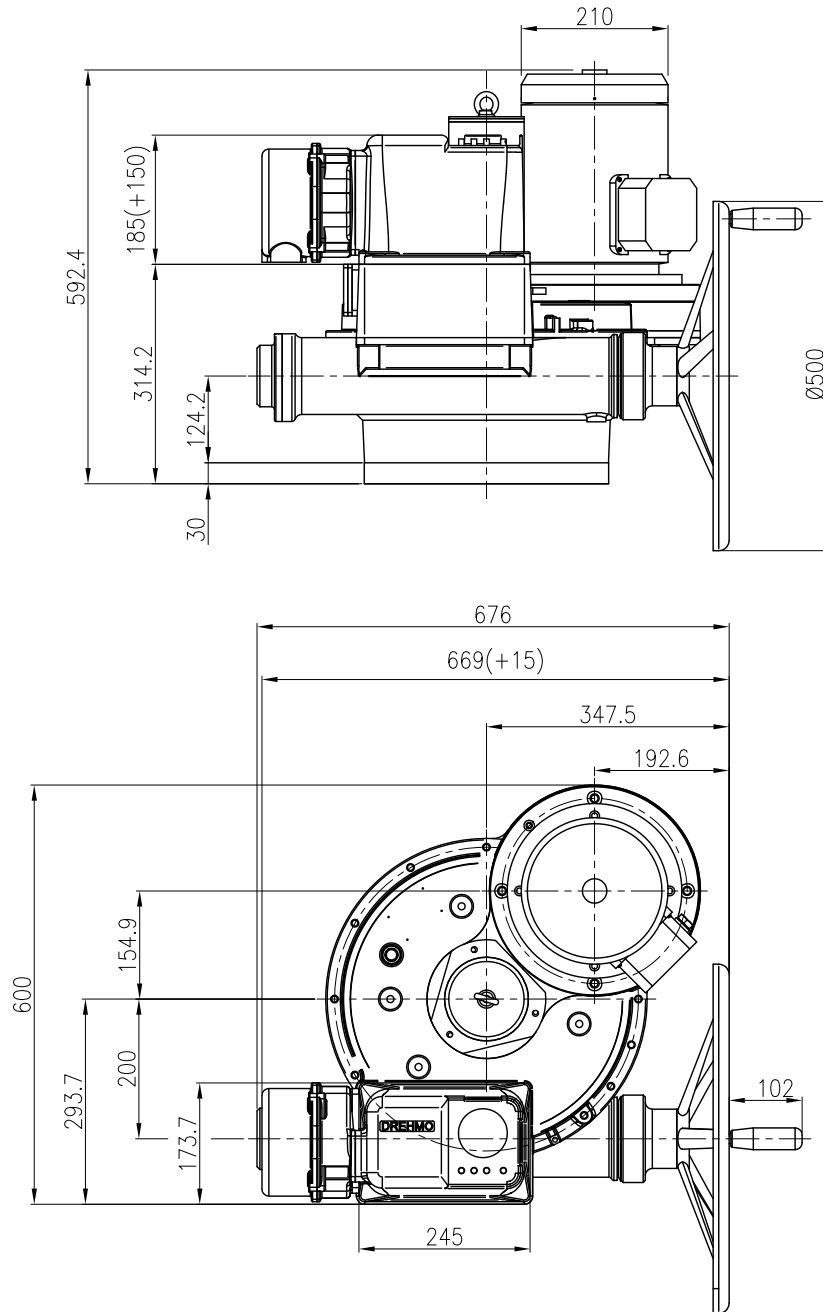
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DRAWING NO.

TBS-SSCVP406-0010-I-11-DSU-0001-1

49-001-001

10



DREHMO / DIM2000

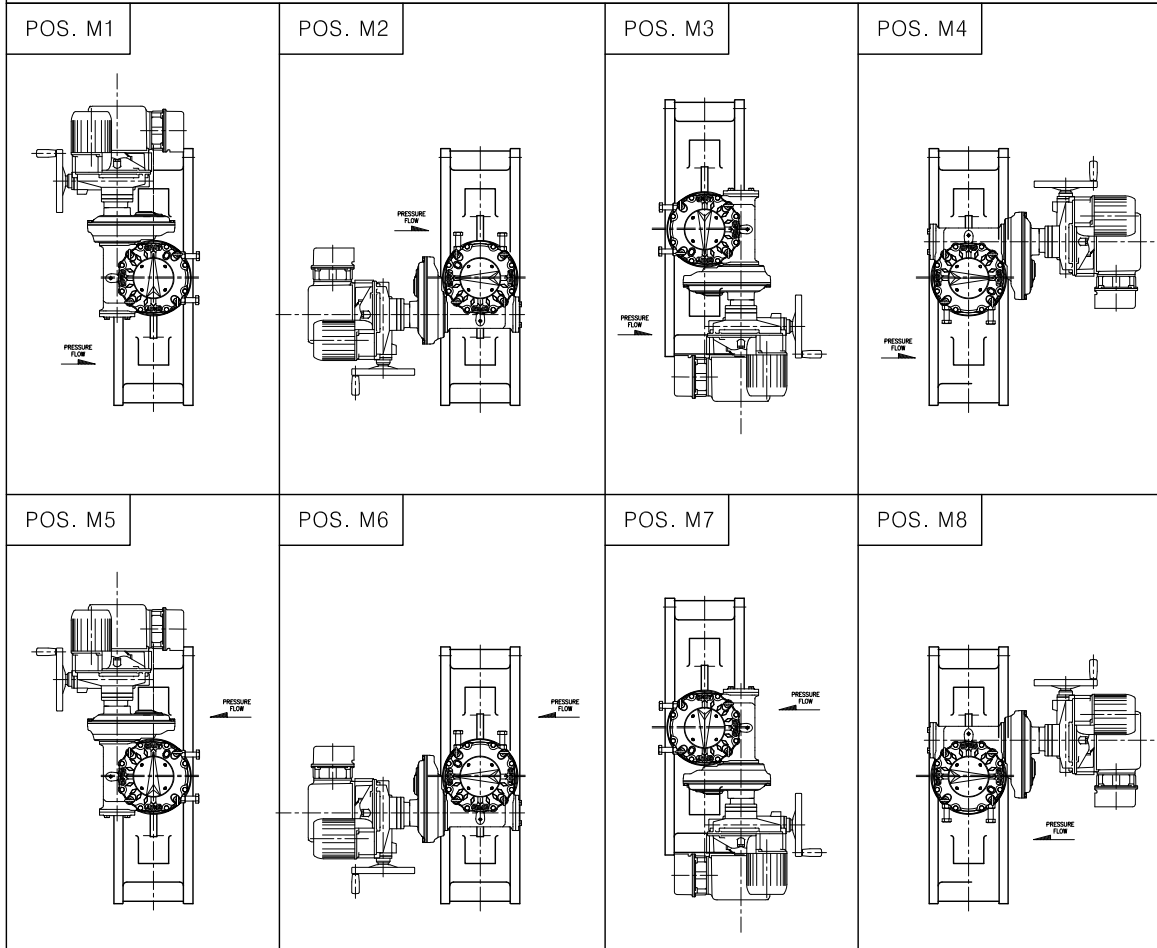
DOCUMENT SUBMISSION STATUS:									
NOTE:									
REV	DATE	DESCRIPTION	PREP	CHKD	APRD	APRD	APRD	APRD	APRD
1	10.Aug.2014	FOR APPROVAL							
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									

OWNER	OWNER'S CONSULTANT	OWNER'S CONSULTANT	OWNER'S CONSULTANT
Vietnam Oil and Gas Group (VNG)	Fichtner	Fichtner	PV POWER PCC
EPC CONTRACTOR	EPC CONTRACTOR'S CONSULTANT	EPC CONTRACTOR'S CONSULTANT	EPC CONTRACTOR'S CONSULTANT
PETROVIETNAM CONSTRUCTION JOINT STOCK CORPORATION (PCC)	WorleyParsons	WorleyParsons	WorleyParsons
POWER ISLAND PACKAGE SUPPLIER	SOJITZ CORPORATION	DAELIM INDUSTRIAL CO., LTD.	DAELIM INDUSTRIAL CO., LTD.

PROJECT TITLE		DRAWING TITLE		VENDOR NAME		FUNCTION		NAME		SIGN		DATE	
THAI BINH2 THERMAL POWER PLANT 2 x 600MW		MOTOR OPERATED RUBBER SEAT FOR ACTUATOR DRAWING		DUKWON		DRIN		S.T. WOO		-		27-Jan-2014	
						CHKD		S.K. LEE		-		27-Jan-2014	
						APPD		-		-		27-Jan-2014	
						REVNO		110180		SCALE		1/1	
						FILE NAME		110180-44 -408-001-401					

Drawn by: Daelim Industrial Co., Ltd.
 Job No. 110180
 A - APPROVED
 B - APPROVED WITH COMMENTS
 C - RETURNED FOR CORRECTION
 D - REJECTED
 N - NOT APPLICABLE (REFERENCE ONLY)
 Signed by: DATE: DCS'S PERMISSION TO PROCEED OR REVIEW TAKEN ON VENDOR PRINTS SHALL NOT RELIEVE VENDOR FROM ITS RESPONSIBILITIES OR LIABILITIES UNDER THE PURCHASE ORDER.

MOTOR OPERATED BUTTERFLY ORIENTATION POSITION



SIZE	TAG NO.	O.P (POS.)	SIZE		O.P (POS.)
80A	11PAB70AA201	M2	1950A	11PAB50AA201	M3
	21PAB70AA201	M2		21PAB50AA201	M3
	11PAB71AA201	M2		11PAB51AA201	M7
	21PAB71AA201	M2		21PAB51AA201	M7
				11PAB52AA201	M3
150A	07GNK11AA201	M2		21PAB52AA201	M3
				11PAB53AA201	M7
750A	11PGB21AA201	M1		21PAB53AA201	M7
	21PGB21AA201	M1		11PAB70AA251	M1
	11PGB23AA201	M1		21PAB70AA251	M1
	21PGB23AA201	M1		11PAB71AA251	M1
				21PAB71AA251	M1
750A	11PAB73AA201	M2		11PAB72AA251	M1
	21PAB73AA201	M2		21PAB72AA251	M1
	11PAB77AA201	M2		11PAB73AA251	M1
	21PAB77AA201	M2		21PAB73AA251	M1
2100A	11LBD15AA201	M5	2700A	18PAB11AA251	M5
	21LBD15AA201	M5		28PAB11AA251	M5
	11LBD15AA202	M1		18PAB10AA251	M1
	21LBD15AA202	M1		28PAB10AA251	M1

DOCUMENT SUBMISSION STATUS:

NOTE:

REV	DATE	DESCRIPTION	PREP	CHKD	APRD	APRD
Δ	30.Sep.2014	FOR APPROVAL	S.T.WOO	S.K.LEE		S.K.JUNG
Δ	05.Aug.2014	FOR APPROVAL	S.T.WOO	S.K.LEE		S.K.JUNG
Δ	23.Apr.2014	FOR APPROVAL	S.T.WOO	S.K.LEE		S.K.JUNG
Δ	27.Jan.2014	FOR APPROVAL	S.T.WOO	S.K.LEE		S.K.JUNG

OWNER	Vietnam Oil and Gas Group (VNG)	OWNER'S CONSULTANT	FICHTNER GmbH & Co. KG	PV POWER PCC
EPC CONTRACTOR	PETROVIETNAM CONSTRUCTION JOINT STOCK CORPORATION (PVC)	EPC CONTRACTOR'S CONSULTANT	WorleyParsons	
POWER ISLAND PACKAGE SUPPLIER	SOJITZ CORPORATION		DAELIM	

Job No.	110180	PROJECT TITLE	THAI BINH2 THERMAL POWER PLANT 2 x 600MW		
A - APPROVED		DRAWING TITLE	MOTOR OPERATED BUTTERFLY VALVE ORIENTATION POSITION		
B - APPROVED WITH COMMENTS		VENDOR NAME	DUKWON VALVES		
C - RETURNED FOR CORRECTION		FUNCTION	NAME	DATE	
D - REJECTED		CHKD	S.T. WOO	27-Jan-2014	
N - NOT APPLICABLE (REFERENCE ONLY)		APPD	S.K. LEE	27-Jan-2014	
SIGNED BY :	DATE :	APPD	S.K. JUNG	27-Jan-2014	
DUC'S PERMISSION TO PROCEED OR REVIEW TAKEN ON VENDOR PRINTS SHALL NOT RELIEVE VENDOR FROM ITS RESPONSIBILITIES OR LIABILITIES UNDER THE PURCHASE ORDER.					
DRAWING NO.	102-SDC.VP406-00100-I-11-DSU-0001-20	JOB NO.	110180	SCALE	1/1
				REVNO.	Δ
				FILE NAME	110180-44 -48-001-401



287mm x 420mm

100

80

MOTOR OPERATED BUTTERFLY VALVE

TAG NO.	11PGB21AA201
SIZE	DN 750A (30")
BODY MATERIAL/TRIM	A216-WCB / 316
FLANGE RATING	ASME B 16.47 SERIES "A"/CL150
DESIGN PRESSURE	10 BAR.g
DESIGN TEMPERATURE	60°C
OPERATING TYPE	ELECTRICAL ACTUATOR
OPERATING TIME	APP. 45 sec.
MFG. DATE	2014. 09.

DUKWON VALVES I38Block-5Knot, Kurang-Dong,Gangseo-Gu, Busan,Korea. TEL. 82-(0)51-831-9020

DN 750A

150

120

MOTOR OPERATED BUTTERFLY VALVE

TAG NO.	11PAB50AA201
SIZE	DN 2400A (96")
BODY MATERIAL/TRIM	A536 Gr.65-45-12 / 316
FLANGE RATING	AWWA C207 CLASS D
DESIGN PRESSURE	6 BAR.g
DESIGN TEMPERATURE	60°C
OPERATING TYPE	ELECTRICAL ACTUATOR
OPERATING TIME	APP. 60 sec.
MFG. DATE	2014. 09.

DUKWON VALVES I38Block-5Knot, Kurang-Dong,Gangseo-Gu, Busan,Korea. TEL. 82-(0)51-831-9020

DN 1950A & LARGE

120

27

TAG NO. : 11PAB70AA201
DESIGN PRESSURE : 7 BAR.g
VALVE SIZE : 80A

80A & 150A

BODY MARKING

DWV
DESIGN CODE
MATERIAL
VALVE SIZE
CHARGE NO.

DISC MARKING

DWV
MATERIAL
VALVE SIZE
CHARGE NO.

NOTE

1. NAME PLATE & TAG PLATE
- CONFORM OF COMMENT

Daelim Industrial Co., Ltd.

Job No. 110180

A - APPROVED

B - APPROVED WITH COMMENTS

C - RETURNED FOR CORRECTION

D - REJECTED

N - NOT APPLICABLE (REFERENCE ONLY)

SIGNED BY : DATE :

DIC'S PERMISSION TO PROCEED OR REVIEW TAKEN ON VENDOR PRINTS SHALL NOT RELIEVE VENDOR FROM ITS RESPONSIBILITIES OR LIABILITIES UNDER THE PURCHASE ORDER.

DOCUMENT SUBMISSION STATUS:

NOTE:

REV	DATE	DESCRIPTION	PREP	CHKD	APRD
01	05.Aug.2014	FOR APPROVAL	S.T.WOO	S.K.LEE	S.K.JUNG
02	23.Aug.2014	FOR APPROVAL	S.T.WOO	S.K.LEE	S.K.JUNG
03	27.Jan.2014	FOR APPROVAL	S.T.WOO	S.K.LEE	S.K.JUNG

OWNER: VIETNAM OIL AND GAS GROUP (PVG) FICHTNER PV POWER PCC

EPC CONTRACTOR: PETROVIETNAM CONSTRUCTION JOINT STOCK CORPORATION (PCC) WorleyParsons

POWER ISLAND PACKAGE SUPPLIER: SOJITZ CORPORATION DAEILIM INDUSTRIAL CO., LTD.

PROJECT TITLE: THAI BINH2 THERMAL POWER PLANT 2 x 600MW

DRAWING TITLE: MOTOR OPERATED BUTTERFLY VALVE NAME PLATE

VENDOR NAME: DUKWON VALVES

FUNCTION	NAME	SIGN	DATE
DRWN	S.T. WOO		27-Jan-2014
CHKD	S.K. LEE		27-Jan-2014
APPD	S.K. JUNG		27-Jan-2014

DRAWING NO. TB2-SDC.VP406-00100-I-11-DSU-0001-21

JOB NO. 110180

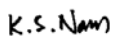
SCALE 1/1

REVNO. 1

FILE NAME: 110180-44-408-001-401

DOCUMENT SUBMISSION STATUS: FC

NOTE:

2	30 Apr. 2014	Revised as per comments	M.G.Kim	K.H.Lee	K.S.Nam	Y.H.Kim				
1	05 Feb. 2013	Revised as per comments	D.H.Choi	K.H.Lee	K.S.Nam	Y.H.Kim				
0	13 Nov., 2012	Issued for Construction	D.H.Choi	S.H.Song	K.H.Lee	Y.H.Kim				
REV	DATE	DESCRIPTION	PREP	CHKD	APRD	APRD				
OWNER  VIETNAM OIL AND GAS GROUP (PVN)			OWNER'S CONSULTANT  FICHTNER GmbH & Co. KG  PVPOWER PCC							
EPC CONTRACTOR  PETROVIETNAM CONSTRUCTION JOINT STOCK CORPORATION (PVC)			EPC CONTRACTOR'S CONSULTANT  WorleyParsons resources & energy WORLEYPARSONS							
POWER ISLAND PACKAGE SUPPLIER  SOJITZ CORPORATION  DAELIM INDUSTRIAL CO., LTD.										
PROJECT TITLE THAI BINH 2 THERMAL POWER PLANT 2 x 600MW										
WORK TITLE / DRAWING / DOCUMENT TITLE CALCULATION FOR COOLING WATER PUMP										
			FUNCTION	NAME	SIGN	DATE				
			DRWN	M.G.Kim		30 Apr. 14				
			CHKD	K.H.Lee		30 Apr. 14				
			APPD	K.S.Nam		30 Apr. 14				
			APPD	Y.H.Kim		30 Apr. 14				
DOCUMENT No: TB2-SDC-01PAC-M-M4-CAL-0001			SHEET No: 26 Pages		SCALE	REV. 2				



Document Review Comment Sheet

PEB Ref. No : TB2-PEB-SDC-M4-ENG-0478

No.	Document No.	Rev	Title	Purpose	Review Status	
					In	Out
1	TB2-SDC-01PAC-M-M4-CAL-0001	1	Calculation for Cooling Water Pump	FC		A
No.	Owner/PMC's Comments	Item status	Contractor's Response			
I	General Comment					
1	Finalized calculation shall be also conformed final Heat balance diagram, P&ID, Plot plan, equipment/piping layout (incl. intake and outfall canal) approved by Owner.		Noted.			
II	Detail Comment					
1	Item 3.3 plot plan Please add as follows: Piping general arrangement (power block)		Noted and Incorporated.			
III	Special Note.		This calculation is submitted in accordance with technical meeting MOM item 1 of mechanical part for CW pipe design and Foundation Issues. (Dated 14th ~ 17th April 2014 in Daelim Office, Seoul) Ref.No is "TB2-SDC-PVC-OTM-0047"			

* Legend

Contractor Purpose:

AP - For Approval
RE - For Reference
FC - For Construction
AB - As Built
INFO - For Information

Approval Status:

A - Approved
B - Approved with Comments
C - Returned for Correction
D - Rejected
I - Accepted for Reference / IB - Accepted for Reference with Comments / R - Returned for Correction



MEETING AGENDA

Thai Binh-II TPP Project, Vietnam
Subject : CW Pipe Design and Foundation Issues

Date: 2014-04-14 ~ 2014-04-17

No.	Decipline	Questionnaires / Clarifications	Meeting Description	Result	Responsibility
1	Mech	Possibility of reducing CW Pipe diamter from 3.8m ID to 3.55m ID	According to PVC/WP request, SDC will calculate CWP TDH based on Mean Water Level(MWL) (@+0.21m above sea level(ASL)). PVC/WP reconfirmed that SDC's plant performance guarantee is based on mean water level(MWL). PVC/WP/SDC have re-checked the CWP calculation based on mean water level , 3.55m ID pipe size will meet technical requirement. SDC will submit the revised CWP calcaution not later than 30.April, 2014. PVC/WP/SDC agreed that there is a single 3.55m ID discharge pipe per unit. SDC will provide the concept of piping entering seal pit to PVC/WP who will adjust the seal pit design to incorporate SDC's piping design. PVC/WP/SDC agreed that no weir will be required for seal pit design. SDC's requirement is entering piping to seal pit must be always under the water level of seal pit.	as discussed	

07/04/14
H. Cost

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	CALCULATION FOR COOLING WATER PUMP	Doc. No.: TB2-SDC-01PAC-M-M4-CAL-0001	
		Job No.: 110180	
		Rev. 2	Page 4 of 27

1.0 **PURPOSE**

- 1.1 To determine the capacity and Total Dynamic Head (T.D.H.) of cooling water pump for Thai Binh 2 thermal power plant (2x600MW).
- 1.2 To design the cooling water system more economically which is focused to find the optimum head required for the safe operation of power plant.
- 1.3 To design the cooling water pump having sufficient capacity to provide the total cooling water requirements.



