6.0 COLOR SHADES

The following colour shades shall be used.

S. No	EQUIPMENT DESCRIPTION	BASE		BAND	
		COLOUR SHADE	No./shade per IS-5 (2007)	COLOUR SHADE	No. per IS-5 (2007)
A.	**GENERAL**				
1.	-Technological Structure (columns/beams) -Equipment structural (columns/beams) -Technological structure Platforms, Equipment Platforms, Walk-ways -Pipe Supports -Spring supports -Monkey ladder rungs	Phirozi Blue	176	--	--
2.	-Staircase side channels -Monkey ladder side beam/ Channel/ cage -Handrails, toe plates, etc.	Light Orange	557	--	--
3	Overhead monorails	Signal Red	537	--	--
4	Staircase steps	Dark Grey	632	--	--
5	Chequered plates	Dark Grey	632	--	--
6	Gratings	Galvanised	--	--	--
7	Davit supports	Phirozi Blue	176	--	--
B.	**EQUIPMENT**				
1	Heater	Aluminium		--	--

DEPARTMENTAL STANDING INSTRUCTIONS

COLOUR CODE FOR REFINERY PLANTS (MECHANICAL SYSTEMS)

S. No	EQUIPMENT DESCRIPTION	BASE		BAND	
		COLOUR SHADE	No./shade per IS-5 (2007)	COLOUR SHADE	No. per IS-5 (2007)
2	HC Vessels/ Drums	Aluminium		--	--
3	Chemical drums	Golden Yellow	356	--	--
4	Acid drums/tanks	Pale cream	352	--	--
5	Columns	Aluminium		--	--
6	Boilers (Fired utility boilers/ CO boilers	Aluminium		--	--
7	Heat exchangers/ coolers/ condenser shells	Aluminium		--	--
8	HRSGs	Aluminium		--	--
9	Flue gas Stack	Black	--	--	--
10	Safety relief valves (PSV/TSV)	Satin blue	177	--	--
11	Control valves	Red/ Yellow/blue		--	--
12	Valves (gate, globe, diaphragm, butterfly etc)	Same as pipeline base colour	--	--	--
13	Drums	Aluminium		--	--
14	Pumps in HC service (operating temp.upto 100deg.C)	Brilliant green	221	--	--
15	Pumps in HC service (operating temp. above 100deg.C)	Aluminium		--	--
16	Pumps (acid/caustic/ chemicals)	Golden Yellow	356	--	--
17	Pumps (Water)	Phirozi	176	--	--

DEPARTMENTAL STANDING INSTRUCTIONS

COLOUR CODE FOR REFINERY PLANTS (MECHANICAL SYSTEMS)

S. No	EQUIPMENT DESCRIPTION	BASE		BAND	
		COLOUR SHADE	No./shade per IS-5 (2007)	COLOUR SHADE	No. per IS-5 (2007)
		Blue			
18	Compressors, blowers, Ventilators, Vent silencers, ID fan/FD fan	Aluminium		--	--
19	Steam turbines	Aluminium		--	--
20	Motor, Switch gear , Machines	Silver grey	628	--	--
21	Electrical Transformers			--	--
22	Fire proofing	Air craft grey	693	--	--
23	Gas turbines	Aluminium		--	--
24	HC Storage tanks	White (reflective white for high vapour presure HC service)		Same as piping	--
C. PIPELINES					
AIR					
1	Instrument Air	White		Black	
2	Plant Air	White		--	--
3	Nitrogen	Lemon Yellow	355	--	--
GASES					
1	LPG, Fuel Gas, Propylene	Aluminium		Signal Red	537
2	Hydrogen	Lemon Yellow	355	Fire Red	536
3	Inert Gas / Nitrogen	Lemon	355	Phirozi	176

S. No	EQUIPMENT DESCRIPTION	BASE		BAND	
		COLOUR SHADE	No./shade per IS-5 (2007)	COLOUR SHADE	No. per IS-5 (2007)
		Yellow		Blue	
4	Sour Gas, Off Gas	Aluminium		Gulf Red	473
5	Liquid Sulphur	Canary yellow	309	--	--
6	Acid gas	International orange	592	--	--
7	Flare gas	Aluminium		--	--
WATER					
1	Fire Water	Signal Red	537	--	--
2	Sea Cooling Water	Sea Green	217	--	--
3	DM water	Sky blue	101	--	--
4	BFW	Sky blue	101	Sea Green	217
5	Condensate	Sky blue	101	Canary yellow	309
6	Fresh water / Service water	Phirozi Blue	176	--	--
7	Drinking Water	Phirozi Blue	176	Traffic yellow	368
8	Tempered Water	Sky Blue	101	Light Brown	410
9	Bearing Cooling Water	Sky Blue	101	Black	

S. No	EQUIPMENT DESCRIPTION	BASE		BAND	
		COLOUR SHADE	No./shade per IS-5 (2007)	COLOUR SHADE	No. per IS-5 (2007)
10	Sour Water/ Wash water	Light Brown	410	--	--
STEAM					
1	VHP Steam	Aluminium		Post office red	538
2	HP Steam	Aluminium		Light Orange	557
3	MP Steam	Aluminium		Dark Violet	796
4	LP Steam	Aluminium		Deep Buff	360
ACIDS & CHEMICALS					
1	Caustic & Chemicals	Golden Yellow	356	--	--
2	Acids	Pale cream	352	--	--
HYDROCARBON					
1	Hydraulic & Lube Oil	Light Grey	631	--	--
2	Cutter Stock	Aluminium		Opaline Green	275
3	Naphtha (HN, SRN, CRN, NGL), MS	Aluminium		French Blue	166
4	Kerosene, ATF, MTO	Aluminium		Lemon Yellow	355
5	Diesel Oils (LDO, HDO)	Aluminium		Brilliant Green	221
6	LGO, HGO, RCO, Circulating	Aluminium		Sea Green	217

S. No	EQUIPMENT DESCRIPTION	BASE		BAND	
		COLOUR SHADE	No./shade per IS-5 (2007)	COLOUR SHADE	No. per IS-5 (2007)
	Oil, VGO				
7	Vac. Resid, Bitumen, Fuel Oil, Clarified Oil	Aluminium		Black	
8	Slurry, Slop cut, Disulphate Oil	Aluminium		Light Grey	631
9	Crude, Slop, Fuel Oil	Black		--	--
10	JBO / Ballast	Aluminium		--	--
D.	**MISCELLANEOUS**				
1	Air Ducts	White		--	--
2	Air filters	White		--	--
3	Cable Trays (Power)	Sky Blue	101	--	--
4	Cable trays (Inst.)	Brilliant Green	221	--	--
5	Underground CBD routing	Traffic red	570	--	--
6	Underground OWS routing	Satin Blue	177	--	--
7	Underground ABD routing	International orange	592	--	--
8	Underground CRW ETP	Light Olive green	278	--	--
9	Emergency Light Fittings	Post Office Red	538	--	--
10	General Light fittings	Dark Grey	632	--	--

S. No	EQUIPMENT DESCRIPTION	BASE		BAND	
		COLOUR SHADE	No./shade per IS-5 (2007)	COLOUR SHADE	No. per IS-5 (2007)

Notes:

a) Heat resistant Aluminium shall be applied for piping/equipment as specified in the table for the services with temperature above 100 deg.C. Poly urethane (PU) aluminium shall be applied with temperatures below 100 deg.C.

b) The colours indicated in the above table are indicative only. Adherence to the colours as per IS-5 shall be ensured.

7.0 APPROVAL & REVISION OF THIS GUIDELINE

a. This guideline is controlled by Maintenance department.

b. Head-Maintenance Offsites is responsible for monitoring various relevant OISD and other statutory standards concerning the required painting frequencies.

c. Based on the information of any such statutory or OISD requirement, revision in this guideline should be proposed by the Head-Maintenance Offsites and approval to be obtained.

Administered by	**Sign**	
	Name	**S Raja**
	Designation	**Head - Maintenance**
Approved by	**Sign**	
	Name	**V V R Narasimham**
	Designation	**GM – Operations**

ANNEXURE-10		
MASTER DRAWING LIST		
Sl. No.	**DESCRIPTION**	**Due date for submission**
MECHANICAL		
1	P&ID OF ACC	2 weeks from date of PO
2	ACC PERFORMANCE CURVE	2 weeks from date of PO
3	ACC THERMAL CALCULATION AND SIZING CRITERIA	2 weeks from date of PO
4	AIR COOLED DUMP CONDENSER DATA SHEET	2 weeks from date of PO
5	AIR COOLED DUMP CONDENSER- GENERAL ARRANGEMENT (GA)	2 weeks from date of PO
6	ALLOWABLE FORCES AND MOMENTS ON ACDC CONNECTION	2 weeks from date of PO
7	GA OF TUBE BUNDLES	3 weeks from date of PO
8	MECHANICAL SIZING CALCULATION OF OF TUBE BUNDLE	3 weeks from date of PO
9	TUBE DRAWING WITH FIN DIMMENSIONAL DETAIL	3 weeks from date of PO
10	GA OF ACDC HANDLING ARRANGEMENT AT FAN DECK	3 weeks from date of PO
11	CONDENSATE STORAGE TANK SIZING CALCULATION	2 weeks from date of PO
12	GA DRAWING OF CONDENSATE STORAGE TANK	2 weeks from date of PO
13	DATA SHEET FOR CONDENSATE STORAGE TANK	2 weeks from date of PO
14	TEST PROCEDURE FOR HYDRO TESTS, LEAKAGE TEST ETC	6 weeks from date of PO
15	FAN CHARACTERSTIC CURVES	6 weeks from date of PO
16	FAN DATA SHEET	6 weeks from date of PO
17	GEARBOX DATA SHEET (IF APPLICABLE)	6 weeks from date of PO
18	FUNCTIONAL DESCRIPTION OF ACC	6 weeks from date of PO
19	PIPE SCHEDULE	6 weeks from date of PO
20	VALVE SCHEDULE	6 weeks from date of PO
21	PAINTING SCHEME OF ACC	6 weeks from date of PO
22	O&M MANUAL- AIR COOLED CONDENSER	20 weeks from date of PO
23	CONSUMBALES LIST (OIL, GREASE etc.,)	6 weeks from date of PO

ANNEXURE-10		
MASTER DRAWING LIST		
Sl. No.	**DESCRIPTION**	**Due date for submission**
	CIVIL	
1	FOUNDATION INPUT WITH COMPLETE LOADING DATA (STATIC AND DYNAMIC LOADS)	2 weeks from date of PO
	ELECTRICAL	
1	ELECTRICAL LOAD LIST	2 weeks from date of PO
2	MOTOR GA AND DATA SHEET	6 weeks from date of PO
3	GA & WIRING DIAGRAM OF LOCAL CONTROL PANEL WITH PUSH BUTTONS	6 weeks from date of PO
	C&I	
1	DATA SHEET OF VIBRATION SWITCH	6 weeks from date of PO
2	DATA SHEET OF OIL LEVEL SWITCH (IF APPLICABLE)	6 weeks from date of PO
3	INSTRUMENT HOOK UP AND WIRING DIAGRAM	6 weeks from date of PO
4	CABLE SCHEDULE (POWER AND SIGNAL) (ONLY LIST- CABLES NTO IN VENDOR SCOPE)	7 weeks from date of PO
Note: The list of Drawings mentioned above is tentative and no. of drawings may increase during detailed engineering.		

Annexure-XI
(SUB-VENDOR LIST)

1.0 Sub-Vendor List

It shall be mandatory for the successful bidder to follow this sub-vendor list. However, this list is not exhaustive. Items for which sub-vendors are not mentioned, all sub-vendors having valid statutory authority approval (which is recognized in India, like BIS/BS/API/ASME/etc.) are acceptable.

S.NO.	ITEM	VENDOR LIST
1.	PIPE/TUBE-C S (SEAMLESS) TO ASTM STDS	ANAND SEAMLESS TUBES PVT. LTD
		ARCELORMITTAL TUBULAR PRODUCTS ROMAN SA
		AVON TUBETECH PVT LTD
		BAOSTEEL GROUP CORPORATION
		BHEL (TRICHY)
		CHANGSHU SEAMLESS STEEL TUBE CO. LTD
		HEAVY METALS & TUBES LIMITED(MEHSANA)
		HENGYANG STEEL TUBE GROUP INTL. TDNG INC
		ISMT LTD-AHMEDNGR
		ISMT LTD-BARAMATI
		JFE STEEL CORPORATION
		JIANGSU CHENGDE STEEL TUBE SHARE CO. LTD
		JINDAL SAW LTD (NASHIK WORKS) JR SEAMLESS PVT.LTD
		KASCO
		LAL BABA SEAMLESS TUBES PVT. LTD
		MAHALAXMI SEAMLESS LIMITED
		MAHARASHTRA SEAMLESS LTD.
		MAHARASHTRA SEAMLESS LTD.
		NIPPON STEEL AND SUMITOMOMETAL CORPORAT
		PANGANG GROUP CHENGDU STEEL & VANADIUM C
		PRODUCTOS TUBULARES S.A.U.
		Patels Airflow Ltd.
		RATNADEEP METAL TUBES LTD.
		SAINEST TUBES PVT LTD
		SN TUBES PRIVATE LIMITED
		TUBOS REUNIDOS SA
		VALCOVNY TRUB CHOMUTOV
		VALLOUREC TUBES FRANCE
		WYMAN GORDON FORGINGS
		YANGZHOU CHENGDE STEEL PIPE COLTD
		YANGZHOU LONTRIN STEEL TUBECO.,LTD.
		ZHEJIANG GROSS SEAMLESS STEELTUBE COLTD
		HUBEI XINYEGANG STEEL CO.LTD
		VALLOUREC TUBES FRANCE
2.	PIPE-CARBON STEEL(WELDED)TO ASTMSTDS	EEW KOREA CO. LTD
		EISENBAU KRAMER GMBH
		ESSAR STEEL INDIA LIMITED

		HYUNDAI RB CO.LTD
		INOX TECH. SPA
		MAN INDUSTRIES (INDIA) LTD
		NIPPON STEEL AND SUMITOMOMETAL CORPORAT
		RATNAMANI METALS AND TUBES LTD
		TATA STEEL UK LIMITED(FORMERLYC702)
3.	**FLANGE- CARBONSTEEL**	ABASI ENGINEERING WORKS
		ANANDMAYEE FORGINGS PVT LTD
		BHARAT FORGE LTD.
		BRUCK GMBH ENSHEIM
		CD ENGINEERING CO.
		CD INDUSTRIES
		CHW FORGE PVT LTD (FR.CHAUDHRY HAMMER)
		ECHJAY INDUSTRIES PVT LTD.(RAJKOT)
		FIVEBROS FORGINGS PVT.LTD.
		GOOD LUCK ENGINEERING CO.
		HILTON METAL FORGING LIMITED
		ITM S.R.L.
		JAV FORGINGS (P) LTD
		KISAAN DIETECH PVT LTD
		KISAAN STEEL (P) LTD
		KOREA FLANGE
		KUNJ FORGINGS PVT LTD
		LAL METAL FORGE LTD
		M.S. FITTINGS MFG. CO PVT LTD
		MAASS FLANGE INDIA PVT. LTD
		MELESI OFFICINE AMBROGIO MELESI& C.SRL
		METAL FORGINGS PVT LTD
		OFFICINE NICOLA GALPERTI &FIGLIO S.P.A.
		OFFICINE SANTAFEDE SRL
		P.K.TUBES & FITTINGS PVT.LTD.
		PARAMOUNT FORGE
		PARAMOUNT FORGE
		PRADEEP METAL LIMITED
		PROMAT BD LTD MIDDLE EAST
		R D FORGE
		R.N.GUPTA & CO. LTD
		SANGHVI FORGINGS & ENGINEERINGLTD
		ULMA FORJA S.COOP.
		UTSAH ENGINEERING PVT LTD(A CD ENGG COMP
		VALVITALIA SPA-TECNOFORGE DIVISION
		VILMAR SA
		BRITEX ENGINEERING WORKS
		STEEL STRONG VALVES INDIA PVT LTD
		JAI AUTO PVT LTD
4.	**GASKETS (NON ASBESTOS)**	CHAMPION JOINTINGS PVT LTD.
		DAVE ENGINEERS PVT.LTD

		FLEXITALLIC LTD
		GOODRICH GASKET PVT LTD
		IGP ENGINEERS PVT. LIMITED
		JAMES WALKER INMARCO INDUSTREISPVT. LTD
		MADRAS INDUSTRIAL PRODUCTS
		NEOSEAL ENGINEERING PRIVATELIMITED
		STARFLEX SEALING INDIA PVT LTD
		UNI KLINGER LTD
		SEALANT AND GASKET INDIA PVT.LIMITED
5.	**GASKET METALLIC & SOFTIRON**	GOODRICH GASKET PVT LTD
		IGP ENGINEERS PVT. LIMITED
		MADRAS INDUSTRIAL PRODUCTS
		MICRO PRECISION PRODUCTS PVT LTD
		STARFLEX SEALING INDIA PVT LTD
6.	**GASKET SPIRAL WOUND**	BOMBAY CHEMICAL EQUIPMENTS
		CHAMPION JOINTINGS PVT LTD.
		DAVE ENGINEERS PVT.LTD
		GOODRICH GASKET PVT LTD
		IGP ENGINEERS PVT. LIMITED
		JAMES WALKER INMARCO INDUSTREISPVT. LTD
		MADRAS INDUSTRIAL PRODUCTS
		NEOSEAL ENGINEERING PRIVATELIMITED
		STARFLEX SEALING INDIA PVT LTD
		TEEKAY FLOWFLEX PVT. LTD.
		UNI KLINGER LTD
7.	**BOLTING MATERIAL**	AEP COMPANY
		BEA SRL
		DEEPAK FASTENERS LIMITED(DORAHA UNIT)
		FASTENERS & ALLIED PRODUCTS PVT LTD.
		FIX FIT FASTENERS MFG. PVT.LTD.
		HARDWIN FASTENERS PVT LTD.
		INDUSTRIAL ENGINEERING CORP.
		KOREA PARTS & FASTENERS (KPF)
		KUNDAN INDUSTRIES LTD.
		LAKSHMI PRECISION SCREWS LTD
		MEGA ENGINEERING PVT. LTD.
		MULTI FASTENERS PVT LTD
		NITIN FASTNERS PVT LTD
		OME METALLURGICA ERBESE S.R.L.
		PANKAJ INTERNATIONAL
		PIONEER NUTS & BOLTS PVT LTD
		PRECISION AUTO ENGINEERS
		PRECISION ENGG. INDUSTRIES
		PRESIDENT ENGINEERING WORKS
		PROCYON TCHNOLOGY
		SOUVENIR INTERNATIONAL

		SYNDICATE ENGINEERING INDUSTRIES TRIPLE FAST MIDDLE EAST LTD
		UDEHRA FASTNERS LTD
		UDEHRA MECHANICAL WORKS
		SAVETA ENGINEERING CO. PVT LTD
		TECHNICAL METAL EST.
8.	**FITTINGS FROM SEAMLESS PIPE-CARBON STEEL**	ALLIED INTERNATIONAL S.R.L.
		APCO PIPE FITTINGS CO LTD
		AWAJI MATERIA (THAILAND) CO. LTD.
		CSA FITTINGS
		DEE DEVELOPMENT ENGINEERS LIMITED
		ERNE FITTINGS GMBH
		EZEFLOW INC.
		GUJRAT INFRAPIPES PVT. LIMITED
		IBF S P A
		ITM S.R.L.
		JIANGYIN LONGSHAN PIPE SOLUTIONSCO. LTD
		JIANGYIN TIANNING METAL PIPEFITTING CO
		K.S.PIPE FITTINGS (P) LTD
		M.S. FITTINGS MFG. CO PVT LTD
		MUNRO & MILLER FITTINGS LTD
		P.K.TUBES & FITTINGS PVT.LTD.
		PATTECH FITWELL TUBE COMPONENTS
		PETRO CHEM INDUSTRIES
		PIANA S.P.A
		RACCORTUBI SPA
		SAWAN ENGINEERS PVT LTD
		SIDHARTH & GAUTAM ENGINEERS
		SUNGKWANG BEND CO. LTD
		TEEKAY TUBES PVT LTD
		TK CORPORATION
		TOPAZ PIPING INDUSTRIES
		TUBE BEND (CALCUTTA) PVT LTD
		U I PIPE FITTINGS PVT LTD
		VALVITALIA SPA-TECNOFORGE DIVISION
		VIRGILIO CENA & FIGLI S.p.A.
		WEIFANG HUODA PIPE FITTINGS MANUFACTURE
		WILH SCHULZ GmbH
		YINGKOU LIAOHE PIPE FITTINGS CO. LTD
		FITTECH INDUSTRIES PVT. Ltd
9.	**INSTRUMENT VALVES& MANIFOLDS**	ANDERSON GREENWOOD CROSBY
		ARYA CRAFTS & ENGINEERING PVTLTD
		ASTEC VALVES & FITTINGS PVT. LTD.
		AUTOCLAVE ENGINERS FLUIDCOMPONENTS
		BAUMER TECHNOLOGIESINDIA PVT.LTD(W058)
		CHEMTROLS INDUSTRIES LTD

		CIRCOR INSTR. TECHNOLOGIES INC-FORM.H608
		COMFIT & VALVES PVT. LTD.
		EXCEL HYDRO PNEUMATICS PVT LTD
		EXCELSIOR ENGG. WORKS
		FLUID CONTROLS PVT LTD
		MICRO PRECISION PRODUCTS PVT LTD
		PANAM ENGINEERS
		PARKER HANNIFIN CORPORATION
		PRECISION ENGINEERING INDUSTRIES
		PRIME ENGINEERS
		SWAGELOK CO.
		SWAGELOK COMPANY,
		SWAGELOK LIMITED,
		SWASTIK ENGINEERING WORKS
		TK FUJIKIN CORPORATION
		WESMEC ENGINEERING PVT LTD
10.	**GATE VALVE (MOTOR-OPERATED)**	AMPO VALVES INDIA PVT LTD
		AMPO, S.COOP (POYAM VALVES)
		BHEL (TRICHY)
		BOTELI VALVE GROUP CO.
		CESARE BONNETTI S.P.A.
		FLOWSERVE PTE(MFR. EDWARD)
		FRIEDRICH KROMBACH GMBH & CO.KG
		GM ENGINEERING PVT. LTD.
		INTERVALVE POONAWALLA LIMITED
		KSB PUMPS LTD (COIMBATTORE)
		L & T VALVES LIMITED
		MSA A.S.
		NITON VALVE INDUSTRIES PRIVATE LTD .
		OSWAL INDUSTRIES LTD
		STEEL STRONG VALVES INDIA PVTLTD
		VELAN VALVES INDIA PVT LTD
		WEIR BDK VALVES-A UNIT OF WEIR INDIA PVT
		XOMOX SANMAR LTD-PACIFICVALVES DIVISION
		Z & J TECHNOLOGIES GMBH
		STEEL STRONG VALVES INDIA PVT
11.	**ACTUATORS-MOV**	AUMA RIESTER GMBH & CO. KG
		ROTORK CONTROLS (INDIA) LTD
		YANGZHOU HENGCHUN ELECTRONICS CO. LTD.
12.	**GATE VALVE (FORGED)**	BFE SRL
		BHEL (TRICHY)
		BOTELI VALVE GROUP CO.
		DOUGLAS CHERO SPA
		GM ENGINEERING PVT. LTD.
		INTERVALVE POONAWALLA LIMITED
		KSB PUMPS LTD (COIMBATTORE)
		L & T VALVES LIMITED