	CALCULATION FOR COOLING WATER PUMP	Doc. No.: TB2-SDC-01PAC-M-M4-CAL-0001	
		Job No.: 110180	
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2.0 SUMMARY

2.1 Cooling water pump capacity

- A. Flow rate per one (1) CWP : 46,700 m³/h
- B. Head : 19 m

2.2 Total cooling water requirement

The cooling water system will provide cooling water for condenser, travelling screen wash pump, chlorination injection system, closed cooling water system and condenser vacuum pump.

Consumer	Flow rate (m ³ /h)	Remarks
Condenser cooling water	89,088 m ³ /h	per 1 unit
Travelling screen wash pump	100 m ³ /h	per 1 unit
Chlorination injection system	185 m ³ /h	per 1 unit
ACW pump for CCW system	3,800 m ³ /h	per 1 unit
Condenser vacuum pump	177 m ³ /h	per 1 unit



	CALCULATION FOR COOLING WATER PUMP	Doc. No.: TB2-SDC-01PAC-M-M4-CAL-0001	
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3.0 REFERENCE

- 3.1 Contract document,

Volume I, General technical requirements

Volume V, Section 14 cooling water system (TB2-0-LI-022-0014-R1)
- 3.2 Heat balance diagram (TB2-SDC-00100-M-M1B-PFD-0001, TB2-SDC-00100-M-M1B-PFD-0009)
- 3.3 Plot plan
- 3.4 General arrangement (Intake area, **Power block**)
- 3.5 Flow of Fluid by Crane
- 3.6 Pump handbook, 2nd edition, Mc GRAW-HILL
- 3.7 Internal flow systems, Volume 5 in the BHRA fluid engineering series



	CALCULATION FOR COOLING WATER PUMP	Doc. No.: TB2-SDC-01PAC-M-M4-CAL-0001	
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4.0 **DESIGN CRITERIA**

4.1 Contract requirement

4.1.1 Two (2) x 50% capacity CW pumps shall be provided for each of the 600 MW steam turbine generator units. At normal operation mode, each pump shall meet 50% cooling water flow of each unit.

4.1.2 The CW Pumps shall be capable of delivering continuously 100% flow to meet the condenser cooling water requirements at MCR (RO) unit load (for condensing the main turbine), the unit and common cooling water requirements of one 600 MW unit (boiler and turbine areas) at MCR load and at the maximum head conditions determined by the design of the system and taking into account the pump motor supply frequency variation of $\pm 5\%$.

4.1.3 TDH of CWP includes a margin of 5% of pump head capacity at rated flow to accommodate normal pump performance deterioration.

4.1.4 As per ITB, GTR Part II-a-section 4, page 4-34/91, The velocity of cooling water do not exceed 3 m/s.

4.2 Others

4.2.1 This calculation data would be adjusted and finalized as per vendor's technical data.

4.2.2 Darcy-Weisbach equation is used for calculation on friction loss in pipes and fittings.

4.2.3 Head loss is calculated for one block which has longest CW pipe line.

4.2.4 Selected CWP TDH is determined by TDH of fouled condition with design margin of 5% as per ITB requirement.

4.2.5 **This calculation is made based on mean water level.**



	CALCULATION FOR COOLING WATER PUMP	Doc. No.: TB2-SDC-01PAC-M-M4-CAL-0001	
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5.0 ASSUMPTION

- 5.1 CWP run-out flow is assumed as 125% of rated capacity flow and will be finalized as per vendor data.
- 5.2 Friction factor of pipe at fouled condition is considered as 1.2 times higher than clean condition.
- 5.3 Specific gravity of cooling water at 30.5°C is considered as 1.029.



	CALCULATION FOR COOLING WATER PUMP	Doc. No.: TB2-SDC-01PAC-M-M4-CAL-0001	
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6.0 BASIC EQUATION

6.1 Friction factor

$$f = 64 / Re \quad (\text{for laminar flow})$$

$$\frac{1}{(f)^{1/2}} = -2 \log_{10} \left\{ \frac{\varepsilon}{3.7 D} + \frac{2.51}{Re (f)^{1/2}} \right\} \quad (\text{for turbulent flow})$$

where

- Re = Reynold's number
- D = inside diameter, ft
- ε = absolute roughness, 0.000155 ft (for aboveground CSRL pipe)
absolute roughness, 0.0004 ft (for buried Concrete pipe)

6.2 Reynold's number

$$Re = \frac{d v \rho}{\mu}$$

where

- μ = dynamic viscosity, centipoise
- d = inside diameter, mm
- v = mean velocity of flow, m/s
- ρ = weight density of fluid, kg/m³



	CALCULATION FOR COOLING WATER PUMP	Doc. No.: TB2-SDC-01PAC-M-M4-CAL-0001	
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6.3 Loss by pipe

$$H_L = f \times \frac{L}{D} \times \frac{v^2}{2g} \quad (\text{Crane 3-3, Equation 3-5})$$

where,

f = Friction Factor
 L = Pipe Length, m
 D = Inside Diameter, m
(Equivalent diameter, $D=4 \times R_h$)
 v = Velocity, m/s

6.4 Friction Loss by valve & fittings

$$H_L = K \frac{v^2}{2g} \quad (\text{Crane 3-3, Equation 3-14})$$

where ; H = Friction Loss m
 K = Resistance Coefficient
 v = Mean Velocity of Flow m/s
 g = Acceleration of Gravity (9.81) m/s²

6.5 ~~Weir formula~~

If $p \leq 1\text{m}$ then $\varepsilon = 0$

$p > 1\text{m}$ then $\varepsilon = 0.55 (p - 1)$

where ; Q = Flow rate m³/s
 C = Flow Coefficient
 g = Acceleration of Gravity (9.81) m/s²
 B = Weir Width m
 h = Water level over weir crest m
 p = Height of weir m



	CALCULATION FOR COOLING WATER PUMP	Doc. No.: TB2-SDC-01PAC-M-M4-CAL-0001	
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7.0 DATA

7.1 Cooling water level

- A. Highest high water level (HHWL) : ~~EL~~ DL + 3.51 m
- B. Mean water level (MWL) : ~~EL~~ DL + 0.21 m
- C. Lowest low water level (LLWL) : ~~EL~~ DL - 1.25 m



7.2 Density (ρ) @ 30.5°C : 1,029 kg/m³

7.3 Dynamic viscosity (μ) @ 30.5°C : 0.860 centipoise

7.4 Condenser top tube elevation : ~~EL + 11.50~~ DL + 11.15m (Preliminary)

7.5 ~~Weir~~ Flume design basis

- A. ~~Flume~~ crest elevation : ~~EL + 3.70~~ DL + 1.00 m (Provided by WP)
- B. Width of ~~Flume~~ : ~~16~~ 10 m (Provided by WP)
- C. ~~Flume~~ bottom elevation (upstream) : ~~EL - 4.50~~ DL - 4.75 m (Provided by WP)



7.6 Siphon head limit : - 7.80 m

7.7 Pressure drop through equipment (Preliminary)

- A. Stop gate : 0.005 m (@ Clean)
0.060 m (@ Fouled)
- B. 1st Bar screen : ~~0.003~~ 0.001 m (@ Clean)
~~0.012~~ 0.008 m (@ Fouled)



	CALCULATION FOR COOLING WATER PUMP	Doc. No.: TB2-SDC-01PAC-M-M4-CAL-0001	
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C. 2nd Bar screen	:	~~0.007~~ 0.001 m (@ Clean)
		~~0.027~~ 0.008 m (@ Fouled)
D. Travelling band screen	:	~~0.011~~ 0.008 m (@ Clean)
		~~0.076~~ 0.1 m (@ Fouled)
E. Condenser	:	~~4.98~~ 4.836 m (@ Clean)
		~~5.07~~ 6.00 m (@ Fouled)
F. Ball strainer	:	~~0.35~~ 0.25 m (@ Clean)
		~~0.42~~ 0.50 m (@ Fouled)
G. Debris filter	:	~~0.66~~ 0.66 m (@ Clean)
		~~0.79~~ 1.32 m (@ Fouled)



	CALCULATION FOR COOLING WATER PUMP	Doc. No.: TB2-SDC-01PAC-M-M4-CAL-0001	
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8.0 CALCULATION

8.1 Total dynamic head calculation for cooling water pump

Steel Pipe is applied to the cooling water piping.

8.2 Cooling water requirement calculation

Refer to the flow rate calculation of CWP attached to this document



< Case. Carbon Steel Pipe, Cylindrical >

8.1 TDH Calculation of CWP

8.1.1 CWP Rated Capacity

1 CWP	(100 % Capacity)	:	46,675	m ³ /h	(Refer to the attachment of flow calculation)
Flowrate to each condenser			100	% of rated flow	
Say,		:	46,700	m ³ /h	

8.2 Line Size

1) CWP individual Discharge Line

$$Q = 46,700 \text{ m}^3/\text{h}$$
$$D = 2.7 \text{ m I.D. of CSEL Pipe}$$
$$A = 5.73 \text{ m}^2$$
$$V = \frac{Q}{A} = 2.27 \text{ m/s}$$

2) CWP discharge common header

$$Q = 93,400 \text{ m}^3/\text{h}$$
$$D = 3.55 \text{ m I.D. of CSEL Pipe}$$
$$A = 9.90 \text{ m}^2$$
$$V = \frac{Q}{A} = 2.62 \text{ m/s}$$

3) Individual Condenser Supply Line

$$Q = 23,350 \text{ m}^3/\text{h}$$
$$D = 1.95 \text{ m I.D. of CSEL Pipe}$$
$$A = 2.99 \text{ m}^2$$
$$V = \frac{Q}{A} = 2.17 \text{ m/s}$$



8.3 Suction Friction Losses

8.3.1 Friction Loss through Stop gate

$H_L = 0.005 \text{ m (@ Clean)}$
 $0.060 \text{ m (@ Fouled)}$

8.3.2 Friction Loss through 1st Bar screen

$H_L = 0.001 \text{ m (@ Clean)}$
 $0.008 \text{ m (@ Fouled)}$

8.3.3 Friction Loss through 2nd Bar screen

$H_L = 0.001 \text{ m (@ Clean)}$
 $0.008 \text{ m (@ Fouled)}$

8.3.4 Friction Loss through Travelling band screen

$H_L = 0.008 \text{ m (@ Clean)}$
 $0.100 \text{ m (@ Fouled)}$

8.3.5 Total Suction Friction Loss

$H_L \text{ (@Clean)} = 8.3.1 + 8.3.2 + 8.3.3 + 8.3.4$
 $= 0.005 + 0.001 + 0.001 + 0.008$
 $= 0.02 \text{ m}$
 $H_L \text{ (@Fouled)} = 8.3.1 + 8.3.2 + 8.3.3 + 8.3.4$
 $= 0.060 + 0.008 + 0.008 + 0.100$
 $= 0.18 \text{ m}$

8.3.6 Misc. Losses

Losses due to stop log slots and forebay and friction loss in the intake pump house are so small that it could be neglected.



8.4 Discharge Friction Losses

8.4.1 Individual pump discharge line, Steel Cylinder Pipe - Design Condition

Flow rate	46,700	m ³ /h	
Q =	46,700	m ³ /h	
v =	2.27	m/sec	
D =	2.7	m	
Area =	5.73	m ²	
L =	30	m	(Preliminary)
ρ =	1,029	kg/m ³	
μ =	0.860	centipoise	
Re =	7319436.7		
f =	0.011	Clean	(Crane A-24)
=	0.013	Fouled	(Refer to the clause 5.2)

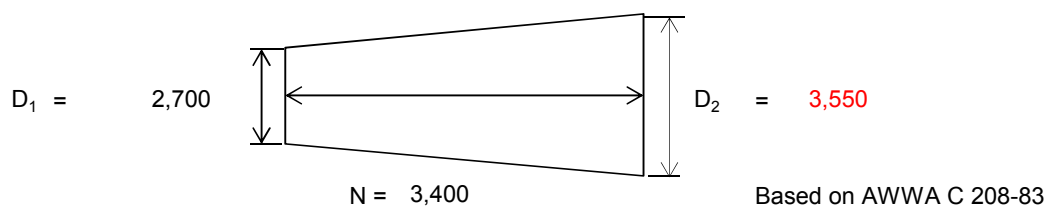
1) Loss by Pipe

$$H_L = f \times \frac{L}{D} \times \frac{v^2}{2g}$$
$$= 0.011 \times \frac{30}{2.7} \times \frac{5.133}{19.62}$$
$$= 0.032 \text{ m @ Clean}$$
$$= 0.038 \text{ m @ Fouled}$$



2) Loss by Fitting

a. K value of Increaser (From Fig. 11.6, page 169 of Internal Flow)



$$\text{Area Ratio, } \frac{D_2^2}{D_1^2} = \frac{3,550^2}{2,700^2} = 1.73$$

$$\text{Non-dimensional length, } \frac{N}{R_1} = \frac{3,400}{2,700 / 2} = 2.52$$

$$K_d = 0.09$$

b. K Value of Bend (From Fig. 9.2, page 141 of Internal Flow) 90° Bend

$$K_b = 0.16 \quad @ \text{ r/d of 2}$$

c. Total K value

Fitting	K value	Q'ty	Total K	Remarks
Increaser	0.09	1	0.09	
Expansion joint	0.1	1	0.1	Assumed
90° Bend	0.16	2	0.32	
Butterfly valve	0.3	1	0.3	
Total			0.81	

d. Calculated Fitting Loss

$$H_L = 0.81 \times \frac{2.26567^2}{2 \times 9.8} = 0.21 \text{ m}$$

$$\begin{aligned} 3) \text{ Subtotal} &= 1) + 2) \\ &= 0.032 + 0.21 = 0.244 \text{ m} @ \text{ Clean} \\ &= 0.038 + 0.21 = 0.250 \text{ m} @ \text{ Fouled} \end{aligned}$$



8.4.2 Common discharge line, Steel Cylinder Pipe
- Design Condition

Flow rate	93,400	m ³ /h	
Q =	93,400	m ³ /h	
v =	2.62	m/sec	
D =	3.55	m	
Area =	9.90	m ²	
L =	2,850	m	(Preliminary)
ρ =	1,029	kg/m ³	
μ =	0.86	centipoise	
Re =	11133791		
f =	0.011	@ Clean	(Crane A-24)
	0.013	@ Fouled	(Refer to the clause 5.2)

1) Loss by Pipe

$$H_L = f \times \frac{L}{D} \times \frac{v^2}{2g}$$

$$= 0.011 \times \frac{2850}{3.55} \times \frac{6.871}{19.62}$$

$$= 3.09 \text{ m @ Clean}$$

$$= 3.71 \text{ m @ Fouled}$$

a. K Value of Bend (From Fig. 9.2, page 141 of Internal Flow)

i. 90° Bend

$$K_b = 0.16 \text{ @ r/d of 2}$$

ii. 45 Bend

$$K_b = 0.09 \text{ @ r/d of 2}$$

b. K Value of Combining Flow (From Fig. 13.17, page 230 of Internal Flow)

$$\text{Angle } \Theta_1 = 180^\circ$$

$$\text{Flow Ratio, } \frac{Q_1}{Q_3} = \frac{46,700}{93,400} = 0.5$$

$$K_{32} = 1.35$$



c. K Value of dividing Flow (From Fig. 13.23, page 233 of Internal Flow)

$$\text{Flow Ratio, } \frac{Q_1}{Q_3} = \frac{46,700}{93,400} = 0.5$$

$$K_{32} = 0.03$$

d. Total K value

Fitting	K value	Q'ty	Total K	Remarks
Increaser	0	0	0	
Expansion joint	0.1	0	0	Assumed
Combining Flow	1.35	1	1.35	
Dividing Flow	0.03	1	0.03	
45° Bend	0.09	4	0.36	
90° Bend	0.16	8	1.28	
Butterfly valve	0.3	0	0	
Total			3.02	

2) Loss by Fitting

$$H_L = 3.02 \times \frac{2.62^2}{2 \times 9.8} = 1.06 \text{ m}$$

3) Subtotal

$$\begin{aligned}
 &= 1) + 2) \\
 &= 3.09 + 1.06 = 4.15 \text{ m @ Clean} \\
 &= 3.71 + 1.06 = 4.77 \text{ m @ Fouled}
 \end{aligned}$$



8.4.3 Individual discharge line to condenser, Steel Cylinder Pipe
- Design Condition

Flow rate 46700 m³/h
 Q = 23,350 m³/h
 v = 2.17 m/sec
 D = 1.95 m
 Area = 2.99 m²
 L = 30 m (Preliminary)
 ρ = 1,029 kg/m³
 μ = 0.86 centipoise
 Re = 5067302.3
 f = 0.011 @ Clean (Crane A-24)
 0.013 @ Fouled (Refer to the clause 5.2)

1) Loss by Pipe

$$H_L = f \times \frac{L}{D} \times \frac{v^2}{2g}$$

$$= 0.011 \times \frac{30}{1.95} \times \frac{4.717}{19.62}$$

$$= 0.04 \text{ m @ Clean (A)}$$

$$= 0.05 \text{ m @ Fouled (B)}$$

a. K Value of Bend (From Fig. 9.2, page 141 of Internal Flow)

90° Bend

$$K_b = 0.16 \text{ @ r/d of 2}$$

b. Total K value

Fitting	K value	Q'ty	Total K	Remarks
Increaser	0	0	0	
Expansion joint	0.1	0	0	Assumed
Dividing Flow	0.03	0	0	
45° Bend	0.09	0	0	
90° Bend	0.16	1	0.16	
Butterfly valve	0.3	0	0	
Total			0.16	

2) Loss by Fitting

$$H_L = 0.16 \times \frac{2.17^2}{2 \times 9.8} = 0.04 \text{ m (C)}$$

3) Subtotal

$$= 1) + 2)$$

$$= 0.04 + 0.04 = 0.08 \text{ m @ Clean (A) + (C)}$$

$$= 0.05 + 0.04 = 0.09 \text{ m @ Fouled (B) + (C)}$$



8.4.4 Loss by Condenser ~~(Preliminary)~~

$H_L =$ 4.836 m (@ Clean)