		MH VALVES PVT LTD.
		NITON VALVE INDUSTRIES PRIVATE LTD
		OSWAL INDUSTRIES LTD
		STEEL STRONG VALVES INDIA PVT LTD
		VELAN VALVES INDIA PVT LTD
		WEIR BDK VALVES-A UNIT OF WEIR INDIA PVT
13.	**GATE VALVE (CAST)**	AMPO VALVES INDIA PVT LTD
		AMPO, S.COOP (POYAM VALVES)
		AV VALVES LIMITED
		BHEL (TRICHY)
		BOTELI VALVE GROUP CO.
		CESARE BONNETTI S.P.A.
		EXPERT ENGINEERING ENTERPRISES
		FLOWSERVE PTE(MFR. EDWARD)
		FLUIDLINE VALVES CO.PVT LTD
		FOURESS ENGG (I) LTD.(AURANGABAD)
		FRIEDRICH KROMBACH GMBH & CO.KG
		GM ENGINEERING PVT. LTD.
		INTERVALVE POONAWALLA LIMITED
		KSB PUMPS LTD (COIMBATTORE)
		L & T VALVES LIMITED
		LAZARO ITUARTE INTERNATIONAL,SA
		MH VALVES PVT LTD.
		MSA A.S.
		NITON VALVE INDUSTRIES PRIVATE LTD .
		NSSL PVT. LTD. (NECO SCHUBERT & SALZER)
		OSWAL INDUSTRIES LTD
		STEEL STRONG VALVES INDIA PVTLTD
		VELAN VALVES INDIA PVT LTD
		WEIR BDK VALVES-A UNIT OF WEIR INDIA PVT
		XOMOX SANMAR LTD-PACIFIC VALVES DIVISION
		Z & J TECHNOLOGIES GMBH
		FLOTEK INDUSTRIES
		NILON VALVES PVT. LTD.
14.	**GLOBE VALVE (CAST)**	AMPO VALVES INDIA PVT LTD
		AMPO, S.COOP (POYAM VALVES)
		BHEL (TRICHY)
		BOTELI VALVE GROUP CO.
		FOURESS ENGG (I) LTD.(AURANGABAD)
		FRIEDRICH KROMBACH GMBH & CO.KG
		GM ENGINEERING PVT. LTD.
		INTERVALVE POONAWALLA LIMITED
		KSB PUMPS LTD (COIMBATTORE)
		L & T VALVES LIMITED
		LAZARO ITUARTE INTERNATIONAL,SA
		MH VALVES PVT LTD.
		MSA A.S.
		NITON VALVE INDUSTRIES PRIVATE LTD .
		NSSL PVT. LTD. (NECO SCHUBERT & SALZER)

		OSWAL INDUSTRIES LTD
		STEEL STRONG VALVES INDIA PVTLTD
		WEIR BDK VALVES-A UNIT OF WEIR INDIA PVT
		XOMOX SANMAR LTD-PACIFICVALVES DIVISION
		FLOTEK INDUSTRIES
		NILON VALVES PVT. LTD.
15.	**GLOBE VALVE (FORGED)**	BFE SRL
		BHEL (TRICHY)
		BOTELI VALVE GROUP CO.
		DOUGLAS CHERO SPA
		FLOWSERVE PTE(MFR. EDWARD)
		GM ENGINEERING PVT. LTD.
		INTERVALVE POONAWALLA LIMITED
		KSB PUMPS LTD (COIMBATTORE)
		L & T VALVES LIMITED
		NITON VALVE INDUSTRIES PRIVATE LTD .
		OSWAL INDUSTRIES LTD
		STEEL STRONG VALVES INDIA PVTLTD
		VELAN VALVES INDIA PVT LTD
		WEIR BDK VALVES-A UNIT OF WEIR INDIA PVT
16.	**PRESSURE VESSEL -CS (UP TO 25MM)**	ACOUSTICS INDIA PVT LTD
		AERO ENGINEERS
		ALSTOM PROJECTS INDIA LIMITED
		ANUP ENGINEERING LIMITED (THE)
		BARODA EQUIPMENT AND VESSELS PVT LTD
		BEEKAY ENGINEERING CORPORATION
		BHEL (TRICHY)
		BHEL(BHOPAL)
		BILFINGER PLANT EQUIPMENTS PVT LTD(FML
		BTL EPC LIMITED
		BUILDWORTH LIMITED
		CICB-CHEMICON PVT.LTD.
		ESSAR HEAVY ENGG SERVICES(UNIT OF EPIL)
		EXPO GAS CONTAINERS LTD.
		FAB-TECH WORKS & CONSTN. PVT LTD.
		FABTECH PROJECTS & ENGINEERS LTD.
		FACT ENGINEERING WORKS
		FERROFAB FZE
		FURNACE FABRICA (INDIA) LIMITED
		FURNACE FABRICA (INDIA) LIMITED
		GEECY ENGINEERING PVT LTD
		GMM PFAUDLER LTD
		GODREJ & BOYCE MFG. CO. LTD.
		GR ENGINEERNG PRIVATE LTD (TARAPORE)
		GRAND PRIX ENGINEERING PVT LTD.
		GRASIM INDUSTRIES

		HANTECH LIMITED
		INDCON PROJECTS & EQUIPMENTS LTD
		INDIAN OIL CORPORATION LIMITED ,BG(CRYO)
		INDUS PROJECTS LIMITED
		INDUSTRIAL MANUFACTURERS
		ISHAN EQUIPMENTS PVT LTD
		JINDAL STEEL & POWER LTD
		LLOYDS STEELS INDUSTRIES LTD.
		MULTIMAX ENGINEERING WORKS PVT LTD
		MULTITEX FILTRATION ENGINEERS LTD.
		NASH ENGINEERING FZCO
		NEW FIELD INDUSTRIAL EQUIPMENT PVT LTD
		NEWTON ENGG & CHEMICALS LTD
		NILE LIMITED
		NOVATECH PROJECTS INDIA PVT LTD
		ORIENTAL ENTERPRISE PVT. LTD
		PATELS AIRTEMP (INDIA) LTD
		PERFECT INTERNATIONAL(FZC)
		PHILS HEAVY ENGINEERING PVTLIMITED
		PHILS HEAVY ENGINEERING PVTLIMITED
		PRABHA STEEL INDUSTRIES
		PRAJ INDUSTRIES LIMITED
		PRECISION EQUIPMENTS (CHENNAI) PVT LTD
		PROGEN SYSTEMS & TECHNOLOGIES LTD
		R. D. ENGINEERS (INDIA) PVT. LTD
		RADIANT HEAT EXCHANGER PVT.LTD.
		RAJ ENGINEERING COMPANY
		RAVI INDUSTRIES
		RELIANCE FABRICATIONS PVT LTD
		SAURASHTRA ENGINEERING CORPN.PVT LTD
		SHARP TANKS & STRUCTURALS (P)LTD
		Shree Satyanarayan Ind. Supp. Pvt. Ltd
		TECHNIP INDIA LTD.
		TECHNO PROCESS EQUIPMENTS (INDIA)PV LTD
		TEMASME VESELEX INDIA (P) LTD
		TITANIUM EQUIPMENT ANDANODE MFG.CO.LTD
		UNIQUE CHEMOPLANT EQUIPMENTS
		UNITED HEAT TRANSFER PVT LTD
		VIJAY TANKS & VESSELS PVT. LTD
		SREE RAMKRISHNA ENGINEERING ENTERPRISES
		SRI LAKSHMI PRABHA ENGG INDUSTRIES PVT LTD
		OSWAL INFRASTRUCTURE LIMITED
		SUDHIR BROTHERS
17.	**FAN-AXIAL FLOW**	ILMED VENTILAZIONE INDUSTRIALE SRL
		MARATHON ELECTRIC MOTOR I LTD-FORM A350
		PATELS AIRFLOW LTD.

18.	**FAN-ID/FD**	AEROMECCANICA STRANICH SPA
		AEROTO BOLDROCCHI (I) P.LTD.
		AIR CONTROL & CHEMICALENGG.CO.LTD.
		ANDREW YULE & CO LTD-KOLKATA
		BHEL (RANIPET)
		BOLDROCCHI SRL
		DMW CORPORATION
		HOWDEN SOLYVENT (INDIA) PVT. LTD.
		ILLINOIS BLOWERS INC
		MITSUBISHI HEAVY INDUSTRIES LTD
		REITZ INDIA LTD
		TLT ENGINEERING INDIA PVT LTD
		TURBO LUFTTECHNIK GMBH
		VAN TONGEREN KENNEMBER BV
19.	**LT/MV MOTORS (EXPLOSION PROOF)**	ABB INDIA LTD (BANGALORE)
		ABB INDIA LTD-FARIDABAD
		BHARAT BIJLEE LIMITED
		CG POWER &INDUSTRIAL SOLUTIONS LTD.
		KIRLOSKAR ELECTRIC CO LTD
		MARATHON ELECTRIC MOTOR ILTD-FORM A350
		SIEMENS INDIA
20.	**CABLE GLANDS (EX. PROOF)**	BALIGA LIGHTING EQUIPMENTS (P) LIMITED
		FCG FLAMPROOF CONTROL GEARSP. LTD(C-157
		FCG POWER INDUSTRIES PVT LTD
		FLAMEPROOF EQUIPMENTS PVT.LTD
		FLEXPRO ELECTRICALS PVT LTD
		STAHL INDIA
21.	**POWER CABLE LUGS (EXPLOSION PROOF)**	AUTOMIC ELECTRIC &
		CHETNA ENGINEERING CO.
		ELECTROMAC INDUSTRIES
		FORWARD ENGINEERING INDUSTRIES
22.	**JUNCTION BOXES (FLAMEPROOF)**	CMP PRODUCTS LIMITED
		FCG FLAMPROOF CONTROL GEARS P. LTD(C-157
		FCG POWER INDUSTRIES PVT LTD
		FLAMEPROOF EQUIPMENTS PVT.LTD
		FLEXPRO ELECTRICALS PVT LTD
		STAHL INDIA

23.	**PUSH BUTTON AND INDICATING LAMPS**	ESSEN DEINKI
		LARSEN & TOUBRO LTD-POWAI
		SCHNEIDER ELECTRIC INDIA P LTD-HYDERABAD
		SIEMENS LIMITED
		TEKNIC ELECTRIC (I) PVT. LTD.

QAP GUIDELINES & FORMAT

`

(ANNEXURE -)

The QAP format and guidelines for filling up the format shall be used by vendor for preparation and submission of QAP after order placement.

Note :

1. Typical /Indicative /Standard QAP(s) for equipment /package attached is reference document and to use by successful bidder in future for preparation and submission of QAP for BHEL /CUSTOMER approval.

2. No deviation to reference document is acceptable.

GUIDELINES TO VENDORS FOR PREPARATION OF QUALITY ASSURANCE PLAN

1. QAP shall be made in landscape mode on A4 size paper as per the format enclosed. Font size shall be minimum 10.

2. Each page of QAP shall contain the following information.
   a) Vendor's name & address.
   b) Customer: BHEL, Hyderabad.
   c) Project.
   d) BHEL Product Standard Number/revision number as referred in P.O.
   e) BHEL Purchase Order Number & Date.
   f) Product as per P.O. description.
   g) QAP Number (unique and shall not repeat)/revision number/date.
   h) Page number and number of pages

3. QAP shall contain four parts / stages as follows.
   a) Raw materials and bought out items.
   b) In process Control / Inspection.
   c) Final assembly, Inspection & Testing.
   d) Painting, preservation & packing.

4. Under 'Component', indicate name of the component (say casing, rotor, pressure gauge, etc).

5. Under 'Characteristics', indicate appropriately (say chemical analysis, mechanical properties, NDT (UT,DP etc.), hydrostatic test, calibration check etc.)

6. Under 'Class', indicate minor, major or critical depending on the importance of characteristic.

7. Under 'Type of check', indicate appropriately (say chemical, mechanical, UT, DP etc.)

8. Under 'Quantum of check', indicate appropriately (say 100%, 10%, sample, per melt, per heat, all pieces etc.)

9. Under 'Reference document' and 'Acceptance norms', appropriate National & International standards, BHEL standards, approved drawing references etc. should be indicated. It is not correct to mention as "Vendor's internal standards or Vendor's standard practice etc.". If vendors' internal standards are referred, same shall be in line with BHEL Spec. indicated in the P.O. These may require review & approval by our Engineering dept.

10. Under 'Format of record', indicate appropriately supplier's test certificate, calibration certificate, lab report, inspection report etc.