 = 6.00 m (@ Fouled)

8.4.5 Loss by Ball strainer ~~(Preliminary)~~

$H_L =$ 0.25 m (@ Clean)

 = 0.50 m (@ Fouled)

8.4.6 Debris Filter ~~(Preliminary)~~

$H_L =$ 0.66 m (@ Clean)

 = 1.32 m (@ Fouled)



8.4.7 Individual condenser outlet (aboveground CSEL pipe)

- Design Condition

Flow rate 46,700 m³/h
 Q = 23,350 m³/h
 v = 2.17 m/sec
 D = 1.95 m
 Area = 2.99 m²
 L = 30 m (Preliminary)
 ρ = 1,029 kg/m³
 μ = 0.860 centipoise
 Re = 5067302.3
 f = 0.011 @ Clean
 0.013 @ Fouled

1) Loss by Pipe

$$\begin{aligned}
 H_L &= f \times \frac{L}{D} \times \frac{v^2}{2g} \\
 &= 0.011 \times \frac{30}{1.95} \times \frac{4.72}{19.62} \\
 &= 0.04 \text{ m @ Clean (A)} \\
 &= 0.05 \text{ m @ Fouled (B)}
 \end{aligned}$$

2) Loss by Fitting

a. K Value of Bend (From Fig. 9.2, page 141 of Internal Flow)

90° Bend

$$K_b = 0.16 \text{ @ r/d of 2}$$

b. Total K value

Fitting	K value	Q'ty	Total K	Remarks
Increaser	0	0	0	
Expansion joint	0.1	2	0.2	Assumed
Dividing Flow	0.03	0	0	
45° Bend	0.09	0	0	
90° Bend	0.16	1	0.16	
Butterfly valve	0.3	1	0.3	
Total			0.66	

$$H_L = 0.66 \times \frac{2.17^2}{2 \times 9.8} = 0.16 \text{ m (C)}$$

$$\begin{aligned}
 \text{3) Subtotal} &= 1) + 2) \\
 &= 0.04 + 0.16 = 0.200 \text{ m @ Clean (A) + (C)} \\
 &= 0.05 + 0.16 = 0.208 \text{ m @ Fouled (B) + (C)}
 \end{aligned}$$



8.4.8 Common header of Condenser Individual Outlet to Seal Pit Inlet
- Design Condition

Flow rate 93,400 m³/h
 Q = 93,400 m³/h
 v = 2.62 m/sec
 D = 3.55 m
 Area = 9.90 m²
 L = 350 m
 ρ = 1,029 kg/m³
 μ = 0.86 centipoise
 Re = 11133791
 f = 0.011 @ Clean
 0.013 @ Fouled

1) Loss by Pipe

$$H_L = f \times \frac{L}{D} \times \frac{v^2}{2g}$$

$$= 0.011 \times \frac{350}{3.55} \times \frac{6.87}{19.62}$$

$$= 0.38 \text{ m @ Clean (A)}$$

$$= 0.46 \text{ m @ Fouled (B)}$$

2) Loss by Fitting

- a. K Value of Bend (From Fig. 9.2, page 141 of Internal Flow)
90° Bend

$$K_b = 0.16 @ r/d \text{ of } 2$$

- b. K Value of Combining Flow (From Fig. 13.11, page 226 of Internal Flow)

$$\text{Area Ratio, } \frac{A_1}{A_3} = \frac{2.2^2}{3^2} = 0.58$$

$$\text{Flow Ratio, } \frac{Q_1}{Q_3} = \frac{23,350}{93,400} = 0.25$$

$$K_{32} = 1.35$$



c. Total K value

Fitting	K value	Q'ty	Total K	Remarks
Increaser	0	0	0	
Expansion joint	0.1	0	0	Assumed
Combining Flow	0.58	1	0.58	
Dividing Flow	0.03	0	0	
45° Bend	0.09	0	0	
90° Bend	0.16	3	0.48	
Butterfly valve	0.3	0	0	
Exit	1	1	1	
Total			2.06	

$$H_L = 2.06 \times \frac{2.62^2}{2 \times 9.8} = 0.722 \text{ m} \quad (C)$$

3) Subtotal

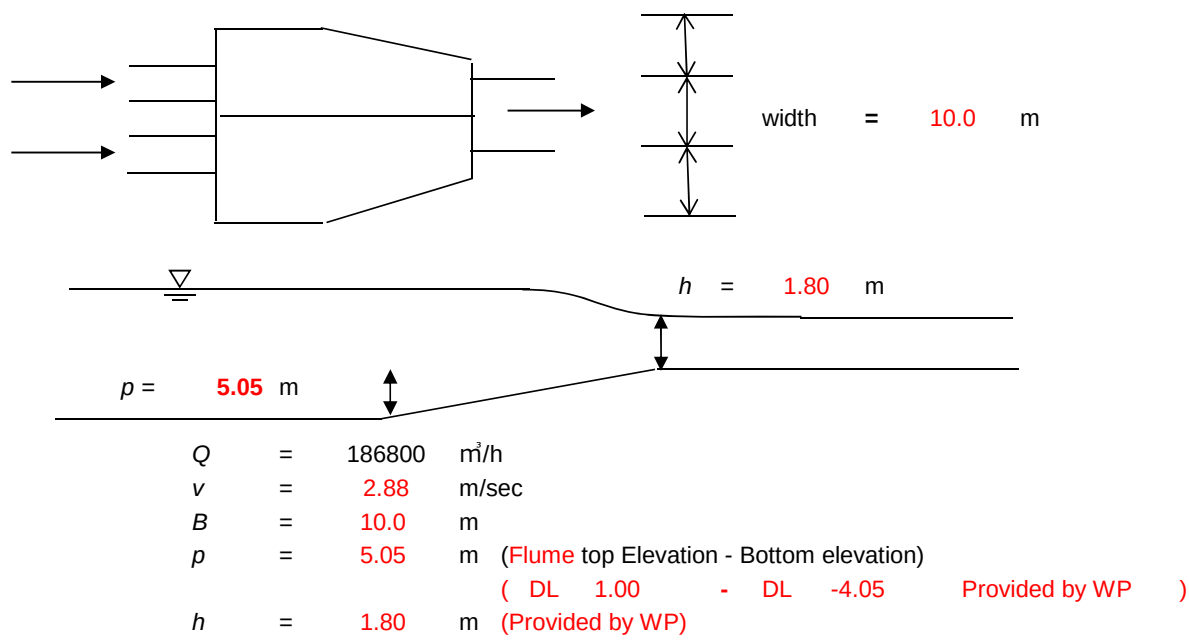
$$\begin{aligned}
 &= 1) + 2) \\
 &= 0.38 + 0.722 = 1.10 \text{ m @ Clean} \quad (A) + (C) \\
 &= 0.46 + 0.722 = 1.18 \text{ m @ Fouled} \quad (B) + (C)
 \end{aligned}$$



8.4.9 ~~Weir~~ Flume Crest pr. Drop

$H_L = 2.22 \text{ m}$ (@ Clean & Fouled)

- Design Condition (Provided by WP)



1) Velocity Head

$H_v = \frac{2.88^2}{2 \times 9.8} = 0.42$



2) Water Depth

$$Q = C \frac{\sqrt{2g}}{3} B h^{3/2}$$

$$C = 0.605 + \left(\frac{1}{1000h} + \frac{0.08}{p} \right) (1 + \epsilon)$$

If $p \leq 1\text{m}$ then $\epsilon = 0$

$p > 1\text{m}$ then $\epsilon = 0.55(p - 1)$

$$\begin{aligned} Q &= 1 \text{ CWP (100\% X 2)} \\ &= 186800 \text{ m}^3/\text{h} = 51.89 \text{ m}^3/\text{s} \\ C &= 0.6618 \\ B &= 10.0 \text{ m} \\ p &= 5.05 \text{ m} \end{aligned}$$

Where

$$\begin{aligned} Q &= \text{Flow rate} && \text{m}^3/\text{s} \\ C &= \text{Flow Coefficient} \\ g &= \text{Acceleration of Gravity (9.81)} && \text{m/s}^2 \\ B &= \text{Weir Width} && \text{m} \\ h &= \text{Water level over weir crest} && \text{m} \\ p &= \text{Height of weir} && \text{m} \end{aligned}$$

$$h = \left(\frac{Q * 3}{C * 2 * \sqrt{2g} * B} \right)^{2/3}$$

$$h = 1.80 \quad (\text{Provided by WP})$$

$$\begin{aligned} \text{Subtotal} & \quad (@ \text{ Clean \& Fouled}) \\ &= 1) \quad + \quad 2) \\ &= 0.42 \quad + \quad 1.80 \\ &= 2.22 \end{aligned}$$

8.4.10 From Seal Pit to discharge (buried concrete pipe)

Losses from flume to discharge outfall are very small and will be neglected.

8.4.11 Discharge Friction Loss

$$\begin{aligned} H_L &= \text{Para. 8.4.1} + 8.4.2 + 8.4.3 + 8.4.7 + 8.4.8 + 8.4.9 \\ &= 0.24 + 4.15 + 0.08 + 0.20 + 1.10 + 2.22 \\ &= 8.00 \text{ m} \quad (@ \text{ Clean}) \\ &= 0.25 + 4.77 + 0.09 + 0.208 + 1.18 + 2.22 \\ &= 8.72 \text{ m} \quad (@ \text{ Fouled}) \end{aligned}$$



8.4.12 Total Discharge Friction loss with Condenser and Ball Strainer losses

$$\begin{aligned} &= \text{Para. 8.4.11} + 8.4.4 + 8.4.5 + 8.4.6 \\ &= 8.00 + 4.836 + 0.25 + 0.66 \\ &= 13.75 \text{ m} \quad (\text{@ Clean}) \\ &= 8.72 + 6.00 + 0.50 + 1.32 \\ &= 16.54 \text{ m} \quad (\text{@ Fouled}) \end{aligned}$$

8.5 Static Head

$$8.5.1 \text{ Condenser Top Tube Elevation} = \text{EL DL} - 11.15 \text{ m}$$

$$8.5.2 \text{ Weir Flume Crest Elevation} = \text{EL DL} - 1.0 \text{ m}$$

$$\begin{aligned} 8.5.3 \text{ Static Head} &= \text{Weir Flume Crest Height} - \text{LWL MWL} \\ &= 1 - 0.21 \\ &= 0.79 \text{ m} \end{aligned}$$

$$8.6 \text{ Syphon Loss (5\%)} = -0.39 \text{ m}$$

8.7 Total Dynamic Head

$$= \text{Suction Friction Loss} + \text{Discharge Friction Loss} + \text{Static Head} + \text{Syphon Loss}$$

$$= \text{Para 8.3} + \text{Para 8.4} + \text{Para 8.5} + \text{Para 8.6}$$

$$= 0.02 + 13.75 + 0.79 + 0.39$$

$$= 14.9 \text{ m} \quad (\text{@ Clean})$$

$$= 0.2 + 16.54 + 0.79 + 0.39$$

$$= 17.9 \text{ m} \quad (\text{@ Fouled})$$

TDH considered the design margin of 5% is ;

$$= 15.7 \text{ m} \quad (\text{@ Clean})$$

$$= 18.8 \text{ m} \quad (\text{@ Fouled})$$

Selected TDH is determined as the fouled condition.

$$= \underline{19} \text{ m}$$



DOCUMENT SUBMISSION STATUS: FC

NOTE:

2	14 Jan , 2013	Revised as per comments	D.H.Choi	K.H.Lee	K.S.Nam	Y.H.Kim
1	14 Dec., 2012	Revised as per comments	D.H.Choi	S.H.Song	K.H.Lee	Y.H.Kim
0	21 Nov., 2012	ISSUED FOR CONSTRUCTION	D.H.Choi	S.H.Song	K.H.Lee	Y.H.Kim
A	21 Sep .2012	ISSUED FOR APPROVAL	D.H.Choi	S.H.Song	K.H.Lee	Y.H.Kim
REV	DATE	DESCRIPTION	PREP	CHKD	APRD	APRD

OWNER



VIETNAM OIL AND GAS GROUP (PVN)

OWNER'S CONSULTANT

FICHTNER
GmbH & Co. KG

FICHTNER



PVPOWER PCC

EPC CONTRACTOR



PETROVIETNAM CONSTRUCTION JOINT
STOCK CORPORATION (PVC)

EPC CONTRACTOR'S CONSULTANT



WORLEYPARSONS

POWER ISLAND PACKAGE SUPPLIER



PROJECT TITLE

THAI BINH 2 THERMAL POWER PLANT 2 x 600MW

WORK TITLE / DRAWING / DOCUMENT TITLE

TECHNICAL SPECIFICATION FOR COOLING WATER PUMP

	FUNCTION	NAME	SIGN	DATE
	DRWN	D.H.Choi		14 Jan. 12
	CHKD	K.H.Lee		14 Jan. 12
	APPD	K.S.Nam		14 Jan. 12
	APPD	Y.H.Kim		14 Jan. 12
DOCUMENT No: TB2-SDC-01PAC-M-M4-SPC-0001			SHEET No : 51 pages	SCALE
				REV. 2

[illegible]

Document Review Comment Sheet

No.	Owner's Comments	Item status	DAELIM's Response
I	General Comments (TB2-SDC-PEB-TE-0106)		
1	Please resubmit the document for Approval as Rev.B	Closed	Kindly note that this technical spec. was provided with the approval status of "B" as per TR No. of TB2-PEB-SDC-TE-0053 dated on 23 of Oct., 2012. So, DAELIM issued the document as Rev.0, and provided with the approval status of "C" by TB2-PEB-SDC-TE-0126 dated on 05 of Dec. 2012. Hence, DAELIM kindly inform PVC that the revision status of this document is Rev. 1 for Construction.
2	Please reply Owner's comment of technical specification for cooling water pump as attached file (Transmittal No. TB2-TB2PP-PEB-T-M-00121 dated 07th Sept, 2012)		Confirmed. Later, please provide the native file of comment sheet as well as PDF file, in case that interactive communication is required. already sent to SDC.

Document Review Comment Sheet

No.	Owner's Comments	Item status	DAELIM's Response
I	General Comments (TB2-SDC-PEB-TE-0106)		
I	General Comments (TB2-PEB-TB2PP-M4-ENG-00001)		
1	Missing content in a standard technical specification for Pump should be included following: - Spare parts& special tools - Test and inspection at shop	Closed	Confirmed. 1. Start up and commissioning spares added in cl. no. "2.2 X". 2. Shop inspection and testing is already incorporated in the cl. No.2.2 & 5.9.
2	Detail Codes & Standards shall be indicated detail such as ANSI/ HI 1.3 Rotate Dynamic (Centrifugal) Pump for design and application, IEC/66034- Rotating electric machine, etc.		Confirmed. Incorporated under cl. No.3.0 (u& v) The Codes and Standards has been incorporated as detail as possible at this moment.
3	Requirements regarding electrical, instrument & control, coating (refer to Section 9,Section 11, etc of EPC Contract) shall be included.	Closed	Confirmed. a) Please refer to clause no. 5.2.12 for "Coating requirements for Pumps". b) All general electrical and I&C requirements will be included in DAELIM's purchase orders issued to equipment suppliers. Kindly inform that DAELIM's purchase order documents are consist of three parts. (Material requisition + Technical specification + EPS contract documents + etc....). So, All EPS Contract requirements will be included and equipments will be provided as per EPS contract. Technical requirement for Electrical and I&C are included in item 5.3 and 5.4.

Document Review Comment Sheet

No.	Owner's Comments	Item status	DAELIM's Response
I	General Comments (TB2-SDC-PEB-TE-0106)		
II	Detail Comments		
1	Paragraph 2.0 :Scope		
1.1	Paragraph 2.1 : Scope: Please add items as following: - If CWP to be manufactured under licence shall be licensor's written guarantee. - 2.3 SI dimensions shall be used. Confirmed. Please refer to the Cl. No. 2.1 of revised specification.		-Incorporated in the clause no.2.1 -Incorporated in the clause no.2.2 T
1.2	Paragraph 2.2: Scope of supply		
	As per EPC Contract, Section I.4, paragraph 14.3.2 "100% Capacity elevated emergency lubricating water Tank and two 100% capacity emergency lubricating water pumps, each capable of supplying lube water to four -50%-capacity CW-pumps" shall be provided.	Closed	Kindly DAELIM informs that The emergency lubricating water pump & tank are not provided as per deviation accepted in A-36. But, As per EPS Contract, para. 14.3.2 of section 14 Cooling water system, Lubricating water system including river water lubricating pumps and basket type of strainers will be provided.
2	Paragraph 4.0 : Condition of services		

Document Review Comment Sheet

No.	Owner's Comments	Item status	DAELIM's Response
I	General Comments (TB2-SDC-PEB-TE-0106)		
2.1	The values of rated capacity (46200 M3/h) ,Total dynamic head at rated capacity (19.9m). etc. shall be calculated and indicated in CWP data sheet. These values should not be shown on the technical specification. SDC will revise the response to show: SDC confirm that the final capacity /TDH based on final heat balance diagram/CWP calculation will be conformed to CWP supplier.	Closed	The specified data is the result of CW pump calculation CW pump sizing calculation. The same is already submitted to owner. DAELIM regards that main technical values such as TDH and capacity should be specified in technical specification. SDC confirm that the final capacity /TDH based on final heat balance diagram/CWP calculation will be conformed to CWP supplier.
2.2	The requirements regarding design condition shall be verified (refer to EPC Contract Section 4.3.)	Closed	Relevant details indicated are as per EPS contract.
2.3	To be indicated at Pump Technical Specification Cooling water specification as shown in Exhibit 5 of EPC Contract.	Closed	Refer to "4.2.4 Sea Water Characteristics".
2.4	Material for Cooling water pump and Cooling water filling pump shall be in accordance with EPC Contract, and A35-Deviation. Confirmed. (Cl. No. 4.2.1 (G) of revised specification)		Confirmed. Incorporated in clause no.4.3.1.
3	Paragraph 5.0 : Detail design		
	Following requirements shall be supplemented into the technical specification of CWP:		Incorporated in the specification as follows:

Document Review Comment Sheet

No.	Owner's Comments	Item status	DAELIM's Response
I	General Comments (TB2-SDC-PEB-TE-0106)		
	a. Pump motor driver SDC will incorporate the technical requirement for pump motor driver (refer to Technical Specification for Condensate for information).		Confirmed. Incorporated in clause no.5.2.3.
	b. instrumentation and Control SDC will incorporate the technical requirement for Instrument and Control (refer to Technical Specification for Condensate Pump for information)		Confirmed. (Cl. No. 5.4 INSTRUMENTATION AND CONTROL REQUIREMENT) Incorporated in clause no.5.4.

Document Review Comment Sheet

No.	Owner's Comments	Item status	DAELIM's Response
I	General Comments (TB2-SDC-PEB-TE-0106)		
	c. Electrical SDC will incorporate the technical requirement for Electrical (refer to Technical Specification for Condensate Pump for information)		Confirmed. Incorporated in clause no.5.2.
	d. Welding	Closed	Confirmed. Incorporated in the clause no.5.7
	e. Noise Control	Closed	Confirmed. Incorporated in the clause no.4.5.1 P
	f. installation The response will be revised as: The installation and erection procedure shall be provided by Vendor		~~Installation of the pump is not in the scope of Pump Supplier, hence the details is not included in the Technical specification.~~ The installation and erection procedure will be provided by Vendor. Incorporated in the clause no.5.10

Document Review Comment Sheet

No.	Owner's Comments	Item status	DAELIM's Response
I	General Comments (TB2-SDC-PEB-TE-0106)		
	g. Casing	Closed	Confirmed.
	h. Piping and Appurtenances		Incorporated in the CI no.5.1.1.6
	i. Sealing		
	j. Protect coating	Closed	Confirmed. (CI no. "5.8.23")
	k. Name plate and labeling	Closed	Confirmed. (CI. No."5.5.1.2")
	l. Coupling and Guarding machine		Confirmed. (Incorporated in the CI no.5.1.1.9 of Design & Construction Requirement)
	m. Shipment Requirement	Closed	Confirmed. (CI. No."5.6 Preparation for shipment).
	n. Base plate		Confirmed. Incorporated in the CI no.5.1.1.2 of Design & Construction Requirement

Document Review Comment Sheet

No.	Owner's Comments	Item status	DAELIM's Response
I	General Comments (TB2-SDC-PEB-TE-0106)		
4	Item 6.0 "Drawing and Documentation requirements" shall be included in material requisition (MR) not in technical Spec. 4. Please add following documents to Section 6.1.2 - Material Test Certificates - Welding Procedure WPS+ PQR + Repair Procedure - Positive Material Identification (PMI) procedure for stainless and alloy steel material -Etc		To specify item 6.0 in technical specification is DAELIM's document format and It would be no problem to proceed in this way. And also, DAELIM kindly inform you that other technical specifications have been approved without this comment. If this requirement on document form shall be incorporated mandatory, Please notify it officially for all technical specification to comply with this requirement. Incorporated in the Technical specification of CWP under Clause no .6.1.2
5	Detail requirements for Shop Inspection; Tests as follows: a. Pump test and inspection shall include items as followings: - General - Inspection +Material Test Certificate + NDT report + Visual & Dimensional Inspection report - Dynamic Balancing Test - Hydraulic Test - Performance Test - NPSHR Test		Confirmed. Incorporated in the CI no.5.9 of Inspection and testing
	b. Preparation for shipment	Closed	Confirmed. Incorporated in the CI no.5.6 of Preparation for shipment

Document Review Comment Sheet

No.	Owner's Comments	Item status	DAELIM's Response
I	General Comments (TB2-SDC-PEB-TE-0106)		
6	Item 5.2.8 General requirement for piping: Piping requirements shall be included requirements accordance with EPC Contract, section 14, paragraph 14.4 . The CW pipes and fittings and Accessories shall be designed, manufactured/ fabricated and installed in accordance ti the AWWA standards: -AWWA C200: Steel Water Pipe-6 inch (15mm) and larger - AWWA C206: Field Welding of Steel Water Pipe - AWWA C207: Steel pipe Flanges for Waterworks Service-Sizes 4 in. Through 144 In. (100 mm through 3,600 mm). - AWWA C208: Dimensions for Fabricated Steel Water Pipe Fittings. - AWWA C210 : Liquid-Epoxy Coating Systems for the interior and exterior of steel water pipelines		Confirmed. The General requirement for piping has been added in the Technical Specification of CWP under clause no.5.1.10
7	Cooling water pumps and auxiliaries shall add bearing life rating		Those information shall be incorporated in data sheet for CWP as Vendor Print.

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1.0 GENERAL

1.1 Purpose

- 1.1.1 This specification defines the scope and minimum requirements for the design, materials, fabrication of a Cooling water pumps and cooling water pipeline filling pumps with all accessories described herein to be used in the thermal power plant in Thai Binh 2.
- 1.1.2 It is not the intent of this specification to specify all details of design requirements. It shall be the responsibility of the Supplier to supply the equipment that is in accordance with high standards of engineering and workmanship, suitable for the intended service as described herein, and consistent with general accepted standards and practice.

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2.0 **SCOPE**

2.1 The scope of work and equipment described in this specification is for one (1) sub critical thermal power plant. The power plant consists of Two (2) x 600 MW power generating units. If CW pumps to be manufactured under license, licensor shall furnish the written guarantee.

2.2 Scope of Supply

The Supplier's scope of supply shall consist of Cooling water pumps, cooling water pipeline filling pumps, associated accessories and appurtenances required for safe, reliable and efficient operation of the power plant.

The scope of supply shall consist of, but not limited to, the following

- A. Cooling water pumps complete with electric motor drives and all accessories.
- B. Design of the pump starting sequence and discharge valve operation at all operating condition in accordance with the pump protection requirements.
- C. Shaft sealing system.
- D. Motor bearing cooling system complete with accessories for each cooling water pump.
- E. Anti vortex devices.
- F. Blind flanges to seal off the pit operating for each pump.
- G. Couplings of approved design to connect the pump shaft directly with the motor shaft.
- H. Sets of base plates, support plates, grounding pads, thrust blocks, template, anchor bolts, nuts, etc.
- I. Each CW pump shall be supplied with 2x100% river water lubricating pump and 2x100% simplex basket type strainers including all internal/integral piping, valves, fittings, sight glasses, temperature indicators, pressure gauges, etc. The strainers shall be capable to clean during lubricating pump in operation.
- J. Temperature detectors for measuring pump & motor thrust bearing metal temperature and motor winding temperature
- K. Vibration monitoring devices
- L. Local oil level gauges & temperature indicator for thrust bearings
- M. Lifting lugs, eye bolts, assembly clips or other attachments as required to facilitate erection, assembly and maintenance

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- N. All flanges, gaskets, bolts and nuts for flanges for flange connections
- O. Special grouting materials other than general non-shrinkage cement mortar.
- P. Furnishing of document, data, drawings, manuals, etc.
- Q. Shop test and inspection.
- R. Sump model test and video recording
- S. Cathodic protection
- T. **SI dimension shall be used**
- U. Local control panel or local control station.
- V. All cable between motor and local control panel.
- W. The following miscellaneous items
 - 1) Associated distribution piping and valves
 - 2) All drainage system, including piping, valves, header and accessories
 - 3) Shop tests and inspection
 - 4) Furnishing of all documentation and relevant drawings
- X. Spare parts for start-up and commissioning
- Y. Special tools and test equipment
- Z. Spare parts for two (2) years operation **(optional)**



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3.0 **CODES AND STANDARDS**

3.1 The latest edition and addenda of the following publications in effect on the date of Contract Award are part of the specification and, where referred to by title or basic designation only, are applicable to the extent indicated by the specific reference. The equivalent codes and standards may be used. However, the equivalency must be demonstrated to the satisfaction of the Purchaser.

- A. American National Standards Institute (ANSI)
- B. American Society of Mechanical Engineers (ASME)
- C. American Society for Testing and Materials (ASTM)
- D. American Welding Society (AWS)
- E. Hydraulic Institute Standards (HI)
- F. American Petroleum Institute Standards (API)
- G. Manufacturers Standardization Society (MSS)
- H. Occupational Safety and Health Act./Administration (OSHA)
- I. American Society of Non-Destructive Testing (ASNT)
- J. Instrument Society of America (ISA)
- K. International Electro technical Commission (IEC)
- L. Steel Structure Painting Council (SSPC)
- M. Tubular Exchanger Manufacturers Association (TEMA)
- N. British Standards Institution (BSI)
- O. Deutsches Institut fur Normung (DIN)
- P. Japanese Industrial Standards (JIS)
- Q. Pipe Fabrication Institute (PFI)
- R. **AISI 326-09 : Detailing for Steel Construction**
- S. **ASME Code Section II: Material (2010 Edition and 2011 Addenda)**
- T. **ASME Code Section V: Nondestructive Examination**

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- U. ASME Code Section IX: Welding And Brazing Qualifications
- V. ASME B 16.5-2009: Pipe Flanges and Flanged Fittings.
- W. ASME B 16.9-2007 : Factory Made Wrought Steel Butt Welding Fittings
- X. ASME B 16.25-2007: Butt Welding Ends.
- Y. ASME B 16.34-2004:Valves-Flanged, Threaded And Welding End
- Z. ASME B 31.1b-2009: Power Piping
- AA. ASW D 1.1-2010: Structural Welding Code , Steel
- BB. NFPA 85 : Boiler and combustion system Hazards Code
- CC. OSHA : Occupational Safety and Health Administration.
- DD. SSPC: Society for Protective Coating.
- EE. ASTM A572/A572 M Standard Specification for High strength Low Alloy Columbium Vanadium Structural Steel.
- FF. ASTM A36: Standard Specification for Carbon Structural Steel.
- GG. IEC/66034: Rotating electrical machines.
- HH. ANSI / HI 2.1 – 2.5: Hydraulic Institute Standard for Vertical Pumps
- II. ANSI / HI 14.6: Hydraulic Institute Standard Performance Testing of Pumps
- JJ. ANSI / HI 1.3 Rotate dynamic (Centrifugal) Pump for design and application
- KK. IEC/66034 – Rotating electric machine

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4.0 **CONDITIONS OF SERVICES**

4.1 Description of Service

The cooling water pumps consists of cooling water pumps, Start-up bearing cooling water pumps and strainers, cooling Water pipeline filling pumps and strainers. The main cooling water pumps for each power block provides cooling water to the condenser for condensing the steam turbine exhaust steam and for auxiliary system cooling.

The cooling water pumps shall conform to the design requirements specified in the Specification.

4.2 Site Data

The site data provided in this Specification thereto are to assist the Supplier in assessing site conditions in general. Such information is provided to the Supplier in good faith and the Supplier accepts responsibility for interpretation of such data. The Supplier shall decide the extent of additional testing and studies necessary to confirm the site data.

4.2.1 Site Ambient Conditions

BASIC PARAMETERS FOR METEOROLOGY DESIGN

A. Air Temperature based on Thai Binh Station

Extremely low air temperature	4.80	°C
Extremely high air temperature	38.0	°C
Yearly mean air temperature	23.3	°C
Mean air temperature in the coldest month	16.2	°C (January)
Mean air temperature in the hottest month	29.1	°C (July)

B. Air Moisture based on Thai Binh Station

Extremely low air relative moisture	20.0	%
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No.	Contents	Unit	Measured value			
			M1	M2	M3	M4
4	BOD5 (20°C)	mg/l	6.43 – 6.61	5.34 - 5.87	5.30 – 5.65	8.00
5	Suspended Solids	mg/l	102 – 146	23 – 45	21 – 35	10.00 – 12.00
6	Arsenic (As)	mg/l	0.001 – 0.002	0.017 - 0.036	0.011 – 0.018	0.005
7	Ammonia (NH ₄ ⁺)	mg/l	1.886 – 1.971	1.352 - 1.599	0.818 – 1.021	0.02 – 0.04
8	Cadmium (Cd)	mg/l	< 0.001	< 0.001	< 0.001	0.103 – 0.114
9	Lead (Pb)	mg/l	0.013 – 0.026	0.001 - 0.004	0.001 - 0.002	0.098 – 0.104
10	Chromium III (Cr ₃ ⁺)	mg/l	0.008	0.010 - 0.011	0.008 – 0.009	0.001 – 0.002
11	Total Chloride (Cl ⁻)	mg/l	-	-	-	8,609-8,964
12	Residual Chlorine	mg/l	-	-	-	0.002
13	Copper (Cu)	mg/l	0.002 – 0.009	0.002	0.002	0.070 – 0.102
14	Fluoride (F ⁻)	mg/l	0.05	0.10 - 0.12	0.09 – 0.10	0.355 – 0.401
15	Zinc (Zn)	mg/l	0.02 – 0.05	0.03 - 0.04	0.03 – 0.05	0.182 – 0.204
16	Manganese (Mn)	mg/l	0.12 – 0.28	0.02 - 0.04	0.01 – 0.03	0.042 – 0.063
17	Iron (Fe)	mg/l	1.14 – 1.78	0.43 - 0.66	0.51 – 0.57	0.056 – 0.183
18	Mercury (Hg)	mg/l	0.0003	0.0003 - 0.0005	0.0002	Trace
19	Sulfur (H ₂ S)	mg/l	-	-	-	-
20	Cyanide (CN ⁻)	mg/l	< 0.01	< 0.01	< 0.01	Trace
21	Total Phenol	mg/l	< 0.005	< 0.005	< 0.005	0.007 – 0.010
22	Coliform	MPN/ 100ml	331 - 340	187 - 204	210 - 284	400
23	Salinity	‰	0.7 – 1.0	2.8 - 4.3	1.9 – 3.1	-
24	TDS (Total Dissolved Solids)	g/l	-	-	-	29.3 – 49.5

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4.3 Design and Operation Conditions

Each cooling water pump & auxiliaries shall be designed for the following conditions.

- A. Cooling water design temperature : 30.5 °C
- B. Specific weight of fluid : 1,029 kg/m³
- C. Cooling water type : Sea water

4.3.1 Cooling water pumps

- A. Number of pumps : Total Four (4)
(2x50% per 600MW Unit)
- B. Type : Direct driven, constant speed, vertical suspended, single or multiple stage, mixed flow, bowl type, Non-pull out
- C. Rated capacity : 46,200 m³/h @ design condition
- D. Total dynamic head at rated capacity : 20 m
- E. Seal type : Gland Packing
- F. Location : Indoor
- G. **Material of Construction**
 - a. Impeller : Duplex SS
 - b. Casing : Stainless Steel 316L
 - c. Shaft : Stainless Steel 316L
 - d. Pump discharge connection flange type : **Stainless Steel 316L**

4.3.2 Cooling water pipeline filling pump

- A. Number of pumps : Total Two (2)
- B. Type : Vertical wet pit, Temporary installed
- C. Rated capacity : 2,180 m³/h
(capable to fill up CW piping for one (1) 600MW unit within 16 hours)

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- D. Total dynamic head at rated capacity : 10 m
- E. Seal type : Gland Packing
- F. Location : Indoor

G. **Material of Construction**

- a. Impeller : Duplex SS
- b. Shaft : Stainless Steel 316 L
- c. Casing : Stainless Steel 316 L
- d. Pump discharge connection flange type : Stainless Steel 316 L
- e. Performance Guarantee



The supplier shall guarantee that the cooling water pumps shall operate without exceeding the vibration and noise emission limits, as specified in this specification and the relevant codes and standards, throughout the range of operation. The cooling water pumps shall be capable of continuous and satisfactory operation supported on the supplied structure under all specified conditions of operation and shall meet the following guarantee parameters as specified in the data sheets by the supplier.

- A. Rated capacity
- B. Total dynamic head at the rated capacity
- C. Minimum submergence at runout capacity
- D. Efficiency at the rated capacity
- E. Power consumption at the rated capacity at motor input terminal.

4.4 Design Requirements

4.4.1 Cooling Water Pumps and Cooling water Pipe Line Filling Pumps:

- A. The design, manufacture, installation and testing of the equipment, material and work shall be in accordance with the requirements and recommendations of all appropriate internationally recognized and accepted Codes and Standards.
- B. Only reliable equipment requiring minimal maintenance shall be used. Skid mounted equipment shall be provided where appropriate.
- C. Easy access is necessary from the ground floor or from an installed platform to each valve, instrument, man way, utility connection, etc.

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- D. The pumps shall be of the direct driven, constant speed, vertical suspended, single or multiple stage, mixed flow, bowl type.
- E. The pump radial shaft bearings shall be water lubricated cutless rubber sleeve type.
- F. The pump thrust bearing shall be of ample capacity to carry the weight of rotating parts plus the hydraulic thrust and shall be readily accessible for inspection.
- G. The design of the CW pumps and motors shall be so that no critical speed is within 25% of pump operating speed.
- H. Pump submergence shall be so the NPSH available based on low water level shall be greater than the NPSH required by the pump, on the basis of 0% reduction in pump head at one pump runout capacity or at 120% of the design capacity, whichever capacity is greater.
- I. One pump runout is defined by the intersection of the one pump characteristic curve and the system head curve.
- J. Each pump shall be designed so reverse rotation at the runaway speed caused by reverse water flow under maximum head will not cause damage to any of the components of the pump.
- K. The pumps shall be designed to pass any foreign object having a maximum diameter of 25mm without damage to the pumping elements.
- L. The CW pump discharge flange shall be above the water level.
- M. The stuffing box sealing shall not require a normal fresh water supply.
- N. Pump design and tests shall be in accordance with the Hydraulic Institute Standards.
- O. Thrust bearing of adequate size and capacity shall be provided to take the vertical thrust of the impeller arising out of the pump operation and dead weight of the rotating components. Life of the thrust bearing shall be guided by the design standard of the pump. Thrust bearing shall be capable of running continuously at maximum load.
- P. The supplier shall design and select the pump with noise level not exceeding 85 dB (A) at a distance of one meter from the pump under operation conditions including start-up, normal and emergency operations
- Q. The CW pump motors shall be selected in accordance with this specification.

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5.0 DETAIL DESIGN

5.1 MECHANICAL REQUIREMENT

5.1.1 Design & Construction Requirement

Pumps shall be of vertical shaft, complete with bowl, column pipe, discharge head and base plate with all accessories. Design and constructional features of the pumps shall be as follows:

5.1.1.1 Bowl Assembly

This will be either a single or multi-stage centrifugal, mixed flow or axial flow type with discharge co-axial with shaft. Type of impeller shall be chosen on the basis of the pump specific speed and the characteristics of handling fluid.

Pump(s) shall have provision for adjustment of impellers in vertical direction from an accessible location, preferably at the housing (where separate thrust bearing for the pump is provided). The adjustment mechanism must take into consideration the extension of the line shaft due to hydraulic down thrust, weight of the shaft and impeller.

5.1.1.2 Base Plate

A common base plate mounting both for the pump and motor shall be furnished. The base plate shall be fabricated steel and rigid construction, suitable ribbed and reinforced.

Each pump will be provided with a heavy structural steel base plate.

5.1.1.3 Discharge Head

Pump(s) shall be above floor type.

In case, expansion joint is to be used at the pump discharge, pump base plate shall either be adequately designed to take the unbalanced forces and moments from the use of such expansion joint or a separate thrust block at the pump discharge head shall be provided to transmit these forces to the external supporting structure. Calculation of thrust load shall be done considering the highest pressure seen by the pump and internal diameter of the arch of the expansion bellow.

5.1.1.4 Column pipe

Column pipe shall be flanged and of bolted connection. Column pipes shall be designed for full internal vacuum.

In case of multi-piece column pipe and shaft assembly, the design shall permit raising/lowering of the pump assembly piece by piece without any difficulty. Any fixtures, clamps, etc. necessary for

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such purpose shall be supplied by the Contractor under this section. The Contractor shall also submit a write-up describing clearly the procedure of handling the pump.

5.1.1.5 Impeller shaft, line shaft and head shaft

Shaft size shall be selected on the basis of maximum torque to be applied on the pump shaft.

Impeller shaft shall be guided by bearings provided in each bowl or above and below the impeller shaft assembly. The butting faces of the shaft shall be machined square to the assembly and the shaft shall be chamfered at the edges.

Line shaft may be of single or multiple pieces as required. In case of multiple pieces, line shaft shall be coupled as per the standard practice of the manufacturer. For screwed coupling, screw directions shall permit tightening of the joint during pump operation.

Replaceable shaft sleeves shall be furnished at applicable locations, particularly under stuffing box and at other locations, as considered necessary.

5.1.1.6 Seal rings

Replaceable seal/wear rings both on impeller and on casing shall be provided in case it is asked for in the annexure.

5.1.1.7 Shaft bearings

Adequate number of properly designed bearings shall be provided for smooth and trouble-free operation of the pump. Number of bearings shall consider the number of shaft pieces used and the critical speed of the shaft.

Complete lubrication arrangement shall be furnished.

5.1.1.8 Thrust Bearing

Thrust bearing of adequate size and capacity shall be provided to take the vertical thrust of the impeller arising out of the pump operation and dead weight of the rotating components. Life of the thrust bearing shall be guided by the design standard of the pump. Thrust bearing shall be capable of running continuously at maximum load.