11. Please refer 'Agency' in QAP format.
    Under P: Perform, W: Witness, V: Verify
    Indicate against each characteristic 1: (BHEL CQS/Nominated inspection agency), OR
    2: (Vendor / Sub vendor)

Note: Performing agency is normally vendor or his sub vendor (Legend 2). Where witness points are indicated in specification, P.O., Drawing etc., for such operations, under Witness (W) column use 1. Under 'Verify' column, use code1.

12. Under 'D' please put (□ Tick) against each characteristic where vendor proposes to submit test certificate/report etc. OR as required as per BHEL Specification.

13. Vendor's signature & stamp should be available on each page of QAP.

14. Vendor should read the BHEL Product Standard thoroughly and QAP should be made only inline and relevant to the Specification & Approved Drawings.

15.The following operations/characteristics/check points may be included (AS APPROPRIATE)

a) Visual check
b) Dimensional check
c) Mechanical and Chemical properties.
d) Surface preparation before painting (by chemical cleaning, sand blasting, shot blasting etc. as the case may be.)
e) Painting check for shade, Dry Film Thickness (DFT), Adhesion/ peel off test etc.
f) Check for correctness for all components mounted as per General arrangement Drawing, Bill Of Materials (BOM), etc. for range, rating, make, color, size, location as per GA, quantity, label description including tag nos., annunciator facia, loose components, accessories, spares etc.
g) Verification of test certificate for protection class for the enclosures.
h) Mechanical functioning of switches.
i) Continuity of earthing and provision of earth points.
j) Colour coding of wiring, size, tightness & dressing of wiring.
k) Review of test certificates of assembled items, raw materials, internal test reports etc.
l) Witness of functional checks, which may include mechanical run & electrical run, H.V.test, IR measurement, Electrical and Mechanical tests etc.
m) PQR, WPS, Welder Qualification Record, welding records (fit up, DP) etc.
n) Material identification (for punch marks of serial numbers, Heat No, Melt No, Inspector's stamp etc.)
o) Hydraulic Pressure Test, Pneumatic Pressure Test, Liquid Penetration Examination and other Non Destructive Tests.
p) Tests on Galvanised items (Visual, Hammer Test, Knife Test, Thickness, Pierce Test (Copper sulphate test), Hydrogen evaluation test, Stripping test (for Mass of Zinc coating)
q) All tests as per BHEL Product Standard & approved drawings including Type tests and Routine tests on individual items and on System as a whole.
r) Packing and Preservation.

16. **QAP Format enclosed.**

17. Typical Manufacturing QAP is attached.

VENDOR'S NAME & ADDRESS:	**MANUFACTURING QUALITY PLAN**		QP. NO.:	
	CUSTOMER: BHEL, HYDERABAD – 32. PROJECT: PRODUCT:	BHEL P.O.NO.: P.O.DATE: BHEL SPEC: REV:	REV NO:	DATE:
			PAGE 1 OF 1	

SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
1.0	**RAW MATERIALS & BOUGHT OUT ITEMS**												
2.0	**INPROCESS INSPECTION**												
3.0	**FINAL INSPECTION & TESTING**												
4.0	**PRESERVATION & PACKING**												

VENDOR TO NOTE: THIS FORMAT IS IN MICROSOFT WORD. HEADER & FOOTER SHALL BE AVAILABLE IN EACH PAGE OF QP. QP SHALL BE IN LANDSCAPE & A4 SIZE ONLY. FONT SIZE SHALL BE MIN 10. VENDOR SHALL SIGN & STAMP IN EACH PAGE OF QP. LOI REF. & DATE ARE NOT ACCEPTABLE. P.O.NO. & DATE SHALL BE INDICATED. QP NO. SHOULD BE UNIQUE AND SHALL NOT REPEAT. ALL THE TESTS / CHECKS INDICATED IN THE BHEL SPEC. SHALL BE INDICATED IN THE QP.

LEGEND: P: PERFORM, W: WITNESS, V: VERIFICATION. INDICATE 1 FOR BHEL CQS (OR BHEL NOMINATED INSPECTION AGENCY) & 2 FOR VENDOR/SUB VENDOR AS APPROPRIATE AGAINST EACH COMPONENT /CHARACTERISTIC UNDER P, W & V COLUMNS. * FOR ITEMS MARKED ✓ (TICK) IN COLUMN 'D', TEST CERTIFICATES SHALL BE SUBMITTED TO BHEL FOR RECORDS.	PREPARED BY VENDOR'S SIGNATURE & STAMP	APPROVED BY BHEL QA SIGNATURE & STAMP	APPROVED BY CUSTOMER'S SIGNATURE & STAMP

	STANDARD MANUFACTURING QUALITY PLAN								MQP. NO.: PESD/QA/MP/0040				
	PROJECT ENGINEERING & SYSTEMS DIVISION BHEL, RC PURAM, HYD-502032			PRODUCT: PRESSURE VESSEL					REV NO: 00			DATE: 03/07/18	
									PAGE 1 OF 6				

SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
1.0	**RAW MATERIALS & BOUGHT OUT ITEMS**												
1.1	Plates	Chemical & Mech. Properties, Heat Treatment and UT (SA435) for plates thickness > 16 mm, Impact test	Major	OEM certificate review	100%	Approved drawing/datasheet/specifications		MTC	✓	2	2	1&3	
1.2	Structural Steels	Chemical & Mech. Properties	Major	OEM certificate review	100%			MTC	✓	2	2	1&3	
1.3	Pipes	Chemical & Mech. Properties, Hydro Test/NDE, Impact test	Major	OEM certificate review	100%			MTC	✓	2	2	1&3	
1.4	Flanges	Chemical & Mech. Properties, Ratings, Dimensions	Major	OEM certificate review	100%			MTC	✓	2	2	1&3	
1.5	Fittings	Chemical & Mech. Properties, Hydro Test/NDE, Dimensions	Major	OEM certificate review	100%			MTC	✓	2	2	1&3	
1.6	Gaskets	Chemical & Mech. Properties, Dimensions	Major	OEM certificate review	100%			MTC	✓	2	2	1&3	
1.7	Fasteners	Chemical & Mech. Properties, Hardness, Dimensions	Major	OEM certificate review	100%			MTC	✓	2	2	1&3	
1.8	Electrodes	Chemical & Mech. Properties	Major	OEM certificate review	100%			Batch Certificate	✓	2	2	1&3	

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PE & SD QA BHEL, HYDERABAD

BHEL QA SIGN & STAMP

APPROVED BY

PE & SD QA BHEL, HYDERABAD

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SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
1.9	Paints	Paint properties	Major	OEM certificate review	100%			Batch Certificate	✓	2	2	1&3	
1.10	Instruments*	Material and Calibration/tests WP/EP as per datasheet	Major	OEM certificate review	100%	Approved drawing/datasheet/specifications		MTC & calibration Report	✓	2	2	1&3	As Applicable
1.11	Valves	Chemical & Mech. Properties, Hydro Test/NDE	Major	OEM certificate review	100%			MTC	✓	2	2	1&3	
1.12	Dish Ends	Chemical & Mech. Properties, HT Chart, NDE	Major	OEM certificate review	100%			MTC	✓	2	2	1&3	
2.0	**INPROCESS INSPECTION**												
2.1	Welding	Procedure, Welder Qualifications	Major	Review	100%	ASME Section IX		WPS/PQR/ WPQ	✓	2	2	1&3	
2.2	Shell Fabrication	Identification of Material & transfer of attestation marks	Critical	Visual	100%	Approved drawing/datasheet/specifications		IR	✓	2	2	1&3	
2.2.1		Dimensional conformity of shell after rolling	Major	Measure ment	100%	Approved drawing	ASME Sec.VIII, Div- I	IR		2	2	1&3	
2.2.2		Fit Up of shell Longitudinal seam	Critical	Measure ment	100%	Approved drawing	ASME Sec.VIII, Div- I, UW 33	IR		2	2	1&3	
2.2.3		PT after back chip of L seam weld	Critical	NDE	100%	ASME Section V, Article 6	ASME Section VIII, Appx. 8	IR	✓	2	2	1&3	
2.2.4		RT of above L seam weld	Critical	NDE	Approved drawing	ASME Section V, Article 2	ASME Sec.VIII, Div- I, UW 51	IR	✓	2	2	1&3	RT Film review

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SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
2.2.5		Dimensional Exam. of shell including ovality	Major	Measurement	100%	Approved drawing & ASME Sec.VIII, Div- I, UG 80		IR	✓	2	1&3		
2.3	Shell with Nozzle Fabrication	Identification of material & transfer of attestation for Nozzle pipe, flange, fittings, pads, lugs etc.	Major	Visual	100%	Approved drawing/datasheet/specifications		IR	✓	2	2	1&3	
2.3.1		RT of Nozzle seam weld (if fabricated from Plate)	Critical	NDE	100%	ASME Section V, Article 2	ASME Sec.VIII, Div- I, UW 51	IR	✓	2	2	1&3	RT Film review
2.3.2		Fit up of Nozzles (pipes, flanges & fittings) to shell before welding	Critical	Measurement	100%	Approved drawing	ASME Sec.VIII, Div- I, UW 33	IR	✓	2	1&3		
2.3.3		Nozzle Orientations	Major	Measurement	100%	Approved drawing		IR	✓	2	1&3		
2.3.4		MPI/PT exam. of Nozzle welds (root weld)	Critical	NDE	100%	ASME Section V, Article 7/6	ASME Section VIII, Appx. 6/8	IR	✓	2	2	1&3	
2.3.5		PT after back chip of weld	Critical	NDE	100%	ASME Section V, Article 6	ASME Section VIII, Appx. 8	IR	✓	2	1&3		
2.3.6		MPI/PT exam. of Nozzle welds (Final Weld)	Critical	NDE	100%	ASME Section V, Article 7/6	ASME Section VIII, Appx. 6/8	IR	✓	2	2	1&3	
2.3.7		Dimensional examination of fabricated shell	Major	Measurement	100%	Approved drawing	ASME Sec.VIII, Div- I	IR	✓	2	2	1&3	

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2.4	Dished Ends	Profile Check, Thinning, Ovality and Stress Relieving (SR in case of cold formed dish ends)	Major	Measurement & NDE	100%	Approved drawing & ASME Section V, Article 7/6	ASME Sec.VIII, Div- I, Appx. 6/8	IR & HT Chart	✓	2	1&3		MPI/PT on outer surface after forming
2.4.1		RT of seam weld of Dish Ends (if applicable)	Critical	NDE	100%	ASME Section V, Article 2	ASME Sec.VIII, Div- I, UW 51	IR	✓	2	2	1&3	RT Film review
2.4.2		Fit up of nozzles, couplings, Lugs to Dish Ends before welding	Critical	Measurement	100%	Approved drawing		IR	✓	2	1&3		
2.4.3		Nozzle Orientations	Major	Measurement	100%	Approved drawing		IR	✓	2	1&3		
2.4.4		MPI/PT exam. of Nozzle welds (root weld)	Critical	NDE	100%	ASME Section V, Article 7/6	ASME Section VIII, Appx. 6/8	IR	✓	2	2	1&3	
2.4.5		PT after back chip of weld	Critical	NDE	100%	ASME Section V, Article 6	ASME Section VIII, Appx. 8	IR	✓	2	1&3		
2.4.6		MPI/PT exam. of Nozzle welds (Final Weld)	Critical	NDE	100%	ASME Section V, Article 7/6	ASME Section VIII, Appx. 6/8	IR	✓	2	2	1&3	
2.4.7		Dimensional examination of fabricated Dished Ends	Major	Measurement	100%	Approved drawing	ASME Sec.VIII, Div- I	IR	✓	2	2	1&3	
2.5	Final Assembly	Fit up of Dished Ends to Shell (Test coupon shall be made available with the job)saddles & support Pads to shell	Critical	Measurement	100%	Approved drawing	ASME Sec.VIII, Div- I, UW 33	IR	✓	2	1&3		

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SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
2.5.1		PT after back chip of welds	Critical	NDE	100%	ASME Section V, Article 6	ASME Section VIII, Appx. 8	IR	✓	2	1&3		
		PT of weldments (Out side)	Critical	NDE	100%	ASME Section V, Article 6	ASME Section VIII, Appx. 8	IR	✓	2	1&3		
2.5.2		RT of Circumferential seam welds	Critical	NDE	Approved drawing	ASME Section V, Article 2	ASME Sec.VIII, Div- I, UW 51	IR	✓	2	2	1&3	RT Film review
3.0	**FINAL INSPECTION & TESTING**												
3.1	Complete vessel assly.	Plates, Pipes and fittings thickness	Major	Measure ment	100%	Approved drawing/specifi cations	ASME Sec.VIII, Div- I	Thickness report	✓	2	1&3	-	
3.2		Dimensional Examination	Major	Measure ment	100%			IR	✓	2	1&3	-	
3.3		R.F. Pads by Pneumatic Test	Critical	Visual	100%	Approved drawing /datasheet/specifications ASME Sec.VIII, Div- I, UG 100		Test Report	✓	2	1&3	-	Soap Sol. Test
3.4		Hydrostatic Test for Complete Vessel	Critical	Visual	100%	Approved drawing /datasheet/specifications / ASME Sec.VIII, Div- I, UG 99		Test Report	✓	2	1&3	-	
3.5		PMI*	Major	Visual	Random	Approved Drawing /Datasheet/Specifications		IR	✓	2	1&3	-	*for SS and AS components
4.0	**PRESERVATION & PACKING**												
3.6	Complete vessel assly.	Surface Preparation (Blast Cleaning)	Major	Visual & Match Card	100%	Approved Drawing /Datasheet/Specifications		Log Book	✓	2	2	1&3	SA 2.5 Copper Grit
3.7		Painting of Surface (Shade, DFT) , Markings	Major	Visual & measure ment	100%			IR	✓	2	2	1&3	

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PREPARED BY

BHEL QA SIGN & STAMP

APPROVED BY

BHEL QA SIGN & STAMP

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SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
4.1		Preservation (N2 Gas fill)	Major	Visual & TC review	100%			IR & TC	✓	2	2	1&3	N2 Gas TC review
4.2		Packing*	Major	Visual	100%			Packing list	✓	2	2	1&3	*Sea worthy Packing for Export Orders
5.0	**SPARES**												
5.1	Items as per list	Chemical & Mech. Properties, Hardness, Dimensions, Quantity	Major	Visual & TC review	100%	Approved drawing/datasheet/specifications		MTC/IR& Packing List	✓	2	1&3		

Abbreviations:-

MTC	– Material Test certificate	WPS	- Welding Procedure Specification	PQR	- Procedure Qualification Record
WPQ	- Welder Performance Qualification	DFT	– Dry Film Thickness	TC	– Test Certificate
NDE	- Non Destructive Examination	PMI	- Positive Material Identification	TPIA	- Third Party Inspection Agency

NOTE:

1. This standard MQP should be read along with specification (latest revision), approved drawings & approved data sheet.
2. Specification/drawing/data sheet shall prevail over quality plan for contradiction if any between Quality plan and drawing/specification.
3. All test certificates/reports reviewed and certified by TPI/BHEL shall be submitted to BHEL as documentation package.
4. Any project/customer specific requirements, which shall be notified, have to be fulfilled by the vendor at the time of execution of order.
5. Welding shall be done as per WPS and Drawing requirement, full penetration shall be ensured for all nozzle welds.
6. Plates used shall conform to latest issue of SA-20 with additional requirements mentioned herein.
7. One product analysis of each heat shall be carried out and reported. Chemical analysis shall be as per applicable specification with carbon content not exceeding 0.23% and Carbon Equivalent (Ce) shall not exceed 0.43.
8. All root runs / Single pass welds shall be carried out by TIG Welding.
9. Charpy V-notch impact testing as per S-5 of spec. SA-20 to be carried out at design temperature.
10. Vessels shall be post weld-heat treated as a complete unit and no welding shall be permitted once post weld heat treatment is performed.
11. All 'T' – joint shall be radiographed as per approved drawing.

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VENDOR'S NAME & ADDRESS:	**TYPICAL MANUFACTURING QUALITY PLAN**		QP. NO.:	
	CUSTOMER: BHEL, HYDERABAD – 32. PROJECT: PRODUCT:**Air cooled Dump Condenser**	BHEL P.O.NO.: P.O.DATE: BHEL SPEC: REV:	REV NO:	DATE:
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SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
1.0	**RAW MATERIALS & BOUGHT OUT ITEMS**												
1.1	Drive Shaft & its components	Chemical & Mechanical Properties	Major	Chem. & Mech. Analysis	One per Lot/Batch /Heat	BHEL Spec/ Appd Dwgs/ Datasheet	BHEL Spec/ Appd Dwgs/ Datasheet	MTC	√	2	-	1	
1.2	Fan Assembly	Chemical & Mechanical Properties	Major	Chem. & Mech. Analysis	One per Lot/Batch /Heat			MTC	√	2	-	1	
1.3	Gear Box	Chemical & Mechanical Properties	Major	Chem. & Mech. Analysis	One per Lot/Batch /Heat			MTC	√	2	-	1	
1.4		UT on Shaft	Major	UT	100%			MTC	√	2	-	1	
1.5	Fabrication Steel	Chemical & Mechanical Properties	Major	Chem. & Mech. Analysis	One per Lot/Batch /Heat			MTC	√	2	-	1	
1.6	Instruments	Chemical & Mechanical Properties, Calibration	Major	Chem., Mech. Analysis	One per Lot/Batch /Heat, 100%			MTC	√	2	-	1	
1.7		Type Test (Weather, Proof & Hazardous area certification etc.)#	Major	Hydro, Type Test	100%			TC	√	2	-	1	# as applicable
1.8	Manifold Pipes	Chemical & Mechanical Properties	Major	Chem. & Mech. Analysis	100%			MTC	√	2	-	1	
1.9	Motor	Refer detailed QAP enclosed separately											
1.10	Pressure Vessel	Refer detailed QAP enclosed separately											

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	CUSTOMER: BHEL, HYDERABAD – 32. PROJECT: PRODUCT:**Air cooled Dump Condenser**	BHEL P.O.NO.: P.O.DATE: BHEL SPEC: REV:	REV NO:	DATE:
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1.11	Valve	Chemical & Mechanical Properties	Major	Chem. & Mech. Analysis	One per Lot/Batch /Heat			MTC	√	2	-	1	
1.12		NDT, Seat Leakage, Body Hydro test, Performance test (For MOV)	Major	LPT	100%			TC	√	2	-	1	
1.13	Pipe	Chemical & Mechanical Properties	Major	Chem. & Mech. Analysis	One per Lot/Batch /Heat			MTC	√	2	-	1	
1.14		Dimensions, Hydro test	Major	Visual, measure ment, Hydrotest	100%			TC	√	2	-	1	
1.15	Tube	Chemical & Mechanical Properties	Major	Chem. & Mech. Analysis	One per Lot/Batch /Heat			MTC	√	2	-	1	
1.16		Dimensions, Hydro test	Major	Visual, measure ment, Hydrotest	100%			TC	√	2	-	1	
1.17	Pipe Fittings	Chemical & Mechanical Properties	Major	Chem. & Mech. Analysis	One per Lot/Batch /Heat			MTC	√	2	-	1	
1.18		Dimensions, Hydro test, Heat treatment.	Major	Visual, measure ment	100%	BHEL Spec/ Appd Dwgs/ Datasheet	BHEL Spec/ Appd Dwgs/ Datasheet	IR	√	2	-	1	

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	CUSTOMER: BHEL, HYDERABAD – 32. PROJECT: PRODUCT:**Air cooled Dump Condenser**	BHEL P.O.NO.: P.O.DATE: BHEL SPEC: REV:	REV NO:	DATE:
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1.19	Flanges	Chemical & Mechanical Properties	Major	Chem. & Mech. Analysis	One per Lot/Batch /Heat			MTC	√	2	-	1	
1.20		Dimensions, Rating check	Major	Visual, measurement	100%			IR	√	2	-	1	
1.21	Fasteners	Chemical & Mechanical Properties	Major	Chem. & Mech. Analysis	One per Lot/Batch /Heat			MTC	√	2	-	1	
1.22		Dimensions, Hardness check	Major	Visual, measurement	Random			IR	√	2	-	1	
1.23	Gaskets	Chemical & Mechanical Properties	Major	Chem. & Mech. Analysis	One per Lot/Batch /Heat			MTC	√	2	-	1	
1.24		Dimensions	Major	Visual, measurement	100%			IR	√	2	-	1	
1.25	Welding consumables	Chemical & Mechanical Properties	Major	Chem. & Mech. Analysis	One per Lot/Batch /Heat			MTC	√	2	-	1	
1.26	Paints	Catalogue/Datasheet	Major	Doc verification	100%			TC	√	2	-	1	
2.0	**INPROCESS INSPECTION**												
2.1	Welding	WPS, PQR, WQR	Major	Doc. Verification	100%	BHEL Spec/ Appd Dwgs/ Datasheet	BHEL Spec/ Appd Dwgs/ Datasheet	WPS, PQR, WQR	-	2	2	1	

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2.2	Drive Shaft, Fan Assy etc.	RT for Butt Welds	Major	RT	100%			TC	√	2	-	1	
2.3		DP for Other welds		DP Test	100%			TC	√	2	1	-	
2.4	Tube Bundle	Dimensions, Air Leakage, Hydro test	Major	Visual, measurement, Hydrotest	100%			TC	√	2	-	1	
3.0	**FINAL INSPECTION & TESTING**												
3.1	Drive Shaft	Visual, Dimensions	Major	Visual, Measurement	100%	BHEL Spec/ Appd Dwgs/ Datasheet	BHEL Spec/ Appd Dwgs/ Datasheet	IR	√	2	1, 3	-	
3.2		Balancing	Critical	Balancing	100%			TC	√	2	1, 3		
3.3		Ovality & Run Out & straightness	Major	Testing	100%			TC	√	2	1, 3		
3.4	Fan Assembly	Visual, Dimensions	Major	Visual, Measurement	100%			IR	√	2	1, 3		
3.5		Balancing & vibration	Critical	Balancing	100%			TC	√	2	1, 3		
3.6	Gear Box Assembly	Visual, Dimensions	Major	Visual, Measurement	100%			IR	√	2	1, 3		(If Applicable)
3.7		Run-in Test(Vibration, Noise, Amperage, torque, oil leakage, temp rise)	Critical	Testing	100%	BHEL Spec/ Appd Dwgs/ Datasheet	BHEL Spec/ Appd Dwgs/ Datasheet	TC	√	2	1, 3		
3.8	Manifold Pipes	Visual, Dimensions	Major	Visual, Measurement	100%			IR	√	2	1, 3		
4.0	**PRESERVATION & PACKING**												

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SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
4.1	Painting#	Shade, DFT, marking	Major	Visual, Measurement	Random	BHEL Spec/ Appd Dwgs/ Datasheet	BHEL Spec/ Appd Dwgs/ Datasheet		√	2	1, 3		
4.2	Packing	Soundness of packing		Seaworthy Packing	100%	BHEL Spec for Export orders	BHEL Spec for Export orders			2	1, 3		

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	TYPICAL MANUFACTURING QUALITY PLAN								MQP. NO.:				
	PROJECT ENGINEERING & SYSTEMS DIVISION BHEL, RC PURAM, HYD-502032				PROJECT: PACKAGE: **LT MOTOR** BHEL TECH SPEC:				REV NO:		DATE:		
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SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
1.0	**RAW MATERIALS & BOUGHT OUT ITEMS**												
1.1	COPPER WIRE Enameled Copper Wire	Overall diameter, elongation, Mandrel winding test, Peel test, springiness, Abrasion test, Cut through test, Heat shock test, Continuity test	Major	Measurement and mechanical & electrical testing	One sample per heat/lot	National & international standard (IS or IEC) / technical specification/ approved drawing/ datasheet		IR / supplier test certificate	√	2	2	1	
1.2	STEEL SHAFT Straightened Steel bar in black Finish	Dimensions, surface finish, chemical composition	Major	Visual, measurement and chemical testing	One sample per heat/lot			supplier test certificate	√	2	2	1	
1.3		NDT	Major	UT	100%			supplier test certificate	√	2	2	1	
1.4	ALUMINIUM INGOTS	Chemical properties	Major	Chemical testing	One sample per heat/lot			supplier test certificate	√	2	2	1	
2.0	**INPROCESS INSPECTION**												
2.1	ASSEMBLY	Completeness and correctness of assembly	Major	Visual verification	100%	MO and manufacturer's internal processes		Log book	--	2	2	2	