Thrust bearings shall be either grease or oil lubricated. Lubrication arrangement shall be such that the lubricant does not contaminate the handling fluid. The arrangement shall also be adequate to protect the bearing, while the pump coast down to stop in case of power failure of the station. Pre-lubrication of the thrust bearing, if recommended by the pump manufacturer, shall be taken care of in designing the lubrication system.

5.1.1.9 Coupling & Coupling Guard:

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The pump shall be connected to the motor shaft by a suitable coupling. Coupling bolt and nuts shall be provided with locking device to prevent the nut from becoming loose at normal and reverse rotation. Suitable arrangement shall be provided to adjust the vertical clearance of impeller.



5.1.1.10 Shaft Sealing System:

Shaft sealing system using gland packing shall be provided.

5.1.1.11 Piping & Appurtenances:

Complete piping and appurtenances like strainers, flow switches, valves etc shall be supplied for pump bearing cooling, sealing and lubrication purpose.

5.1.2 Drive Unit

The pump will be driven by constant speed electric motor.

Unless otherwise specified in annexures, drive element power rating shall be the maximum of the following requirements.

- A. 15% margin over the pump shaft input power at the rated working condition.
- B. 5% margin over the maximum pump shaft input power required within its operating range including the shut off point.
- C. Pump shaft input power required considering overloading of the pump assuming single pump operation in the event of tripping of the other pump(s) operating in parallel.

5.1.3 Maintenance Manual

The Contractor shall develop maintenance manuals for equipment supplied in this Contract.

The manuals shall be developed with the objective of providing standardized methods of performing preventive and corrective maintenance by maintenance personnel with different levels of experience.

For each piece of equipment supplied under this Contract, the following shall be developed:

- A. A step by step procedure covering preventive and corrective maintenance of the specific piece of equipment. Both types of maintenance shall be covered under one procedure, with each having its own relevant section,
- B. Detailed dismantling and assembly procedures with associated routine tests and checks prior to returning equipment to service,

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- C. Detailed assembly drawings and illustrations necessary to complement, support and clarify assembly procedures specified herein including parts lists and numbers for replacement ordering,
- D. Setting and running clearances and tolerances,
- E. Cleaning and preservation procedures,
- F. Instrument calibration requirements and procedures,
- G. A Preventative Maintenance Schedule for equipment covered by this Specification,
- H. A Lubrication Schedule showing requirements and Specifications for equipment covered by this Specification,
- I. Printed Circuit Board Schematics and Module Schematics,
- J. Detailed Drawings and method of use of Special Maintenance Tools, and
- K. List of Recommended Spare Parts.
- L. The draft maintenance manual shall be submitted 6 months prior to start of first commissioning activities or 24 months after the Commencement date whichever is the earlier.

5.1.4 CD-ROM

“As-built” Process and Instrumentation drawings, and final Design, Operation and Maintenance manuals shall, in addition to the twelve hardcopies, be provided in CD-ROM format and shall be based on Microsoft software. Two sets of the CD-ROMs shall be submitted to the Employer.

5.1.5 Factory Witness Tests

5.1.6 The time and duration of visits by the Employer’s representatives shall be finalized by the Employer after the submission of Inspection and Test Plan schedule.

5.1.7 Key activities to be witnessed by the Employer’s representatives shall include, but not necessarily be limited to the following:

- A. Motor control centers tests
- B. I&C equipment
- C. Other tests as required by the purchaser

5.1.8 The Supplier shall submit the Inspection and Test Procedures 3 months after Contract is awarded.

5.1.9 The shop test reports shall be submitted within 1 week after the completion of the test.

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5.1.10 General Requirements for Piping

Permanently and legibly mark pipe in general accordance with the guidelines in ASTM A700 and with information required by the applicable ASTM or ASME material specification. Marking shall not result in harmful contamination, reduce the effective minimum wall of the pipe, or create any sharp discontinuities. Marking shall withstand shipping, handling, storage at the job site, and shall remain legible during erection.

Mark each designed and prefabricated pipe section with paint or securely fastened metal tags that refer to the mark number indicated on the pipe erection drawings/spool sheets. Marking shall withstand shipping, handling, storage at the job site, and shall remain legible during erection. Markings shall be 180° apart and located at each end.

Use waterproof materials containing less than 100 ppm leachable chlorides for sealing austenitic stainless steel parts.

Properly protect all openings with watertight coverings to prevent the entrance of moisture, dirt, or debris. Protect projecting parts and machined surfaces with suitable metal or plastic caps, or equal methods. All end/opening protectors shall be sealed with a minimum of two (2) wraps of waterproof tape. Open ends and branches of shop fabricated pipe shall be securely closed as follows to protect the interior cleanliness and end surfaces during shipment.

Submit instructions for any special storage requirements a minimum of 90 days in advance of shipment to allow for necessary preparation. Identify any special materials, equipment, consumables, services, and procedures to properly store all items. The storage procedure shall include recommendations for on-site storage.

Unless otherwise specified, all materials and Equipment permanently incorporated in the Work shall be new, and both workmanship and materials shall be of utility quality. Materials and Equipment shall be as stated herein.

The Contractor shall hydrostatically test piping in accordance with the applicable Code and submit the results of testing to the Employer for the record.

The CW Pipes and Fittings and Accessories shall be designed, manufactured/ fabricated and installed in accordance with the AWWA standards:

- AWWA C200: Steel Water Pipe-6 inch (150mm) and Larger.
- AWWA C206: Field Welding of Steel Water Pipe.
- AWWA C207: Steel Pipe Flanges for Waterworks Service-Sizes 4 In. Through 144 In. (100 mm through 3,600 mm).
- AWWA C208: Dimensions for Fabricated Steel Water Pipe Fittings.
- AWWA C210: Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines.

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5.2 ELECTRICAL REQUIREMENT

5.2.1 VOLTAGE DISTRIBUTION AND REGULATION

The rating parameters and plant specifications are based on IEC Standards and the voltage levels of 10 kV and 400 V shall be adopted as follows:

- A. 10 kV, 3 phase 3 wire for motors rated above 300 kW and for bulk power distribution;
- B. 400 V 3 phase 3 or 4 wire, for motors rated up to 300 kW and for other 3 phase loads;
- C. 230 V A.C. 2 wire for small loads requiring single phase power;
- D. 220 V D.C. 2 wire for essential control circuits and emergency drives.

Equipment requiring AC power supply at voltages other than those described above shall be used only with the approval of Employer, and in such cases the Contractor shall provide devices to transform, regulate or control the specified power supplies to those required by the equipment. Total galvanic isolation shall be achieved between systems operating at different voltage levels.

Doors and front panel control switches shall be lockable, three sets of individual keys and five sets of master keys shall be provided for lockable items.

Equipment provided shall be entirely suitable for operation between the limits of variation in the specified A.C. power distribution system as described below:

- A. Under steady-state conditions the frequency may vary between 52.5 Hz and 47.5 Hz. with short-term excursions down to 46 Hz.
- B. Under steady-state conditions the voltage may vary between $\pm 5\%$ of nominal voltage, at 21 kV phase-isolated bus. Additional voltage drop at equipment load terminals due to cable impedance shall be a maximum of 5% of nominal voltage.

Equipment supplied shall be capable of withstanding complete loss of, or sudden restoration of, the A.C. power supply system without suffering any damage.

Wire used for internal wiring in a panel, switchboard, switchgear, distribution board and electrical equipment shall be flame-retardant and heat-resistant type of 90°C minimum temperature rating complying to BS 6231. Wiring shall have sleeve type identification. The information on the ferrules shall include the local terminal number and the remote panel and termination numbers. This format of numbering system shall be submitted to the Employer for the record.

5.2.1.1 Multicore Control Cables

The following requirements on control cables shall apply:

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Cables shall be manufactured in accordance with IEC 60502 having stranded copper conductors, with EPR or XLPE insulation, rated 600/1000 volt, separation taped, galvanized steel wire armor, CPE or LSZH sheath and CPE or LSZH outer sheath with circular cable construction.

Cables shall have 25% (1/4 cycle) overlapped aluminum/polyester laminated tape screen with 7/0.3 tinned copper drain wires. For relay/contact type systems operating at 230 V AC or 220 V DC the cables need not be screened.

Cable cores shall be colored white and each core shall be uniquely numbered in black in both words and numbers at a spacing not exceeding 100mm.

At least 4 cores or 10% of total number of cores of a cable (whichever is greater) shall be provided as spares. This does not apply to a two-core cable.

The conductor cross sectional area for relay/contact type systems shall be sized to meet the maximum voltage drop of 5%.

The minimum conductor cross sectional area for solid state type system shall be 0.5 mm².

5.2.1.2 Instrumentation Cables

The instrumentation cables shall have stranded, copper conductors with EPR or XLPE insulation, galvanized steel wire armor and CPE or LSZH outer sheath. The cores shall be formed a twisted pair or twisted triples depending on the application.

The cables shall have an overall screen. For added immunity against electrical interference the individual pairs of triples may also be screened. The screens shall be an aluminum/polyester laminate taped with a minimum 7/0.3 mm² tinned copper drain wire.

Each twisted pair or twisted triple shall be color and number coded.

The minimum cross sectional area of the conductors shall be 1.5 mm² for single pair or single triple cable and 0.5 mm² for multi pair or multi triple cable. For "resistance temperature device" (RTD) circuits the cross sectional area shall be such that voltage drop along the cable is minimized to ensure the required RTD accuracy.

At least 2 pairs or 10% of total number of pairs of a cable shall be provided as spares. This does not apply to single pair or single triple cable.

The conductor assembly shall be covered by a non-hygroscopic tape and overlaid by a shield of aluminum bonded polyester tape applied in a spiral wrap, overlapped one-half of its width.

5.2.1.3 Cables for High Temperature Applications

Ambient temperature above 55°C shall be considered as high temperature application.

Unless otherwise approved fire resistant cables shall be used for high temperature application.

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5.2.2 Control Circuit Wiring

This Clause covers connections for voltages not exceeding 400 V nominal and contained within enclosures such as switchboards, switchgear, control cubicles, and interpanel wiring. It does not include connections within specific components such as relays and circuit breakers.

5.2.2.1 Wire Construction

Insulation shall be EPR or XLPE of 0.6/1 kV voltage grade.

Conductors shall be made of copper complying with IEC 60228. Each conductor shall have at least seven strands.

The conductor cross sectional area shall be suitable for each particular circuit ensuring that temperatures do not exceed acceptable levels (as nominated by the wiring manufactures) under any normal or abnormal mode of operation.

In all cases, the size conductor shall be as follows:

- A. 1.5 mm² for less than 5 m long.
- B. 2.5 mm² for more than 5 m long.
- C. 0.5 mm² for hardwired circuit.

Note: Wiring for current transformers shall be at least 2.5 mm² irrespective of the route length. See Appendix 4 for Boiler Proper, Deviation K-46; current transformer wire size confirmed as 6 mm².

5.2.2.2 Current Transformer Circuits

Current transformer circuits shall use cables with 6 mm² minimum stranded copper conductors, insulated and jacketed in accordance with this Specification.

5.2.2.3 Special Control Cables

Special control applications may require extra flexible cables, high voltage co-axial signals cables, shielded multi-conductor and twisted pair cables.

The conductor size wherever possible shall not be less than 1.5 mm² stranded, to minimize cable damage during installation.

Cables for communication between Instrumentation and Control equipment shall meet the requirements specified in the Instrumentation and Controls section of this Specification.

5.2.2.4 High Temperature Instrument Circuits

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Where instruments such as limit switches, pressure switches, transmitters and RTDs are at high ambient temperature areas (55°C and above), they shall be wired with fire resistant cables up to a junction box and following the grouping procedure specified from the junction box to the I/O Cabinet, motor control center, switchgear panel or control desk. A trunk control cable in accordance with the requirements of this Specification shall be used.

The fire resistant cables shall be installed in an above ground conduit system to the instrument or marshalling box. The system shall be rated for operation at 105°C, 185°C or 250°C shall be used depending on the application.

5.2.2.5 Junction and Pull Boxes

Junction and pull boxes shall be approved type made of galvanized sheet steel or cast aluminum and shall have gasketed covers secured by cadmium plated steel screws. Boxes shall be sized and of rigid construction and shall have a degree of protection of IP 55. In no case shall the steel sheet be less than 1.5 mm.

Boxes above floor level shall have drain holes to permit condensed moisture to escape. Boxes shall be securely mounted, shall be plumb with surrounding structures and shall be fastened in place independently of conduits or cables entering them.

5.2.3 Motor

5.2.3.1 General

5.2.3.1.1 The motors shall be defined as the rotating electrical ones. With the exception of DC Motors, all motors sized between 0.75kW and lesser than 300kW shall be squirrel cage induction motors rated at 400 volts, 3-phase, 50 Hertz. Motors larger than 300kW shall be squirrel cage induction motors rated for use on a 10kV nominal system, 3-phase, 50 Hertz. Motors less than 0.75kW, shall be single phase and powered from 230VAC. All DC motors shall be rated at 220 volts DC

5.2.3.1.2 The motors shall be designed and constructed in accordance with IEC 60034 or ANSI Standard C50.41 NEMA Standard MG 1 and NEMA for performance.

5.2.3.1.3 The motor supplier shall have sufficient supply record for the similar to that proposed in response to this specification to demonstrate the reliability of the motor.

5.2.3.1.4 The motors shall have the following tests completed in the factory at a minimum:

- ✓ Measurement of winding resistance
- ✓ No-load readings of current and speed at normal voltage and frequency.
- ✓ Current input at rated frequency with rotor at standstill for squirrel-cage motors. This may be taken single-phase or polyphase at rated or reduced voltage. (When this test is made single-phase, the polyphase values of a duplicate machine should be given in any report.)
- ✓ Measurement of open-circuit voltage ratio on wound-rotor motors.
- ✓ High-potential tests.

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5.2.3.1.5 The following tests shall be conducted after erection and installation:

- ✓ Winding resistance measurements.
- ✓ Insulation resistance test.
- ✓ Air gap and alignment check (motor assembled on Site).
- ✓ Direction of rotation check.
- ✓ Start time running test uncoupled.
- ✓ Vibration test.
- ✓ Temperature monitoring system calibration (if applicable).
- ✓ Bearings/lube oil temperature measurement.
- ✓ Bearing insulation resistance test.

5.2.4 Duty, rating and Motor Clarification

5.2.4.1 Motors shall be adequately rated for the accelerating and full continuous load duty requirements of the driven equipment at rated frequency.

5.2.4.2 Unless otherwise approved AC motors shall be three-phase, squirrel cage induction type with a rated speed not exceeding 1500 rpm and suitable for across the line starting. If any special starting equipment is required, it shall be provided with the associated motor and interconnecting cabling.

5.2.4.3 The motors shall be suitable for continuous full load operation at ten percent above or below the nominal supply voltage and with a simultaneous frequency variation of plus or minus five percent providing that the sum of the variations does not exceed ten percent.

5.2.4.4 Under certain conditions the voltage on the motor terminals for starting or during accelerating of the driven equipment may momentarily drop to 80 percent of normal. The motor shall be capable of accelerating the driven equipment safely under these conditions.

5.2.4.5 Under the most onerous service conditions for 1 minute with the supply at the motor terminals as low as 75% of system rated voltage with frequencies within the range 48.5 to 51 Hz, the motor shall be capable of providing the required torque to the driven equipment under these conditions.

5.2.4.6 Induction motors with the lowest locked rotor currents should be provided, based on the starting requirements of the driven equipment. The starting current of medium voltage motors shall not exceed six times of full load current, and starting current of low voltage motors shall not exceed eight times of full load current.

5.2.4.7 All motor nameplates shall also include the full information of the bearing numbers, including prefixes and suffixes, if any.

5.2.5 Insulation

5.2.5.1 Unless otherwise approved, the insulation system used on all motors shall be rated at Class F IEC 60034-1), but the limit of temperature rise shall not exceed that nominated in IEC 60034-1 for Class B insulation.

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- 5.2.5.2 For 10kV motors, the insulation system used on all motors shall be capable of withstanding the stress and fatigues due to the re-striking voltages associated with the making and breaking of currents using vacuum technology. Motors shall be tested in accordance with IEEE 512 or the equivalent IEC standard.
- 5.2.5.3 Windings shall be epoxy sealed, vacuum/pressure and post impregnated (VPI) with the entire stator subjected to a minimum of two treatments. Insulation systems for all motors shall be given an anti-abrasion coating. The winding end turns shall be adequately braced and supported to withstand the starting duty and bus transfer condition.
- 5.2.5.4 For high voltage motors the insulation system used shall be epoxy resin bonded mica. The insulation system shall be fully consolidated prior to slot insertion and the completed winding shall not be of vacuum or pressure impregnated with varnish. In addition, HV insulation impregnated insulation system could be applied with normal insulation system. After being insulated and slot inserted, the winding shall be treated with vacuum, or pressure impregnated insulation (application of VPI technology for motor insulation).
- 5.2.5.5 The insulation system shall not use natural rubber insulation around motor leads.
- 5.2.6 **Motor Enclosure and Cooling**
- 5.2.6.1 All motors shall be totally enclosed. The degree of protection to IEC 60529 provided by the enclosure shall be IP 54 for indoor motors and IP 55 for outdoor motors.
- 5.2.6.2 In all cases except special instances, the primary coolant shall be air. The preferred secondary coolant is air but water is acceptable, subject to the approval of the Employer, where manufacturer's standard or the overall pump/ motor/bearings system requires water to achieve an optimum standard design.
- 5.2.6.3 Unless otherwise approved, all motors shall be air cooled type and totally enclosed. They shall be provided with suitable means of drainage to prevent accumulation of water due to condensation and be provided with suitable means of breathing. All motors of the vertical spindle type shall be provided with a suitable enclosure of approved designs. All motors shall be waterproof type with IP54 enclosure as a minimum according to IEC Standard. Motors located in hazardous areas shall have flameproof enclosures certified by BASEEFA, UL listed or FM approved.
- 5.2.6.4 All motors provided with filtered air cooling or heat exchangers shall have a contact making thermometer fitted in the internal air circuit at the outlet of the air from the air cooler. Where contact-making thermometers are used, they shall be mounted away from the motor housing to prevent mal-operation due to vibration. The contacts shall be rated for alarm initiation.
- 5.2.7 **Anti-condensation Heaters**
- 5.2.7.1 All motors above 50kW shall be equipped with heaters to prevent moisture condensing on the insulation or metallic surfaces during shutdown periods. The heaters shall be suitable for 230 volts, AC single phase supply and shall be powered from a circuit breaker. The circuit breakers powering the motor space heaters shall be supplied and mounted in a separate power panel in the Motor Control Centers (MCC). The motor space heater circuit breakers for MV and LV Switchgear shall be a part of a dedicated anti-condensation heater supply bus. The heaters shall also be

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energized on disconnection of the motor's power supply by means of the motor starter auxiliary contacts.

5.2.7.2 Heaters shall be connected to a suitable single-phase AC supply derived from a dedicated anti-condensation heater supply bus for the MV and LV switchgear motors.

5.2.7.3 The heaters shall comprise at least two separate elements, each connected to its own terminals in terminal box. The heater elements shall be paralleled at these terminals. The rating of the heaters shall be such that, with one heater element out of service and with AC supply on the terminals of the remaining heater(s), the motor windings and insulating materials will be maintained at a temperature not less than 6°C above ambient temperature.

5.2.7.4 Heat shall be transferred to the windings by convection from heaters mounted on the motor frame. Heaters fastened to the windings are not acceptable. The surface temperature of the heaters shall not exceed 200°C. With the motor stopped and all heaters in service the temperature rise of the insulation shall be within 10°C - 30°C.