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	TYPICAL MANUFACTURING QUALITY PLAN								MQP. NO.:				
	PROJECT ENGINEERING & SYSTEMS DIVISION BHEL, RC PURAM, HYD-502032			PROJECT: PACKAGE: **LT MOTOR** BHEL TECH SPEC:					REV NO:		DATE:		
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SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
3.0	**FINAL INSPECTION & TESTING**												
3.1	**ROUTINE TESTING**	Measurement of winding resistance in cold condition	Major	Testing	100%	National & international standard (IS or IEC) / technical specification		TC	√	2	1	--	
3.2		SH heater resistance (if applicable)	Major	Testing	100%			TC	√	2	1	--	
3.3		Insulation resistance (before and after HV test)	Major	Testing	100%			TC	√	2	1	--	
3.4		High voltage test at 1.8 KV for 1 minute and space heater HV test	Major	Testing	100%			TC	√	2	1	--	
3.5		Direction of rotation	Major	Testing	100%			TC	√	2	1	--	
3.6		No load test (measurement of NL A, voltage, NL power and NL RPM)	Major	Testing	100%			TC	√	2	1	--	
3.7		Reduced run up voltage test at (rated volt√3)	Major	Testing	100%100%			TC	√	2	1	--	
3.8		Locked rotor test at full load current	Major	Testing	100%			TC	√	2	1	--	
3.9		Vibration measurement	Major	Testing	100%			TC	√	2	1	--	
3.10		Measurement of noise level	Major	Testing	100%			TC	√	2	1	--	
3.11		120% over speed test	Major	Testing	100%			TC	√	2	1	--	

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	PROJECT ENGINEERING & SYSTEMS DIVISION BHEL, RC PURAM, HYD-502032			PROJECT: PACKAGE: **LT MOTOR** BHEL TECH SPEC:				REV NO:	DATE:			
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SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
3.12	**TYPE TESTS**	Measurement of winding resistance in cold condition	Major	Testing	One /rating	National & international standard (IS or IEC) / technical specification		TC	√	2	--	1	Verification of Identical Type test Report of same Rating Identical type test reports for motor ratings (not more than 5 years old) will be provided.
3.13		Temp. rise test at full load (load point for 100%, 75% & 50% load (full load, ¾ and ½ load)	Major	Testing	One /rating			TC	√	2	--	1	
3.14		160% momentary overload test	Major	Testing	One /rating			TC	√	2	--	1	
3.15		Locked rotor amp and torque test	Major	Testing	One /rating			TC	√	2	--	1	
3.16		No load test	Major	Testing	One /rating			TC	√	2	--	1	
3.17		Reduced voltage running up test	Major	Testing	One /rating			TC	√	2	--	1	
3.18		Insulation resistance test (before and after HV test)	Major	Testing	One /rating			TC	√	2	--	1	
3.19		HV test – 1.8 KV for winding and 1.5 KV for space heater	Major	Testing	One /rating			TC	√	2	--	1	
3.20		Vibration test	Major	Testing	One /rating			TC	√	2	--	1	
3.21		120% over speed test	Major	Testing	One /rating			TC	√	2	--	1	

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	PROJECT ENGINEERING & SYSTEMS DIVISION BHEL, RC PURAM, HYD-502032			PROJECT: PACKAGE: **LT MOTOR** BHEL TECH SPEC:					REV NO:		DATE:		
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SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
4.0	**PRESERVATION & PACKING**												
		Painting*, (Shade, DFT,) Marking	Major	Visual, DFT	Random	Technical specification/ approved drawing/datasheet		TC	√	2	--	1	
		Packing*	Major	Visual	Random			Packing List	√	2	--	--	

Notes:-

4. This MQP should be read along with specification ((Latest revisions to be considered as per PO), approved drawings & approved datasheet.
5. Specification/drawing/datasheet shall prevail over quality plan for contradiction if any.
6. Any project/customer specific requirements which shall be notified have to be fulfilled by the vendor at the time of execution of order.

Abbreviations:-

MTC	–	Material Test certificate	COC	–	Certificate of Compliance	DFT	–	Dry Film Thickness
TC	–	Test Certificate	NDE	–	Non Destructive Examination	IR	–	Inspection Report
DFT	–	Dry Film Thickness	IBR	–	Indian Boiler Regulations	IS	–	Indian Standards

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DOMESTIC PACKING

COMMON GUIDELINES

1 GENERAL:

This standard lays down packing instructions for domestic packing of Components/Assemblies/Equipment to be despatched against Customer's contracts, for which there are no special instructions issued by the Engineering Departments.

The Components/Assemblies need to be packed suitably to avoid physical damage & corrosion during transit & storage. For specific applications the concerned engineering department shall issue a product standard. Reference of this product standard, must appear in the Shipping list/Packing List.

2 SCOPE:

This procedure gives minimum guidelines to be complied with for domestic packing of Components/Assemblies/ Equipment. This domestic packing shall be suitable for different handling operations and for the adverse conditions during transportation and during indoor / outdoor storage of materials.

3 TYPES OF PACKING:

The following 5 types of packing have been standardized for packing of General Components/Assemblies.

1) '**OP**' - Open Type.
2) **'PP**' - Partially Packed.
3) '**CP**' – Crate/Box Packing - Components/Equipment requiring physical protection.
4) '**CQ**' - Case Packing – Machined components-Small & Medium Components/ Assemblies/ Equipment which require corrosion & physical protection.
5) '**CR**' - Case Packing – Electrical/Electronic Components/Assemblies, which require special packing viz. Water Proof, Shock Proof etc...

4 DESCRIPTION OF TYPES OF PACKING:

The various types of packing, as standardized above, are described below.

4.1 'OP' - Open Type

In case, of components which are not affected by water & dust and do not require special protection, are generally not machined, shall be sent as open packages. However, these components may be sent in crates, wherever necessary.

4.2 'PP' - Partially Packed

Components which need special protection at selected portions only shall be despatched partially packed. Machined surfaces should not be allowed to come directly in contact with the wood. Such surfaces should be protected with 70GSM(Colourless) Multi Layered Cross Laminated Polyethylene Film to Specification No. AA51420. All sharp corners and edges shall be protected by rubber mats to prevent damage to the polyethylene film

4.3 'CP' - Crate Packing

Assemblies/Components which need only physical protection from the point of view of handling shall be despatched duly packed in crates.

4.4 'CQ' - Case Packing - Machined Components/Assemblies/Equipment

Small and medium sized components/assemblies/equipment due to size/weight and to avoid handling and pilferage problems shall be packed in Case/Containers. Wherever required adequate quantity of silica gel to AA55619 or VCI Powder/Tablets, packed in thin muslin cloth cotton bags shall be suitably placed. Small machines/components of less weight shall be provided with suitable cushioning by Rubberised coir. The components inside the case shall be entirely covered with 70GSM(Colourless) Multi Layered Cross Laminated Polyethylene Film Specification No. AA51420, wherever required.

4.5 'CR' - Case Packing - Electrical & Electronic Components/Assemblies

Delicate components likely to be damaged e.g. Gauges, Instruments etc. are to be wrapped in waxed paper or polyethylene air bubble film and packed in cartons. Adequate quantity of Silica gel to AA55619 packed in cotton bags of 100grams each are to be suitably placed in the cartons. The cartons shall be entirely covered with 70GSM(Colourless) Multi Layered Cross Laminated Polyethylene Film Specification No. AA51420 before being packed in the cases. VCI Powder/Tablets can be used as an alternative to Silica Gel to AA 55619.

Empty space in the cartons shall be filled with rubberized coir to get proper cushioning effect. The cartons shall be manufactured from corrugated Fiber Board, meeting requirements of AA51414.

5 PREPARATION OF PACKING CASES

5.1 DOMESTIC:

Based on the availability, the wood shall be Rubber wood (Havea Brasiliensis)/Pine wood for packing of cubicles, loose items, spares and photovoltaic items meant for customers in India**.**

5.2 DIMENSIONS:

a) Thickness of planks for Front, rear, top and bottom sides and binding, jointing battens shall be 25 +2/-3 mm.

b) Width of all planks including the tongue shall be more than 125mm and after plaining it shall be minimum 100mm.

c) Minimum number of planks shall be used for a shook.

d) Horizontal, vertical, diagonal planks shall be given for binding (number of such planks depend on the dimension of panel.

e) External sides of front and rear planks to be plained to facilitate writing of address and other markings.

f) Width of binding planks shall be minimum 100mm.

g) Distance between any 2 binding planks shall be less than 750mm.

h) diagonal planks shall be used in between vertical binding planks when distance between inner to inner of vertical planks is more than 750mm

i) Distance of the outer edges of these planks from the edge of case shall be less than 250mm.

j) Diagonal planks are not required for top planks and width side, if the width of pallet is less than 750mm.

5.3 JOINTING OF PLANKS

Single length planks shall be used for cubicles whose overall length is less than 2400mm. For cubicles of length more than 2400mm, jointing is permitted. The jointing shall be done with one single or maximum of 2 planks of wood same as other planks of width 250 mm (minimum) with two rows of nails on either side of the joint in zigzag manner. From the joint along height side, it shall be of lap joint with overlap of at least the width of plank.

5.4 TONGUE AND GROOVE JOINTS

Two consecutive planks shall be joined by tongue and groove joint. Depth of tongue shall be 12+1 mm, thickness of tongue shall be 8 +1 mm. The groove dimensions shall be such that the tongue fits tightly into the groove to make a good joint. This type of joint can be done based on the product requirement wherever required.

5.5 PERMISSIBLE DEFECTS

Wood shall be free from knots, bows, visible sign of infection and any kind of decay caused by insects, fungus, etc.

End splits: Longest end splits at each end shall be measured and lengths added together. The added length shall not exceed 60mm per meter run of shook's. Wood pins shall be used to prevent further development of split.

Surface cracks: Surface cracks with a maximum depth of 3mm are permissible. A continuous crack of any depth all along the length is not allowed.

5.6 CHEMICAL TREATMENTS FOR PRESERVATION OF WOOD

1) This treatment provides protection to the packing wood against deterioration due to fungi and attack by termites, borers and marine organism and any kind of infections.
2) The wooden planks, after making tongues / grooves shall be treated with chemicals. For pine wood, treatment with ASCU/ CCA solution need not be done.
3) The chemical used shall be ready mix ASCU paste. This consists of Arsenic pent oxide, copper sulphate sodium dichromate. This Paste shall be mixed at the rate of 1 kg of paste per 10 liters of water to the extent of water used. Alternate this CCA paste as mentioned at para 5) below can also be used.
4) The chemical treatment shall be done at the premises of the contractor. A cement concrete tank of capacity to hold a minimum of 2000liters of solution shall be constructed. The solution shall be prepared in the presence of BHEL Representative by contractor. The wooden planks shall be soaked in the solution for a minimum of 12 hours. The solution shall be replenished after treating a maximum of 12 cubic meters of wood. A log book shall be maintained by the contractor to give the details of date of preparation of solution, quantity of solution prepared, quantity of chemicals used, Quantity of wood treated and the details of replenishment. Samples of solutions before mixing will be tested at the laboratories designated by BHEL. The testing fees to be paid to the laboratories will have to be borne by the contractor. The paste shall be tested as and when required.
5) Specifications for water soluble type wood preservatives: Copper – Chromium – Arsenic [CCA]: Copper – Chromium – Arsenic preservative formulation shall be as per IS:10013 Part – II – 1981 shall consist of following active ingredients in nominal proportions by weight as shown below:

– Arsenic Pent oxide	AS2O52H2O	12.5
– Copper Sulphate	CuSO45H2O	37.5
– Sodium Dichromate	Na2Cr2O75H2O	50.0
– Or Potassium Dichromate	K2Cr2O7	

5.7 OTHER MATERIALS

5.7.1 NAILS

The dia. of the nails shall be 3.15mm. The length of the nails shall be 65mm wherever two planks of 25mm thickness are joined and 75mm wherever a 25mm planks is joined to a 50mm plank.