5.2.7.5 A permanent warning label shall be fitted in a prominent position on the motor indicating that heater supply remains alive even when the main motor power connections are disconnected.

5.2.8 General Construction

5.2.8.1 All screwed fastenings on motors installed outdoors or subject to severely corrosive, atmospheres shall be stainless steel or other approved corrosion-resistant material.

5.2.8.2 Motors shall be installed with packing of approved thickness provided between each motor and its bedplate to facilitate alignment. On motors 30 kW to 400 kW, side and end jacking screws shall be provided to facilitate alignment.

5.2.8.3 All devices needing attention while the plant is in service (e.g. thermometers and flow indicators) shall be located on the same side of the motor as the power cable terminal box.

5.2.8.4 All motors shall be provided with lifting eyes. In areas where lifting facilities are not available, all motors above 1 ton shall be provided with overhead structural beams designed for lifting the motors.

5.2.8.5 All outdoor motors shall be provided with an enclosure/housing.

5.2.8.6 All motors shall be provided with stainless steel markers to show the direction of rotation.

5.2.8.7 All motors shall be mounted with the possibility of carrying out a free-run test at its mounting at site. Exception shall be subjected to Employer approval.

5.2.8.8 Each motor shall be fitted with at least one earthing terminal consisting of a brass bolt or stud with brass type spring washer. The terminal shall have a cross-sectional area of at least half that of the power supply conductor with a minimum of 25 mm². 10kV motors shall have at least two earthing terminals.

5.2.9 Bush-gear, slip-rings and commutators

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- ✓ Brush-gear shall be arranged so that brushes may be changed quickly. The tensioning gear shall be arranged so that brush pressure will not change appreciably with brush-wear. Current loading in all brushes connected in parallel shall be effectively equal.
- ✓ Screws or nuts which must be loosened in changing brushes shall be captive.
- ✓ Under normal conditions of running and starting, the brush-gear shall run without sparking injurious to slip-rings, commutators or brushes. Detailed descriptions shall be provided by the Contractor for the following questions:
 - What provision would be made to guard against slip-ring and commutators flashover and, in particular, when the plant is required to start after extended periods at standstill.
 - What maintenance is necessary to prevent flashover?
 - What maintenance is necessary when the motor is subjected to long periods of running at light loads and no load?
 - Brush-gear compartments shall be separated from the rest of the machine. Their ventilation system shall be such that the brush-gear compartment is under positive pressure. The ventilation system shall be arranged to remove carbon dust and so prevent the dust being deposited on insulation surfaces, and shall be provided with inlet filters to prevent pollution of cooling air. The air inlet and discharge shall be arranged to prevent the ingress of water into the enclosure. Such separate compartments shall be provided with their own anti-condensation heaters.

5.2.10 Stator Windings

- ✓ High voltage windings shall consist of rectangular shaped conductors made up into preformed coils and installed in "open" slots. Random wound windings shall not be used.
- ✓ The material used for slot wedges shall not be subject to shrinkage in service. The "magnetic" wedges are not acceptable. Slot wedges shall be either sealed into position or suitably locked or trapped to prevent axial migration and vibration.
- ✓ For all high voltage motors, steps shall be taken to eliminate corona involving at least the application of semi-conductive tapes to the coils and the use of semi-conductive slot liners.
- ✓ Full details of proposed coil manufacture shall be given including the following information:
 - Type and thickness of strand and turn insulation material and method of application.
 - Type and thickness of main slot ground wall insulation and method of application including pressing details, release tapes, pressure and temperature.

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- Corona protection details of the slot portion including coil tape details and its application together with thickness and details of slot liners. Tapes shall extend beyond the slot entrance.
- Stress grading at slot exit, details of tape and application and extent beyond slot.
- End winding insulation, details of taping and curing method including sealing tape.
- Bracing details of the end windings including gap filler between coils, surge ring insulation and method to eliminate mechanical stress on coils at slot entrance/exit.
- ✓ The quality of bracing on all high voltage motors shall be suitable for re-energizing the motor on to a supply at 105% rated voltage with a minimum of 85% of residual flux in the stator. The windings and leads shall be braced and blocked so as to prevent loosening of any part of the winding. In this regard particular attention shall be given in vertical motors to prevent winding migration.
- ✓ All motor windings shall be brought out to terminal boxes of approved type. On high voltage motors all six ends of the windings shall be brought out, three on each side of the motor.

5.2.11 Stator (static)

- ✓ The design of high voltage motor stator cores shall be such that periodic re-tightening to ensure tight cores is not required. It is preferred that welded construction, spring-loaded bolts or dished cantilever type pressure plates be used.
- ✓ On high voltage motors core tooth supports shall be positively anchored to the stator pressure plates by welding or mechanical interlocking, e.g. hammerhead. Heavy section tooth supports shall not be spot-welded to laminations. However, the practice of spot-welding light I or L section spacers to provide vent ducts is acceptable provided the quality control methods applied are acceptable.
- ✓ On high voltage motors there shall be positive means of locating stator cores against circumferential or axial movement. Any locking keys, dowel pins etc., should be so fitted that in the event of movement the locking device does not fall out of its location.

5.2.12 Rotor

- ✓ The rotor design shall provide a rigid cage construction with the bars firmly wedged in the bar slots and solidly bonded to the end rings. The end ring assembly shall be such that it is free to move with the expansion of the bars with no distortion.
- ✓ The ability of the cage construction to provide satisfactory operation under repetitive starting cycles, and load cycling, shall be a matter of close attention during design and manufacture. This feature of the motor design shall be fully described with Tender.

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- ✓ The rotor shall be capable of the full over-speed requirement imposed by the driven equipment in the reverse direction.
- ✓ The rotor shaft shall be insulated from the stator frame at one bearing to prevent the flow of induced current. Shaft earthing shall be provided, if required.
- ✓ On high voltage motors the rotor lamination clamping plates shall be positively anchored to the motor spider. Heavy section tooth supports shall not be spot-welded to end laminations.
- ✓ Detailed description shall be provided on the arrangement of the cage end rings and cage bars on high voltage motors and information released service experience with the design offered.

5.2.13 Winding temperature detector

- ✓ Motors rated 200kW and above shall be provided with winding temperature detection.
- ✓ The stator winding shall be provided with six temperature detectors to provide stator winding temperature detection. These temperature detectors shall be resistance type, two per phase placed between coil sides within the slots at locations of greatest running temperature. Wiring from these detector to the terminal box shall be shielded against stray fields and protected from mechanical damage and shall be no smaller than 1.0 mm². All detectors shall be wired to the DCIS; it shall indicate the temperatures and also shall provide temperature alarms.
- ✓ Connections to temperature detectors shall be terminated in a separate terminal box.
- ✓ The temperature rise of the stator winding and lead insulation shall not exceed 80°C over an ambient temperature of 40°C as measured by RTD when delivering rated power. All insulation shall be non-hygroscopic. The neutral connections of the windings shall be made inside the terminal box.

5.2.14 Frame

- ✓ The motor frame shall be rigid fabricated steel construction. Fine steel mesh screening shall be installed over air vents and intakes to prevent access to the motor internals of rodents or large insects.
- ✓ A tapped machine boss with bolt and washer shall be provided for connecting the frame to the station earth system.

5.2.15 Terminal Box

- ✓ All terminal boxes shall be of the totally enclosed type designed to exclude the ingress of dust and moisture and sealed from the internal air circuit of the motor. All joints shall be flanged and sealed with gaskets of neoprene or other approved material. The terminal boxes including removable covers shall be fabricated from mild steel plate with fully insulated terminals or connectors and shall also be provided with a silica breather device.

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- ✓ A separate terminal box shall be provided for the power supply cables, each group of secondary connections (e.g. thermocouples and current transformers) and the anti-condensation heaters.
- ✓ Terminal boxes shall be of fabricated steel construction and shall provide the same degree of protection as that of the associated motor.
- ✓ Terminal boxes which are split in more than one direction and in which the gaskets meet to form a "T" junction will not be accepted. Cover gaskets shall be fixed firmly to either the cover or the box.
- ✓ For all motors, the construction of the terminal box shall have provision for rigidly-mounted stud terminals for connections to the terminals of the incoming power supply cables. The earthing terminal shall consist of a brass bolt or stud with brass spring & flat washers and nuts suitable for terminating the earthing conductor.
- ✓ All cables shall be terminated with ring lugs and spring washers. All motor windings shall be connected to the terminals and winding connection for star or delta application shall be done at the terminals. The cable lugs shall have hot-stamped sleeves with letters corresponding to the letters on the terminal.
- ✓ All terminal boxes shall have insulating barrier between adjacent terminals and between terminals and the wall of the terminal boxes. The Contractor shall be responsible for drilling and tapping holes in the gland plates to suit the appropriate cable glands.
- ✓ The Contractor shall propose "oversized" motor terminal boxes. Motor terminal boxes for motors rated more than 1 MW shall be "oversized" to facilitate termination of cables, stress cones, differential protection, surge capacitors, etc.
- Power cable terminal boxes and terminals

Power supply cable terminal boxes shall comply with the requirements of BS 4999, Part 145.

For high voltage motors the power cable terminal boxes shall be the pressure relief type with the vents arranged in such a way that the force of an explosion within the box cannot cause injury to personnel. They shall be phase segregated type so as to restrict any electrical breakdown to an earth fault. They shall be so rated that they will safely carry through faults of the levels and times expected to be present. They shall be fitted with dryness indicators using silica-gel or other similar material.

For motors rated more than 1MW at 10 kV, the provision and installation in the neutral terminal box a three-phase set of differential protection current transformers to IEC 60044 shall be provided.

The current transformers shall be toroidal in shape and installed with suitable brackets, clamping plates, removable sections of phase connections etc, a secondary connections terminal box

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containing stud connections shall be provided near the neutral terminal box in an approved position.

Rating plates for the current transformers shall be attached to the outside of the neutral terminal box.

Power supply cable terminal boxes shall be provided with cable lugs and internal supports all suitable for use with the cable to be provided. Cable lugs shall be suitable for use with copper cable.

Terminal boxes shall be suitable for dry type terminations

- Secondary Terminal Boxes and Terminals

Terminal boxes shall be provided for temperature detectors and anti-condensation heaters.

Terminal boxes for temperature detectors shall be provided with stud or tunnel type terminals. Each terminal shall be labelled to identify the thermocouples, resistance temperature detectors or thermostats, their type and polarity. A warning label shall be provided fixed to the outside of the box stating "Temperature Detector Terminal Box. Do Not HV Test".

The terminal box for anti-condensation heaters shall be provided with 8 mm minimum diameter stud terminals for each heater element and means of isolating from the supply the individual heater elements. A connection diagram shall be included in the terminal box.

5.2.16 Bearings

- ✓ Motor bearings shall be suitable for the application and details shall be provided for approval.
- ✓ Dual-element thermocouples shall be provided by the manufacturer for monitoring the metal temperatures of bearings of all auxiliaries and the associated driving motors where the motor rating is 200kW. All detectors shall be wired to the DCIS; it shall indicate the temperatures and also shall provide temperature alarms.
- ✓ All motors rated at 2000kW and above shall be fitted with sleeve type bearings and all vertical motors rated at 1500kW and above shall be fitted with segmental pad type thrust bearings on the top and sleeve guide bearings at the bottom. The bearings on the motor and the driven device shall be of similar design.
- ✓ Bearing thermocouples shall be terminated in the same terminal box as the winding temperature detectors.
- ✓ All HV motors shall have one pedestal insulated from the frame. For motors with double shaft extension a combination of one insulated bearing and one insulated coupled is preferred.
- ✓ The bearings shall be suitably sealed to prevent leakage of oil and entrance of dust and dirt.

5.2.17 Coupling

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- ✓ The couplings shall be of the limited end float type for the horizontal motors and shall be of the rigid adjustable type for the vertical motors.

5.2.18 Internals

- ✓ The shaft, rotor and stator cores, and other metallic internal surfaces of the motor, shall be treated to prevent corrosion due to the presence of surface moisture during prolonged shutdowns and shipments

5.2.19 Shaft Covers

- ✓ All parts of the rotor shaft external to the stator frame shall be suitably shrouded.

5.2.20 Vibration

- ✓ The first critical speed of the motor shall be a minimum of 130 per cent of rated motor speed to ensure that any critical speed of the motor driven equipment combination may be well removed from the rated speed.
- ✓ The maximum peak to peak displacement of the motor running at full speed uncoupled and supplied at rated voltage and when mounted elastically as defined in ANSI/HIS 14.6.

5.2.21 Sole Plates

- ✓ The Supplier shall supply sole plates and holding down bolts for mounting all horizontal motors.
- ✓ The sole plate design shall be such that they can be mounted on a rough concrete plinth and secured to the concrete with foundation bolts. Tapped holes shall be provided in the sole plates for the motor holding down bolts.
- ✓ The Supplier shall supply packing in random sizes for field alignment of the motors. The Supplier shall also provide dowelling holes in the motor feet and dowels for final fittings in the field.

5.2.22 Low Voltage Motors

- ✓ All low voltage motors shall have Class F insulation or better with only a Class B temperature rise.
- ✓ The motor shall satisfy the temperature rise limits in accordance with the Standards specified based on a 40°C ambient.
- ✓ Bearing, unless otherwise specified, shall be of the anti-friction, grease lubricated type, double shielded to prevent the entrance of dirt and water, with seals to prevent the migration of the lubricant from the bearing. Greasing connections shall be readily accessible.

5.2.23 10 kV Motors

- ✓ All 10kV motors shall have Class F insulation with only a Class B temperature rise. The insulation shall be vacuum pressure impregnated.

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- ✓ All 10kV motors greater than shall be powered via MV switchgears with adequate insulation margin between turns, for the motor design life, to cover the stress and fatigues due to the re-striking voltages associated with the making and breaking of currents using vacuum technology. Sample coils are to be tested to IEC60034.15.
- ✓ Four consecutive starts from cold state up to full speed must be possible, the second start must be possible immediately after the first, the third 20 minutes after the second and the fourth 20 minutes after the third.

5.2.24 Motor Control and Indication

- ✓ The general requirements for the motor control and indication shall be as outlined below. For some motors, special arrangements may be required and shall be shown by detailed designs.
- ✓ The Contractor shall provide all signals as required by the logic and as specified which shall be monitored by the DCIS and all commands from the DCIS to the motors. The Contractor shall provide and terminate all the wiring between his equipment and the DCIS. The Contractor shall supply the field interface and the requirements of the control devices to the Employer's approval.
- ✓ The Contractor shall also supply and install the wiring from the field devices including the MCC's to the DCIS.
- ✓ The Contractor shall also provide motor controls and indication lights on motor control center starters for low voltage motors as detailed in the Motor Control Centers Section of this Specification.
- ✓ All control and selector switches provided by the Contractor shall be key lockable. Three sets of individual keys and five sets of master keys shall be provided for all lockable items.

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5.3 Cathodic protection

General

The Cathodic Protection System shall be installed to provide, in conjunction with the appropriate plant material selection, a continuous protection from corrosive reaction by the river water, for the following:

A. Impressed Current Cathodic Protection System

- Condenser
- CW pipelines to and from Condenser
- Condenser CW Inlet Debris Filters
- Condenser CW Valves and Condenser Piping
- CW Screens, Screen Wash Pumps and Screen Wash Duplex Strainer
- CW Pumps and Discharge Valves including Lubricating Water Pumps and Strainers
- Filling Pumps
- Condenser Tube Cleaning Equipment including Ball Strainers, Ball Collectors and Ball Recirculation Pumps
- Condenser Exhauster Seal Water Coolers
- Vacuum Priming Units
- ACW Coolers
- ACW Pumps and Strainers
- Ferrous Portions of the CW System
- Chlorination River Water Booster Pumps and Strainers
- River Water Piping and Valves 150 mm diameter and above
- Any other metallic below-ground piping; such piping shall be provided with isolating flange gaskets for below/above ground transitions

B. Sacrificial Anode System

- Bar Screens, Stop gates and Guide Channels

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In addition, protection coatings, where stated in the Specification shall still be applied.

Please refer to Section 14.8 of TBFD-0-SP-ABC-MB00 – Cathodic Protection System for the technical requirements of all cathodic protection equipment and accessories.

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5.4 INSTRUMENTATION AND CONTROL REQUIREMENT

- 5.4.1 Each Unit, Common system and its auxiliaries shall be equipped with the Microprocessor based Distributed Control and Information System (DCIS). The system shall have functions such as regulating control, interlock and protection, sequence/on-off control, interface with operator, data acquisition and display, historical data storage and retrieval system, performance parameter calculations, SOE inputs storage and alarm processing. In addition, this system shall also be responsible for co-coordinated control of turbine and boiler, boiler control, boiler auxiliaries, turbine control, turbine auxiliaries, boiler and turbine protection, electrical system, water treatment plant (WTP), waste water treatment plant (WWTP), coal supply system, limestone preparation, FGD, Gypsum dewatering and disposal, ash handling plant and other ancillaries.
- 5.4.2 The control and monitoring system for each Unit and Common system shall be designed, manufactured and supplied by the same control equipment supplier to achieve the integration requirements and the standardization of operator and monitoring functions in the plant control room (PCR) at the Center Control Building (CCB).
- 5.4.3 The alarm and protection devices shall be supplied to bring the operators' attention to protect the operators and minimize equipment damages from abnormal process parameters and equipment malfunctions. Requirements included in the Specification illustrate the minimum extent of interlocking and equipment protection. Additional equipment and process protection are to be provided as required to make a complete safe and workable system.
- 5.4.4 The Contractor shall design and provide everything necessary for all process and equipment alarm, critical and tripping status to be remotely monitored at the PCR for operator access and operation. The Contractor shall also design and provide everything necessary for tripping points and pre-trip points to be monitored by the sequence of events system (SOE) in DCIS.
- 5.4.5 Instrumentation, electrical equipment and wiring for voltages in locations where fire or explosion hazards may exist due to flammable materials, gases or vapors, flammable liquids, combustible dust, or ignitable fibers shall comply with the relevant international and local safety standards as well as the requirements in this Specification.
- 5.4.6 See Appendix 2_ST Deviation; Deviation J-008; Explosion proof instruments and enclosures known as hazards shall be classified during detail design.
- 5.4.7 The power supply incomers to panels, DBs and Sub-DBs shall be provided with isolating breakers at the panel itself.
- 5.4.8 Wire terminations shall use only ring type lugs for current transformers and BMS trip circuits. Other wiring terminations shall use locking fork type compression lugs and if this is not possible, screw spring type terminal blocks shall be used. Each terminal shall utilize maximum of two connections only.
- 5.4.9 Miniature circuit breakers (MCB) shall be used instead of fuses in electrical circuits.

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- 5.4.10 Replacement items such as indicating lamps and fuses shall be standardized so as to reduce to a minimum the types and sizes to be held in stock. Indicating lamps shall be LED or neon type, without dropping resistor and visible clearly from outside of the panel from any angle.
- 5.4.11 Panels shall be earthed and the doors where electrical equipment is mounted shall have flexible earth connections.
- 5.4.12 Fans and filters for electrical equipment shall be mounted so it can be maintainable safely and conveniently without shutting down the system. Redundancy shall be provided for critical equipment.
- 5.4.13 Doors for use in Protection Relay Panels, Marshalling Boxes, Auxiliary Relay Panels and Control Panels shall be installed with internal fluorescent lightings operated by limit switches. Such circuit shall operate the lightings automatically when the doors are open.
- 5.4.14 Panels, cubicles, DBs, junction boxes and marshalling boxes shall have bottom cable entries. Circuit breakers shall be key lockable.
- 5.4.15 Doors on equipment and control switches located outside the control room shall be provided with facilities for locking.
- 5.4.16 Panels, equipment cabinets, control switches (outside PCR), enclosures and selector switches (outside PCR) shall be key-lockable. Master key arrangement for the total plant shall be finalized by the Employer during detail engineering stage.

5.4.17 **Pressure gauges**

Pressure gauges with ranges below atmospheric shall be related to absolute pressure while other pressure ranges shall be expressed as gauge pressure. Pressure gauges shall be calibrated in kPA. Manometers shall be calibrated in mmH₂O or mmHg.

Normal operating point shall be approximately 70 % of the dial range.

Locally mounted pressure gauges shall have a dial size of 150 mm minimum with black on white markings and 15 mm connection. Gauges for separate mounting shall be provided with 1/2 inch NPT (male) bottom connection. Gauges for separate mounting shall be provided with 1/2 inch NPT (male) bottom connection. The connections (male and female) shall be uniformed. Local gauge accuracy tolerance shall be the manufacturer's standard but not greater than ± 0.5 % of full scale range.

5.4.18 **Vibration measurements**

Vibration measuring devices shall be of the non-contacting transducer type and shall be designed and selected for operation in their particular intended environment. Vibration transducers shall be located at or adjacent to each machine bearing mounted in tapped holes in the bearing housing or by rigid bracket.

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Relative vibration shall be measured by the use of non-contacting transducers (proximity type) to measure the relative motion between the shaft and bearing housing.

Absolute vibration shall be measured by non-contacting transducers, measuring relative shaft vibration, in combination with seismic transducer (velocity type or accelerometer), measuring the support vibration. Both transducers shall be mounted close together so that they undergo the same absolute motion in the direction of measurement. Their conditioned outputs shall to be vectorially summed to provide a measurement of the absolute shaft motion.

The following instrumentation shall be provided:

- A. One event per revolution sensor (key phaser) on each shaft.
- B. Journal bearings shall have radial shaft relative displacement sensors (X-Y probes) mounted at 45° from the vertical centreline.
- C. Bearing housing shall have a velocity seismic transducer displaying vertical velocity in RMS.
- D. The thrust bearings shall have dual probes with voting logic monitoring the axial position.

Alarms and trips signals shall be provided for each bearing for both relative and seismic measurements.

Vibration measurements, alarm and trip indications shall be available in the CCR via the DCS.

The shaft relative displacement sensors shall be used for diagnosis, monitoring, alarm and emergency shutdown. The vertical seismic transducers shall be used for diagnosis, monitoring, and alarm.

The measurement of both relative and absolute shaft vibration shall be broad band so that the frequency spectrum of the machine is adequately covered.

5.4.19 Temperature measurements

The method of temperature measurement to be employed shall be selected for the particular application bearing in mind requirements for accuracy and reliability. Sensing elements for air, inert gas and radiant temperature measurements shall be complete with suitable protective sheath. For steam, water and hazardous applications, thermo wells shall be utilized.

Unless otherwise specified, resistance thermometer detectors (RTDs) shall be used only where they can be readily replaced without loss of plant capability. RTDs shall be to IEC 60751 Grade II using 3-wire connections for applications up to 450°C. On differential temperature measurements RTDs to IEC 60751 Grade I shall be used.

Thermocouples shall be used in accordance with the requirements of IEC 60584. Careful consideration shall be given to the design and installation of thermocouple systems to ensure that inaccuracies are not introduced into the measurement due to the use of unsuitable materials or by

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incorrect installation. Automatic cold junction compensation shall be provided as well as compensating cables of suitable size and material where required. Thermocouples shall be installed in such a way as to be capable of replacement with the plant in operation. A thermocouple shall not be connected to more than one receiving instrument. Dual element thermocouples shall be used with the second element as a spare.

Thermocouple open circuit shall be detected and failure alarm shall be generated via DCS.

Local temperature indicators shall be supplied with a thermo well and shall preferably be of the bimetallic type and of the multi-angle variety.

No temperature measuring system shall use mercury as its sensing medium.

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5.5 PLANT IDENTIFICATION

5.5.1.1 General

The International System of Units (SI) shall be used. The KKS numbering system shall be adopted for plant component classification and identification system. Numbering shall be from North to South and East to West.

5.5.1.2 Nameplates

Nameplates, process flow indication, identification labeling and warning signs shall be provided for Equipment throughout the Plant. Nameplates shall be in English with a minimum letter size of 6.4 mm.

SI Units shall be clearly stamped on nameplates. Nameplates including electrical panels shall be made of stainless steel and fixed with stainless steel screws or bolts. Lettering shall be of enamel or abrasion resistant paint.

Names and numberings of tanks, vessels, motors, heaters and equipment are to be written in bold sign writing on the respective shells or bodies of the tanks, vessels, heaters or equipment. The size, color and the orientation shall be submitted to the Employer for the record.

5.5.1.3 Pipe Marking

Un-insulated and insulated pipes including insulated pipes in trenches shall have pipe markings on the piping or jacket as applicable, complying fully with ASME A13.1, "Scheme for the Identification of Piping Systems".

5.5.1.4 Floor Level Labeling

Wall mounted signage consisting of 2.5 mm solid aluminum plate of minimum 25 micrometers anodizing, and etched with graphics, and coated with paint of approved color shall be provided at floors and platforms to indicate the allowable loadings. The signage shall be provided to indicate the floor levels at 4 prominent locations on every floor.

5.6 Preparation for Shipment

5.6.1 All apparatus shall be carefully packed for export shipment and storage at site in such a manner that it is protected against damage during transportation and all climatic conditions. The packing cases and packing materials are included in the Contract and shall become the property of the Company.

5.6.2 Key equipment shall be transported with monitoring dew meters within each transport case.

5.6.3 The Supplier shall clean all components and preserve and protect them on the basis that equipment and all accessories will be stored unprotected in the field for a minimum period of six (6) months.

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- 5.6.4 Prior to shipment, the equipment shall be completely drained and thoroughly dry. When such draining requires removal of plugs, drain valves, etc., the Supplier shall make sure that these parts are reinserted or reassembled prior to shipment.
- 5.6.5 All openings, nozzles, flanged, threaded and weld-end connections shall be provided with protection to prevent damage, corrosion and entrance of foreign matter during shipment and storage.
- 5.6.6 All openings shall be provided with substantial wooden or metal closure.
- 5.6.7 Flanged connections shall be protected by a 12mm or thicker plywood disc bolted to the face of the flange.
- 5.6.8 Threaded connections shall be protected with screwed or snap-in (snap-on) type plastic protectors.
- 5.6.9 Metal straps, fasteners or covers shall not be tag-welded to any manufactured part.
- 5.6.10 All electric and electronic equipment shall be packed to ensure against physical damage during shipment and storage, and shall be wrapped to protect against humidity and contact with water.
- 5.6.11 All exterior parts of the unit except for machined surfaces shall be painted in accordance with the specification.
- 5.6.12 Equipment shall be adequately supported for shipment. All loose parts shall be crated or boxed for shipment. Each box shall be approximately marked for identification purposes. Where shipment is braced internally, it shall be marked conspicuously, "Remove internal braces before testing and operating".
- 5.6.13 Spare parts shall be packed for long term storage.
- 5.6.14 The Supplier shall make suitable treatment for prevention of the rust and corrosion on the surfaces of the equipment and components during the sea transportation.
- 5.7 Welding
- 5.7.1.1 All welding, welding procedure qualifications, electrodes, preheat and post weld heat treatment, and welder operators' performance test shall be in accordance with ASME Section IX. The Supplier's ability to use the process shall be demonstrated to the Purchaser's satisfaction.
- 5.7.1.2 The supplier shall be responsible for the welding performed by its organization and shall establish its own welding procedures. The supplier and its sub vendors shall be responsible for the development and qualification of all Welding Procedure Specifications, welders, and/or welding operators required to perform the Work including the supply of all testing materials and filler material required for the qualification of these procedures.
- 5.7.1.3 All components shall be visually examined prior to assemble and painting. Welds and components appear sound and without defects, rough edges shall be trimmed and ground smoothly. Heat treatment inspection, painting inspection, packing inspection and shipping inspection will be done.

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- 5.7.1.4 All major components and assembled equipment shall be checked dimension in accordance with the Purchaser's acceptance drawing.
- 5.7.1.5 All components which interface with the Purchaser supplied equipment shall be checked after assembly to verify that all dimensions involved in the interface agree with those shown in the approved outline drawings.
- 5.7.1.6 When the equipment is put into service, the Purchaser will perform tests to determine whether the equipment meets the Supplier's guarantees.
- 5.7.1.7 The Supplier shall provide the Purchaser with detailed procedures for checking and testing of the equipment.
- 5.7.1.8 Upon completion of the installation of individual systems and at such time as designated by the Purchaser field tests shall be performed on all equipment, materials and systems in accordance with the Supplier's recommendations, testing standards or as directed by the Purchaser.
- 5.7.1.9 Visual & Dimensional Inspection report
- 5.8 PAINTING
- 5.8.1 The plant is located in an area close to the sea. Environmental conditions encountered in the plant locality shall be considered when selecting and applying coatings.
- 5.8.2 Proper internal protection against corrosion shall be applied at shop while the equipment is being manufactured.
- 5.8.3 The specific type of coating and surface preparation required for each category of equipment or structure shall be determined by the Supplier. Coating applications shall meet SSPC-PA 1, Paint Application Specification No. 1 – Shop, Field, and Maintenance Painting of Steel.
- 5.8.4 All ferrous surfaces shall be coated with the exception of stainless steel surface, bronze surface, galvanized steel surface and machined or wearing surface. Machined or wearing surface shall be protected by an approved shipping and storage preservative.
- 5.8.5 Application of paint shall conform to Steel Structures Painting Council Paint Application Specification No.1, "Shop, Field and Maintenance Painting".
- 5.8.6 Coatings shall be applied to those areas which are not insulated.
- 5.8.7 A prime coat (125 ± 25 microns DFT) shall be in place on surfaces prior to a top or finish coat application unless noted otherwise below.
- 5.8.8 Internal surfaces and parts except stainless steel components shall be shot blasted to confirm to SSPC SP 6 and coat of rust preventive coating soluble in water applied immediately after blasting.
- 5.8.9 Further measures such as placing bags of desiccants in the deaerator and storage tank shall be provided for the internal protection from completion of manufacturing at shop to commencement of piping connections to deaerator at site. The supplier shall periodically check at intervals of no more

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than 3 months to ensure no rust has formed and also to replace bags of desiccant. Alternatively nitrogen blanketing can be used. Permanent facilities including at least 2 fittings for nitrogen blanketing shall be provided.

- 5.8.10 The application method for field-applied coatings may be spray, brush, or roller if environmental requirements are met and in accordance with the paint and coatings manufacturer's recommendations.
- 5.8.11 Supplier is responsible for the proper surface preparation, priming and finish coat for equipment, piping, steel shapes, vessel surfaces and equipment surfaces.
- 5.8.12 Supplier is responsible for determining whether or not the work is for complete coatings or just touch ups on pre-primed or pre-finished items.
- 5.8.13 The Supplier finds that coating has been damaged during transportation, assembly, installation, or any other reasons due to handling of the equipment, the Supplier shall be responsible for re-coating.
- 5.8.14 The Supplier finds that equipment has a suppliers' standard finish coat color that does not match the plant specific color chart the Supplier shall be responsible for re- coating.
- 5.8.15 Supplier shall coat vessel and tank shop weld seams, and shall prime and finish paint field weld seams. The coating width shall be no less than 500 mm wide, centered on the seam.
- 5.8.16 Supplier shall comply with safety instructions as outlined by the Material Safety Data Sheets (MSDS) supplied by the paint and coatings manufacturer. This applies to every different compound, material, and solvent supplied.
- 5.8.17 Paints, hardeners, catalysts, solvents and other flammable material supplied by the Supplier shall be stored in a safe place and in an area recommended for that type of material. Ignition sources, sparks, flames and welding operations are prohibited in the material storage and working areas.
- 5.8.18 Dry film thickness of each coat shall be measured as described in ASTM D7091. The complete surface shall be inspected visually for skips, holidays, hiding and uniform color.
- 5.8.19 Random thickness measurements shall be taken with a frequency of at least 5 readings per 10 m2. Each measurement shall consist of the average of 3 readings taken within a 25 mm radius of the sample point.
- 5.8.20 Instruments used for the measurement of thickness shall be calibrated prior to the start of testing and shall be in accordance with the manufacturer's instructions. The base metal thickness of the calibration standard should not vary more than 15% of the metal in the component being painted.
- 5.8.21 Coatings and coating layers that do not meet the minimum thicknesses as set out in this document or by the manufacturer shall be repaired according to the paint and coatings manufacturer's instructions and shall be retested.
- 5.8.22 Color scheme: The color scheme shall be as follows:

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SURFACE COLORS		
Surface	Federal Standard 595C or ANSI Color No.	Color
Equipment	30475	Rawhide
Handrails	13591	Yellow
Pipe Attachments (clamps, etc.)		Match Pipes
Pipe Hangers and Supports		Match Steel
Fire Hydrants, Hose Stations, Post Indicating Valves	11120	Red

5.8.22.1

5.8.23 Coating requirements for Pumps

5.8.23.1 Surface preparation

Clean surface in accordance with SSPC- SP 6 commercial blast cleaning. If not possible, then hand tool clean to SSPC-SP 2 or power tool clean to SSPC-SP 3.

5.8.23.2 Prime Coat

Epoxy mastic 125 +/- 25 microns DFT

5.8.23.3 Finish Coat

- A. Timing of application – finish coat to be applied within 24 hours of priming.
- B. Surface Preparation – Remove dirt, oil, grease, and other contaminants.
- C. Apply one coat of Polyurethane Enamel Topcoat or Acrylic Polyurethane, at 75 microns DFT. The total dry film thickness should be 200 microns. The maximum dry film thickness shall not exceed 250 microns.

5.8.24 Color scheme: The color scheme shall be as follows:

SURFACE COLORS		
Surface	Federal Standard 595C or ANSI Color No.	Color
Equipment	30475	Rawhide
Handrails	13591	Yellow
Pipe Attachments (clamps, etc.)		Match Pipes
Pipe Hangers and Supports		Match Steel
Fire Hydrants, Hose Stations, Post Indicating Valves	11120	Red

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5.9 INSPECTION AND TEST

5.9.1 Testing

- 5.9.1.1 Pumps and motors shall be tested in the Contractor's or Sub-Contractor's works in accordance with ASME Power Test Code (PTC) 8.2 for centrifugal pumps / ANSI HI 14.6 and the IEEE No. 112 Standard Test Procedure for Poly phase Induction Motors and Generators. Certified pump performance curves and motor test certificates shall be submitted to the Employer for approval.
- 5.9.1.2 Dynamic balancing of pump impeller shall be carried-out.
- 5.9.1.3 Pumps shall be tested with its contract motor.
- 5.9.1.4 The pump tests shall be carried out in accordance with the ASME PTC 8.2 Type A / ANSI HI 14.6 for centrifugal pumps, Hydraulic Institute Standard for displacement pumps and HEI for liquid ring vacuum pumps.
- 5.9.1.5 Certified copies of their performance characteristics obtained during the tests shall be submitted to the Employer for verification.
- 5.9.1.6 The noise levels using sound pressure level meters and vibration levels shall also be measured during the shop test.
- 5.9.1.7 The pumps shall be tested at the specified minimum submergence and static lift to determine pump total head, net positive suction head and shaft power requirements between shut off and maximum flow output (at pump run out condition for the case of cooling water pumps to determine head-capacity, head-power and cavitation characteristics curves to verify the net positive suction head requirements and to indicate freedom from vibration between shut-off and maximum flow.
- 5.9.1.8 Trial assembly of all pump components with column pipes, discharge head, and motor stool shall be carried at shop.
- 5.9.1.9 NPSHR test shall be conducted on one pump of each rating.
- 5.9.1.10 Performance testing shall be carried out as per HI standard.
- 5.9.1.11 Raw material test shall be done and Material test Certificate shall be furnished.
- 5.9.1.12 NDT shall be done as per applicable codes and standards. NDT report shall be furnished.
- 5.9.1.13 Radiography examination as per ASME 186/446 with severity level 2 for gas porosity, level 3 for sand, slag and shrinkage, & level 0 for cracks, inserts, mottling. Extend of radiographic examination should cover vanes, vanes junctions, full radial depth of hub & other accessible areas.
- 5.9.1.14 Spot radiography for butt weld of fabricated components of thickness of 10mm & above shall be carried out.
- 5.9.1.15 Segmental flanges exceeding 30mm thickness shall be stress relieved.

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5.9.1.16 No repair welding is permitted on cast iron /alloy cast iron castings.

5.9.1.17 Cooling water pump house hydraulic model tests

The Contractor shall complete the intake and pump house hydraulic model tests, within three months after award of Contract, to verify the dimensions of the CW intake and pump house as shown generally on the Report Drawings.

The Contractor shall construct a model of the complete intake and pump house as shown on the Report Drawings to determine the following:

- A. The degree of turbulence and swirl in the model and the modifications recommended to eliminate them, if any.
- B. The existence of air entraining vortices in the model and the modifications recommended to eliminate them, if any.
- C. The resulting flow conditions in the model when various combinations of pumps and stop gates per TG unit are in use.

The results of the model tests shall confirm the following:

- A. Minimum height of the bottom of the intake suction bell above the floor of the pump house.
- B. Minimum allowable submergence water level below minimum low water level to prevent the occurrence of pump cavitation, turbulence and air entraining vortices within the operating flow range.
- C. Minimum allowable dimensions in the following locations:
 - 1) Pump chamber suction bell side wall clearances.
 - 2) Plenum chamber widths upstream and downstream of the travelling screens.

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5.10 INSTALLATION



Contractor shall submit to the Employer the Installation/erection manuals for Contractor's supplied equipment. The Manuals shall be finalized and submitted 3 months prior to starting the Installation/erection work

5.11 SPARE PARTS AND SPECIAL TOOLS

5.11.1 Spare Parts



Supplier shall provide start-up and commissioning spares.
Spare parts for two (2) years operation.

5.11.2 Special Tools



Supplier shall supply set of special tools required for the system.

Supplier shall submit drawings showing details and method of use of the Special Maintenance Tools to be handed over to the Contractor /Owner employees. The maintenance manuals shall also make reference to the Special Maintenance Tools.