5.7.2 BLUE NAILS

These are used for nailing bituminized Kraft paper/hessian cloth to the planks. The length of the nails shall be 16mm.

5.7.3 HOOP IRON STRIPS

These are used for strapping the boxes. The width of the strips shall be 19+1mm and thickness 0.6+0.01mm. The material shall be free from rust.

5.7.4 CLIPS

These shall be used for strapping the hoop iron strips on the boxes.

5.7.5 BRACKETS

These brackets are used for nailing to the corners of cubicle boxes. The brackets shall be of mild steel of thickness min 2mm and width 25+1mm. The brackets shall be of “L" shape, the length of each side being 100+2mm. Two holes shall be provided towards the end of each side for screwing /nailing.

5.7.6 FASTENERS

Bolts, double nuts, spring washers will have to be used for packing of some special items like transformers, reactors, breakers, etc., to hold the job to the bottom plank of the box. The bolts, nuts, washers will be provided by the vendor. Drilling of holes will have to be done using contractor's tools.

5.7.7 MULTI LAYERED CROSS LAMINATED POLYTHELENE FILM

70GSM (Colourless) Multi Layered Cross Laminated Polythelene Film Specification No: AA51420 are used to make covers to the jobs individually. The cross lamination gives qualities of extra toughness, together with flexibility and lightness coupled with good weather resistance to ultra violet rays.

5.7.8 RUBBERISED COIR:

The rubberized coir is used as cushioning material. For the packing of loose items, items are to be arrested by using rubberized coir. For the packing of cubicles rubberized coir of thickness 25mm and width 75mm shall be used.

5.7.9 FOAM RUBBER / 'U' FOAM:

This is used for covering the delicate items. This material is provided by the vendor.

5.7.10 MARKING PLATE:

This shall be of anodized aluminium sheet. Details and specifications are given in Figure 4

5.7.11 PACKING SLIP HOLDER:

This shall be of galvanized iron tinned sheet /Aluminium sheet

5.7.12 SILICA GEL:

This shall be of indicating type to conform to IS: 3401/AA55619.

5.7.13 COTTON BAGS:

These are used for holding silica gel. The bags shall have the following matter indicated on them:

BHEL-UNIT NAME	PLACE-PINCODE
SILICA GEL	INDICATING TYPE
BLUE :	ACTIVE
ROSE :	REDUCED ACTIVITY
WHITE :	NO ACTIVITY. TO BE REPLACED WITH FRESH SILICA GEL

5.7.14 COTTON/ PLASTIC TAPE:

This is used for tying small items. And also to prevent vibrations of moving parts within the cubicles.

5.7.15 MARKING INK:

The ink used normally is black in color. In some special cases other color also will have to be used. The ink shall be non-fading/indelible and non-washable by water.

5.7.16 POLYETHYLENE BAGS:

These are to be used for keeping the Packing slips. The bag shall be of size 70mm X 100mm (minimum).

5.7.17 Hessian cloth, twine thread, paint will have to be used in packing certain items.

5.7.18 Mechanical Latching clamps:

For CLW Railway panels and similar Panels self-locking clamps can also be used on need basis in conjunction with or apart from regular bolt and nut fixing arrangement. For reusable boxes, these clamps provide easy locking and unlocking arrangement. These clamps will be made available from BHEL in some cases.

5.7.19 STICKERS

The following stickers to be put by the vendor on cubicles/Boxes after packing.

1) Case No sticker: 2 nos. Size 25.Cm x 0.45Cm
2) BHEL Monogram sticker: 1 no. Size 1.75Cm x 2.3Cm
3) Address sticker: 2 nos. Size 3.8Cm x 3.0Cm
4) Direction sticker “Front” & “Back” - 4 nos. Size 2.0Cm x 0.75Cm
5) Chain Mark Sticker: 4 Nos. Size – 3.0Cm x 0.75Cm
6) "Fragile” sticker: 2 Nos. Size. 2.1Cm x 1.5Cm
7) "DO NOT STACK” sticker - 2 Nos. Size 3.0Cm x 2.2Cm

6 PACKING OF CUBICLES WITH RUBBER WOOD:

6.1 The wood shall conform to specification AA51402.

6.2 The packing is to be done as per clause 4 in all respects.

6.3 The cubicles are already fixed on wooden pallets. Hence the contractor need not arrange the bottom pallets normally.

6.4 The cubicles will be of different sizes both width wise and lengthwise. The cubicles may be made up of single suite, 2 Suite, 3 Suite, 4 Suite, etc., The width of the cubicles generally varies from 400 mm to 1650mm.The length of the cubicle, generally varies from 1500 mm to 4800 mm. The height is normally 2430 mm. In some cases, the height may be less/more**.**

6.5 MULTI LAYER CROSS LAMINATED POLY FILM

The inner surface of 4 sides of shook's shall be nailed with Multi-layer cross laminated poly film (as per 5.7.7) using blue nails (as per 5.7.2) wherever 2 pieces of Cross laminated poly film are used, the joint shall have an overlap of minimum 20mm.

The inner surface of top cover shall be nailed with Multi-layer cross laminated poly film (as per 5.7.7). This sheet shall project outside on 4 sides by at least 100mm and shall be nailed properly on sides. Joining of sheets should have overlap of minimum 20mm.

The cubicles shall be covered with Multi-layer cross laminated poly film (as per 5.7.7).

6.6 SILICA GEL:

Silica gel (as per 5.7.12) packed in cotton bags shall be kept at different places inside the cubicle as per BHEL-Unit directions. Each suit of cubicle shall be provided with 1 kg of Silica gel (for a 4 suit cubicle 4 kgs of Silica Gel to be used. The bag containing silica gel to be as per 5.7.13).

6.7 LOOSE PARTS:

Any loose parts in the cubicles shall be tied using cotton/ plastic tape. Wooden battens shall be provided wherever necessary.

6.8 WOODEN BATTENS:

In case of cubicle which are not rectangular in shape like control desks, sufficient number of wooden rafters/battens of proper size shall be provided to give strength to the package.

6.9 RUBBERISED COIR:

Gap between the cubicle and the case shall be filled with rubberized coir (as per 5.7.8) with distance between consecutive layers less than 500mm.

6.10 CLAMPING:

Packing shall be bound at edges by nailing M.S. Clamps / Brackets (as per 5.7.5). Each vertical edge shall have minimum 3 clamps. Top horizontal edges will have one clamp for every meter length of package. However, minimum 4 clamps shall be nailed at the top for any cubicle.

6.11 PACKING SLIP:

Packing slip kept in the polyethylene bag (As per 5.7.16) shall be placed in the box at appropriate place. In addition, one more packing slip covered in polyethylene cover and packing slip holder (as per 5.7.11) shall be nailed to front / rear of case.

6.12 MARKING PLATE:

One no. (As per 5.7.10) shall be nailed to the front side of the case.

6.13 CASE MOUNTING:

After complete packing, stencil marking of various details and marking of symbols shall be done as per BHEL instructions using indelible / non washable marking ink.

6.14 Different types (Typical) of Cubicles with sizes for Packing

1. Single suite cubicle - 900 x 950 x2500
2. Two suite cubicle - 1650 x 950 x 2500
3. Three suite cubicle - 2400 x 950 x2500
4. Four suite cubicle - 3150 x 950 x 2500
5. Regulation cub - 1300 x 1350 x 2500
6. Thy cub - 2870 x 1350 x 2500
7. VFD Cub - 3800 x 1550 x 2500

6.15 PACKING OF CUBICLES WITH PINE WOOD

Packing of cubicles for export shall be done exactly in same manner as described at Cl.No 5 except for the following changes: -

Wood shall be Silver Oak/ Pine wood instead of rubber wood as per AA51401.

– Double polyethylene petticoat instead of one.

– Fumigation may have to be done if required (BHEL Scope).

7 PACKING OF LOOSE ITEMS/SPARES USING RUBBER WOOD:

1) Shape of cases shall be square, rectangular with single gabled roof or with double gabled roof depending on the nature of the job to be packed. Construction shall be as per drawings enclosed. Only gable will be additional as required.
2) Wood shall be rubber wood with Tongue and Groove joint as per clause 5.4.
3) Chemical treatment as per Clause 4.6 to be done.

4) Width of planks shall be at least 100 mm. Width of binding planks (battens) shall be at least 75mm.

5) External surface of planks on front and rear shall be plane 100% (except bottom plank).

6) Inner surfaces of all 6 sides shall be lined with Multi Layered Cross Laminated Polythelene Film (as per clause 5.7.7) using blue nails.

7) Rubberized coir of minimum 25mm thickness and 100 mm width shall be nailed to inner surfaces of bottom and 4 sides of box.

8) Internal packing: Items that go into the box shall be packed using 70GSM, (Colourless) Multi Layered Cross Laminated Polyethylene Film Specification No: AA51420. Any space left between the job and the sides and the top of the box shall be filled with rubberized coir to get proper cushioning effect.

9) Certain items like transformers, reactors, breakers, etc., shall be bolted to the bottom of the box using bolts, nuts and washers.

10) Silica gel as per clause 5.7.12 held in cotton bags as per clause 5.7.13 shall be kept at proper places in the box.

11) Packing slip kept in polyethylene bag (clause 5.7.16) shall be placed in the box.

12) Marking plate as per clause 5.7.10 shall be nailed to side of the box.

13) Two numbers of hoop iron strips as per clause 5.7.3 shall be strapped tightly on the case using clips.

14) Stencil marking of various details and marking of various symbols shall be done as per BHEL instructions using indelible/non-washable marking ink.

15) Loose items to be kept inside the cubicle

- The components which are removed from cubicle for shipping purpose only, such as meters shall be kept inside the cubicle individually, kept in wooden box and tied firmly in bottom of Cubicle.

- Other items which are given loose in addition to cubicle shall be packed in separate boxes.

8 BOX SIZES

8.1 BOX SIZES

Table 1 – SPARES WOODEN BOX DETAILS

SNO	BOX TYPE	BOX SIZE (in mm)	BOX Wt (in KG)	Carrying Capacity
1	A	800 X 200 X 200	15	
2	B	1500 X 200 X 200	22	
3	C	2000 X 200 X 200	27	
4	D	1100 X 200 X 200	15	
5	E	200 X 200 X 200	5	
6	F	320 X 250 X 260	13	
7	G	320 X 250 X 430	16	
8	H	430 X 370 X 430	23	
9	I	1100 X 400 X 400	45	
10	J	1500 X 500 X 400	65	
11	K	2000 X 500 X 400	93	
12	L	2500 X 500 X 400	88	
13	M	900 X 600 X 600	100	
14	N	3000 X 400 X 400	60	
15	P	600 X 500 X 400	35	
16	Q	710 X 630 X 600	90	
17	R	850 X 630 X 670	102	

SNO	BOX TYPE	BOX SIZE (in mm)	BOX Wt (in KG)	Carrying Capacity
18	S	1000 X 770 X 670	140	
19	T	2500 X 850 X 800	180	
20	U	1500 X 700 X 700	120	
21	W	1200X900X600	120	
22	Y	450 X 200 X 200	10	

Table 2 – WOODEN BOX DETAILS

BOX TYPE	BOX SIZE (in MM)	BOX Wt (in KG)	Carrying Capacity
1	320X250X260	10	
2	320X250X430	15	
3	430X370X430	25	
4	670X670X470	65	
5	720X630X600	75	
6	1000X770X660	100	
7	1100X430X670	80	
8	1200X1200X900	80	
9	1300X770X1050	155	
10	2500X850X800	225	
11	2000X1500X1200	305	
12	1850X1050X1250	260	
13	2000X800X800	180	
14	2600X1500X1600	470	
15	250X250X600	20	
16	250X250X880	30	
17	300X300X700	25	
18	380X380X880	45	
19	510X510X1400	60	
20	570X570X1400	80	
21	575X575X1875	105	
22	3600X1100X1100	390	
23	900X500X800	110	
24	2000X950X740	225	
25	1600X1120X700	220	
26	2500X2000X1200	490	
27	2900X1900X1400	525	
28	3000X1000X900	370	
29	3200X2200X950	450	
30	2150X1100X750	325	
31	2000X2000X700	130	
32	700X1200X1325	130	