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6.0 **DRAWING AND DOCUMENTATION REQUIREMENTS**

6.1 Drawings and Documents to be Submitted with Proposal

6.1.1 For the drawings and documents to be submitted with proposal, refer to attached Material Requisition.

- A. Drawing and document list including a submittal schedule
- B. Outline drawings showing pump assembly, turbine assembly and their auxiliaries, interface connections to the related equipment, foundation details with loading data, disassembly clearances, and all requested permissible reaction forces and moments at major nozzles.
- C. P & I Diagrams including sealing, cooling, and lubricating systems etc. with the mark of scope of supply.
- D. Pump and motor characteristic curves
- E. Deviation and exception list
- F. Allowable nozzle loading
- G. Control panel arrangement drawings showing the control and monitoring equipment.
- H. Spare parts list
- I. Standard and code list
- J. Utility consumption list
- K. Equipment datasheet
- L. Motor datasheet and outline drawings for all motors
- M. Functional/logic diagrams and its description for pump and its auxiliary equipment.
- N. Experience or reference list
- O. Manufacturer's catalogues and literature to supplement the drawings and illustrate the equipment, instruments, and fittings to be furnished.
- P. Proposed shipping scheme and packing list
- Q. Shop inspection and test plans
- R. Performance test procedure

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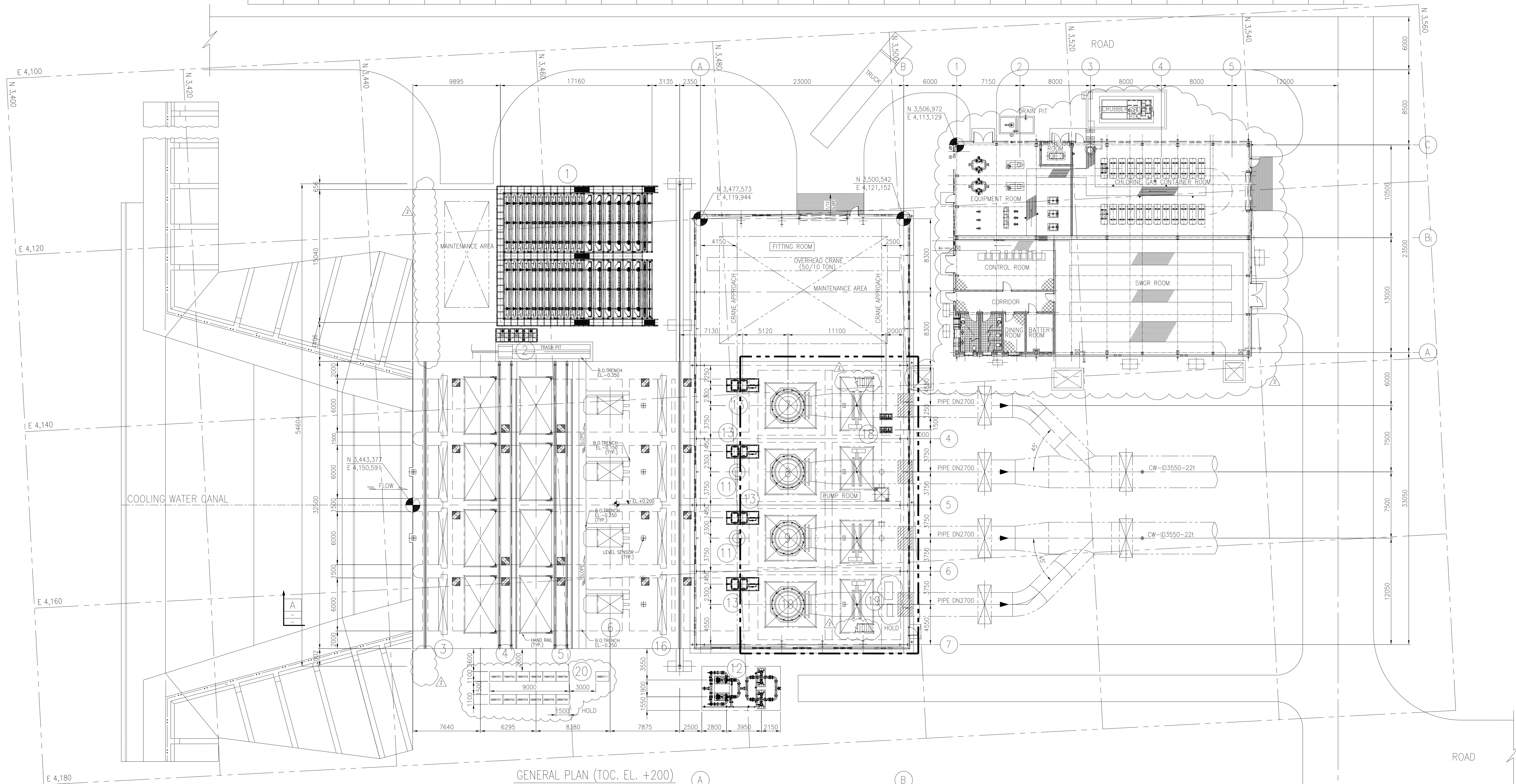
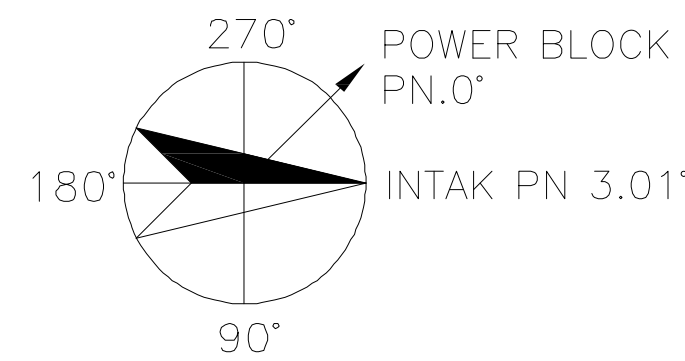
- S. Description of shop assembly extent and field installation requirement
- T. Catalogue information
- U. Cathodic protection system datasheet, installation, detailed operation and control write-up.

6.1.2 Drawings and documents below, shall be a guideline of drawings and documents to be provided by the supplier.

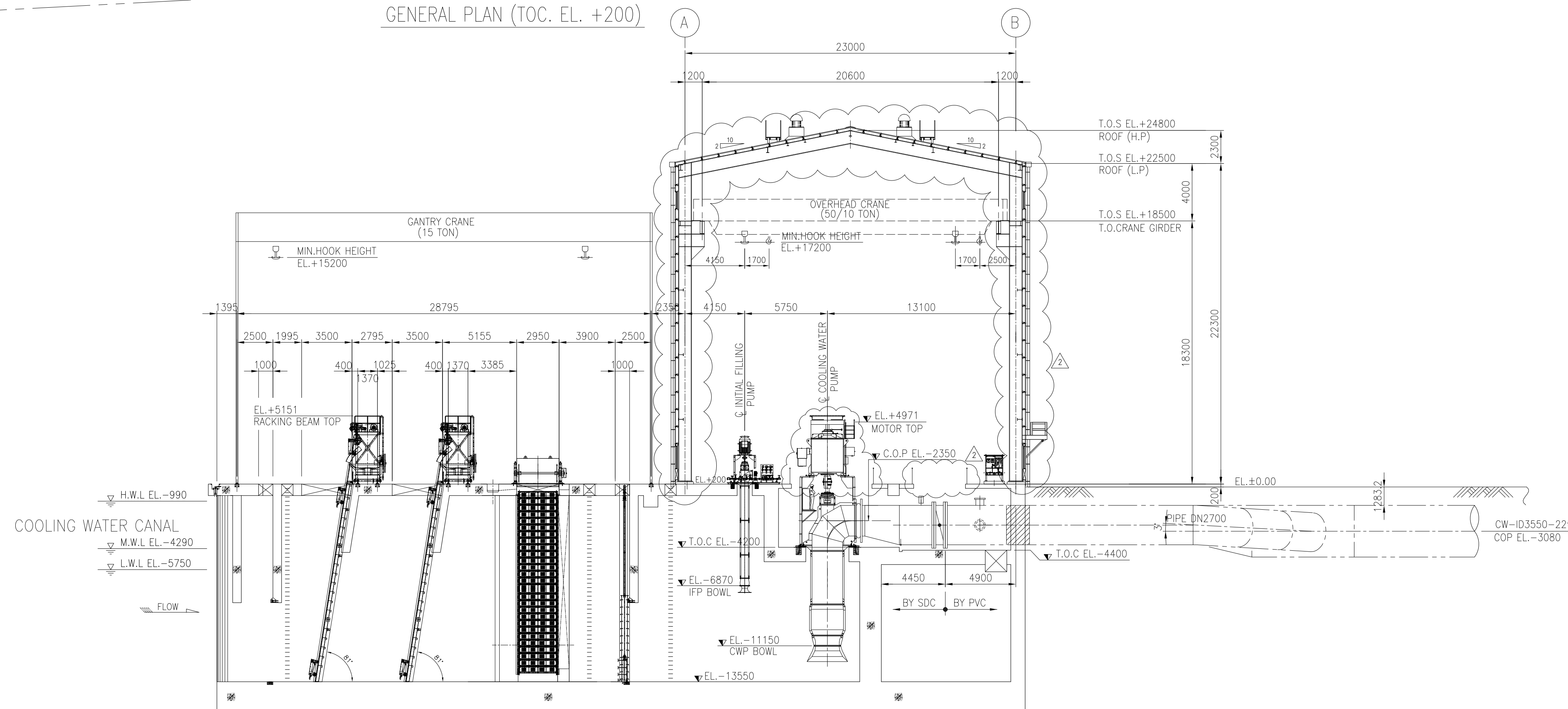
- A. Master drawing lists
- B. Monthly progress report
- C. P&IDs
- D. Spare parts list with sketches
- E. Special tools list with sketches
- F. Manufacturing and delivery schedule
- G. Bearing list showing type, size, lifetime and lubricating plan.
- H. Set point and alarm list
- I. Instrument list with data sheet
- J. Clearance and tolerance list
- K. Line and valve schedule index
- L. Input / Output list including interface signal with the purchaser's main control system
- M. Assembly and erection drawings
- N. General arrangement drawings
- O. Component detail drawings
- P. Detail drawings for steel works for foundation
- Q. Detail drawings for control apparatus and supervisory equipment
- R. Electrical interlock wiring diagram
- S. Piping arrangement drawing, isometric drawing, support detail drawing
- T. Control panel outline and arrangement drawings

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- U. Motor data as per specification of electric motor
- V. Control logic diagrams
- W. CRT graphic display to be implemented in plant DCS
- X. Test and inspection procedure
- Y. QA /QC manual
- Z. Sub contractor list
- AA. Sump model test report and video recording
- BB. Erection procedure
- CC. Initial commissioning procedure
- DD. Instruction manuals including O/M manuals
- EE. Shop test reports
- FF. Finalized data sheet
- GG. **Material Test Certificates**
- HH. **Welding Procedure WPS+ PQR + Repair Procedure**
- II. **Positive Material Identification (PMI) procedure for Stainless and alloy steel material.**
- JJ. As-Built Drawings



GENERAL PLAN (TOC. EL. +200)



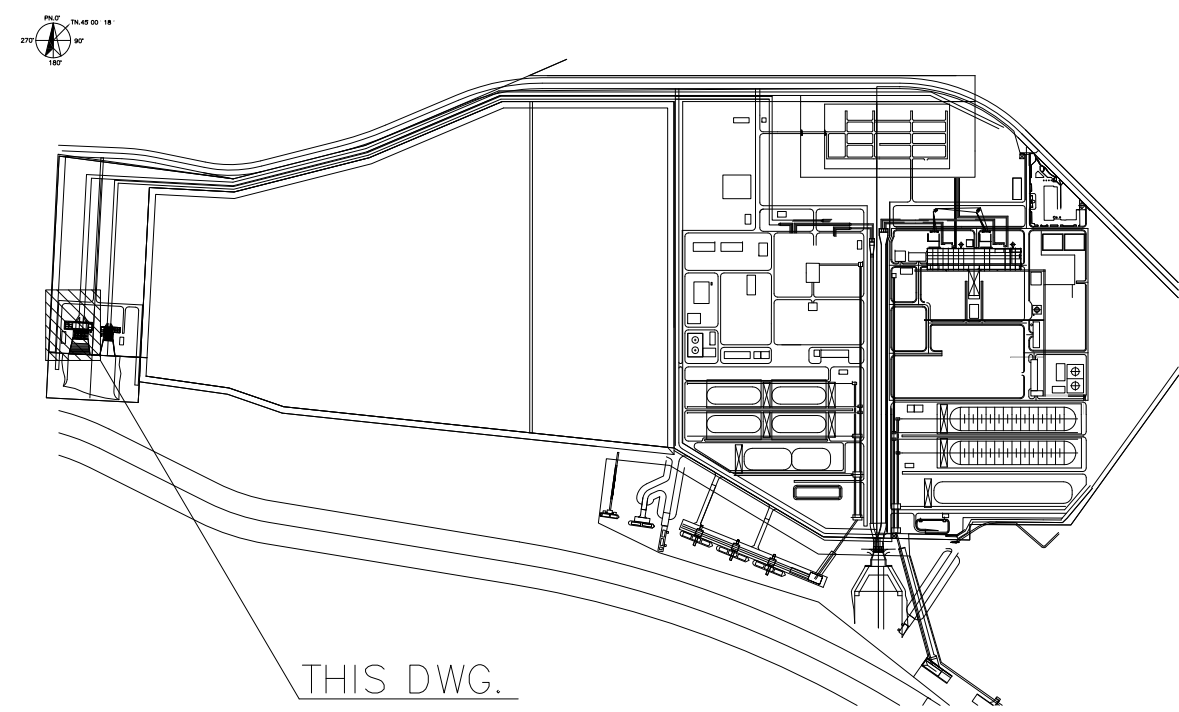
SECTION "A-A"

NOTE

1. BASED COORDINATION ARE IN METERS AND ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE STATED.
2. FINISHED GRADE ELEVATION EL. ±0.00m = MEAN SEAWATER LEVEL + 4.5m
3. BASE COORDINATE FOR INTAKE STRUCTURE AREA

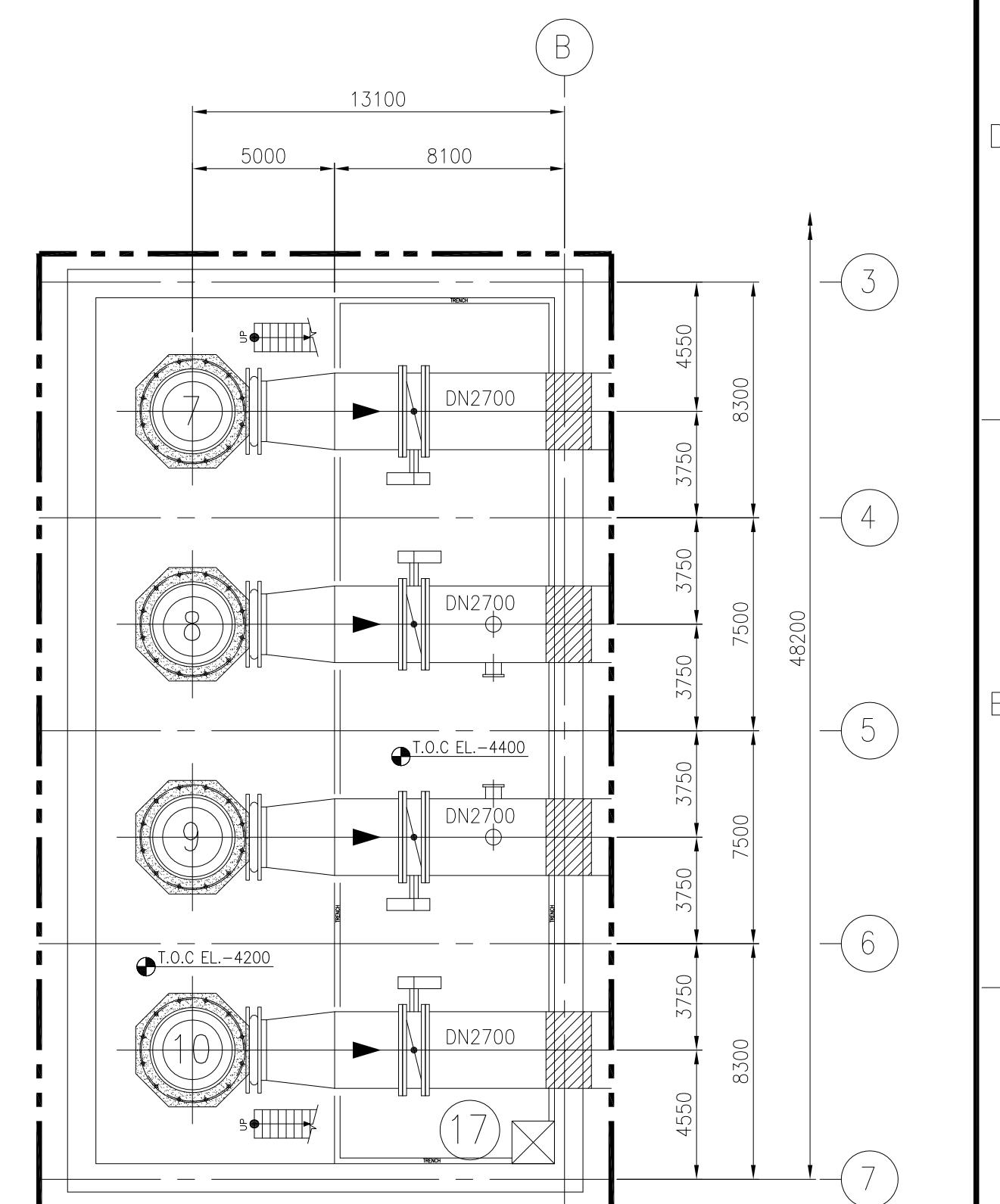
POWER PLANT	INTAKE STRUCTURE
N 3,000,000	N 3,443,377
E 6,000,000	E 4,150,591

4. UNDERGROUND PIPING FOR CW SHALL BE SUPPLIED BY PVC.
5. ANY CHANGES, REVISIONS, AND/OR AMENDMENTS OF THIS DRAWING SHALL BE CONDUCTED WITH PRIOR WRITTEN CONFIRMATION FROM THE FIELD ENGINEER.



KEY PLAN

ITEM NO.	DESCRIPTION	EQUIPMENT NO.	REMARK
1	SUPPORT STAND	-	
2	TRASH PIT	-	
3	1ST STOP GATE AND GUIDE	-	
4	1st BAR SCREEN	-	
5	2nd BAR SCREEN	-	
6	TRAVELLING BAND SCREEN	-	
7	COOLING WATER PUMP	28PAC10-AP002	
8	COOLING WATER PUMP	28PAC10-AP001	
9	COOLING WATER PUMP	18PAC10-AP002	
10	COOLING WATER PUMP	18PAC10-AP001	
11	LOCATION OF INITIAL FILLING PUMP	-	
12	SCREEN WASH PUMPS SKID	-	
13	CWP MOTOR BEARING COOLING SYSTEM	-	
14	CHLORINATION HOUSE (WITH ELE. BLDG. FOR CWP)	-	
15	EYE WASH STATION AND SAFETY SHOWER	-	
16	2ND STOP GATE GUIDE	-	
17	CWP HOUSE SUMP PUMP	08GMA01-AP001/2	
18	RESIDUAL CHLORINE ANALYZER SAMPLING RACK	-	
19	RECTIFIER FOR CWP	-	
20	RECTIFIER FOR INTAKE	-	

BASEMENT FLOOR
TOC. EL. -4,400

DOCUMENT SUBMISSION STATUS: FC

NOTE:

REV	DATE	DESCRIPTION	PREP	CHKD	APRD
1	02.JUL.2015	REVISED AS PER MARKED	W.S.CHO	S.JANG	J.H.PARK
2	12.DEC.2014	REVISED AS PER MARKED	W.S.CHO	S.JANG	J.H.PARK
3	05.SEP.2014	FOR CONSTRUCTION	W.S.CHO	S.JANG	J.H.PARK

OWNER	OWNER'S CONSULTANT	OWNER'S CONSULTANT
POWER ISLAND PACKAGE SUPPLIER	POWER ISLAND PACKAGE SUPPLIER	POWER ISLAND PACKAGE SUPPLIER
DAELIM	DAELIM	DAELIM

PROJECT TITLE: THAI BINH2 THERMAL POWER PLANT 2 x 600MW

DRAWING TITLE: GENERAL ARRANGEMENT FOR INTAKE STRUCTURE AREA

FUNCTION	NAME	SIGN	DATE
DRWN	W.S.CHO		02.JUL.2015
CHKD	S.JANG		02.JUL.2015
APRD	J.H.PARK		02.JUL.2015
APRD	Y.H.KIM		02.JUL.2015

FILE NAME: TB2-SDC-00100-P-M8-DGA-0000