Table 3 – STEEL BOXES

SL NO	TYPE	DIMENSION IN MM			WEIGHT	CARRYING CAPACITY (KGS)
		LENGTH	BREADTH	HEIGHT		
07	I	2480	1680	1500	339	4500
08	II	1200	900	600	061	2000
09	IIB	1800	850	950	115	2500
10	III	900	600	600	029	1000
11	IV	600	450	500	019	750
12	V	400	350	300	011	500

TYPICAL PATTERN OF WOODEN BOX

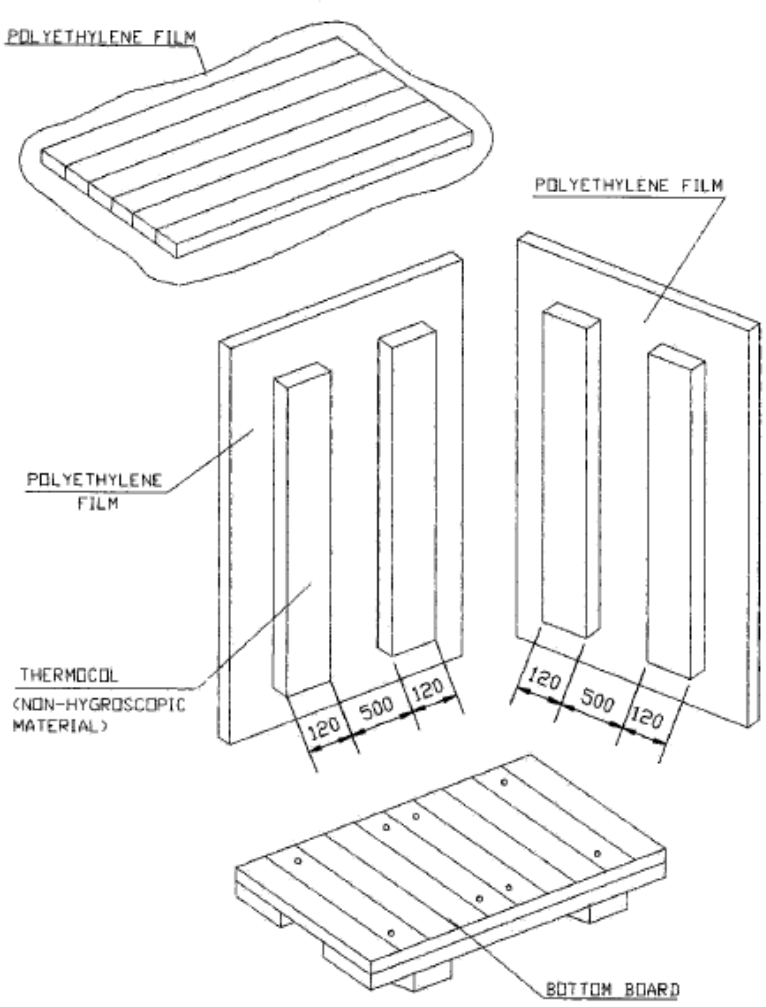


Figure 1

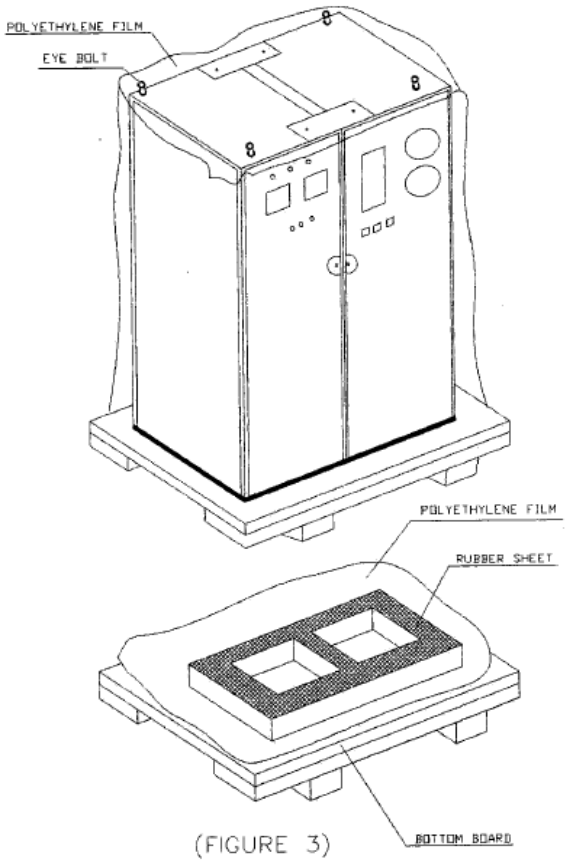


Figure 2

8.2 STEEL CONTAINERS:

Steel containers for packing can be used in case of repeated supplies of the same equipment. Empty steel containers are to be returned back from customer's end and to be reused for the next supplies. The containers are to be made of structural steel as per AA10108 with proper reinforcement with I, C and T Sections.

a) Following precautions are to be taken during packing: -

b) Put the machine in the steel container properly,

c) Cover the machine with polythene.

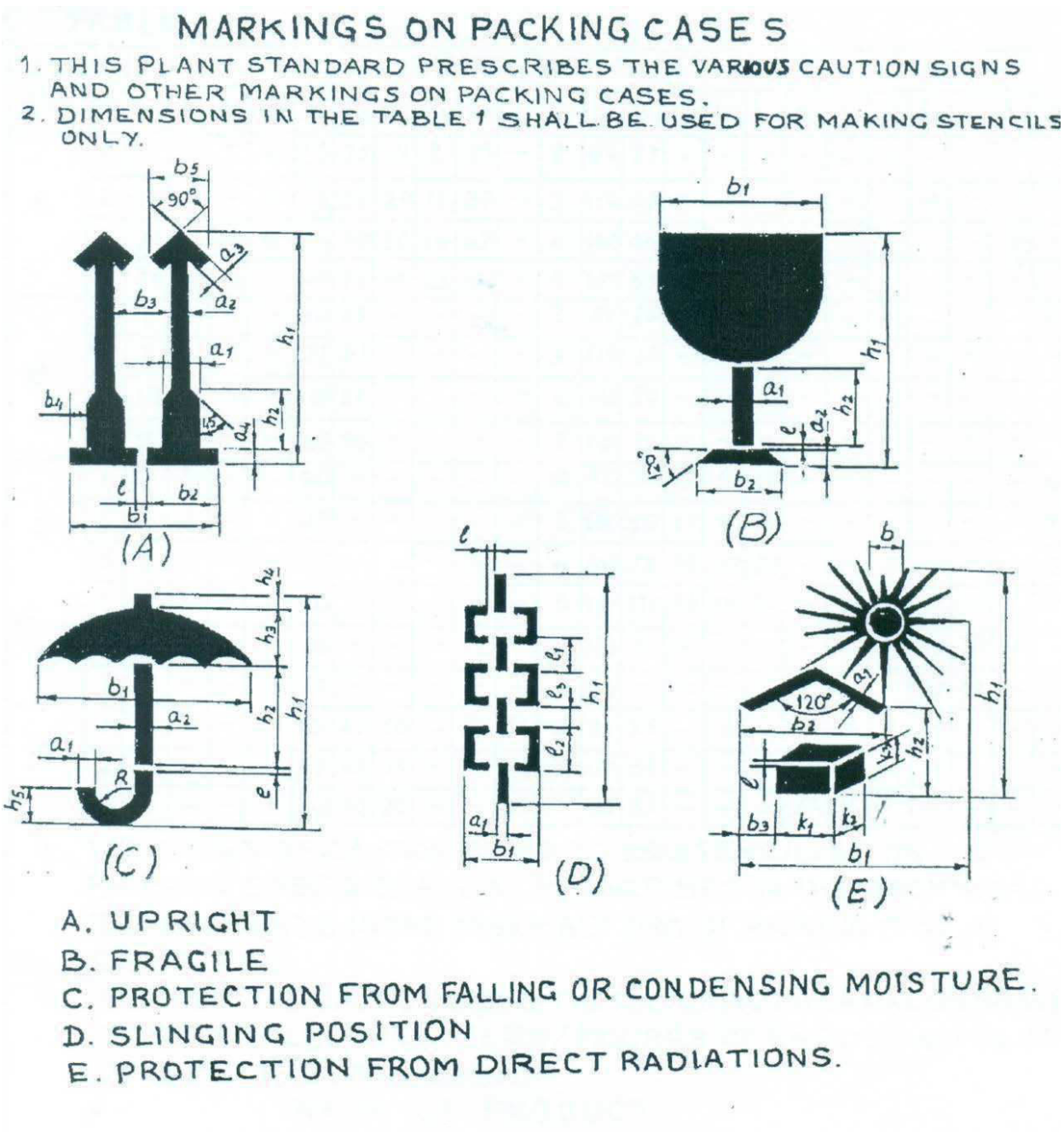
d) To arrest the movement in the steel container necessary wooden Blocks/Battons may be put.

e) Put cover on steel, container and Bolt Properly

8.3 SEALED PACKING:

Components sub-assemblies and assemblies sensitive to climatic conditions shall be packed seal tight. All the openings of the sensitive components, sub-assemblies and assemblies shall be blanketed to prevent the ingress of dust and moisture. The components sub-assemblies and assemblies are completely covered with 2 layers of polyethylene sheet. All sharp corners and edges are to be protected by rubber mats to prevent the polyethylene sheet from damage. Top surface of the case shall be free from dents to prevent rain water pockets.

9 MARKINGS/STENCILINGS



Center of Gravity

Figure 3

CORPORATE STANDARD

DESIGN-ATION		DIMENSION IN MM																						
		a1	a2	a3	a4	b1	b2	b3	b4	b5	b	l	h1	h2	h3	h4	h5	k1	k2	k3	l1	l2	l3	R
A	1	12	5	5	4	52	25	19	8	21		2	84	23										
	2	17	7	7	6	75	36	29	11	30		3	119	33										
	3	24	10	10	8	104	50	38	16	42		4	168	46										
	4	34	14	14	11	147	71	59	23	60		5	239	65										
B	1	5	5			50	33					2	84	25										
	2	7	7			71	47					3	119	36										
	3	10	10			100	66					4	168	50										
	4	14	14			142	94					5	239	71										
C	1	4	3			66						2	80	39	19	5	11							6
	2	6	4			85						3	114	55	27	7	16							9
	3	8	6			120						4	160	78	38	10	22							12
	4	11	9			170						5	227	110	54	14	31							17
D	1	6				30						4	148								30	30	10	
	2	9				42						5	209								42	42	14	
E	1	3				69	47	10			16	2	91	26				17	8	11				
	2	4				98	67	15			23	3	128	33				24	11	16				
	3	6				138	94	20			32	4	182	62				34	16	22				

Table 4

Black and Red Marking Ink to IS:1234 "Ink, Stencil, Oil Base, For Marking Porous Surfaces" or duplicating ink stencilling, oil base for marking porous surfaces.

All cases containing fragile items are to be stencilled with red marking and stencilling paint/ink

"HANDLE WITH CARE", "FRAGILE DO NOT TURN OVER".

Besides the caution signs the product information's shall be stencilled of letters with 13mm to 50mm height.

In case of consignment consists of more than one package, each package shall carry its package no as given in shipping list. All caution signs shall be stencilled in high quality full glossy out door finishing paint red in colour (AA56126). All other markings shall be carried out in black enamel(AA56126).

Caution signs & other markings shall be stencilled on both the end shooks & the side shooks.

Caution sign (for slinging) shall be stencilled only on side shooks at the appropriate place.

Note: Incase the size of package is small for using the stencils, then hand written letters/figures shall be allowed.

	BHEL – <unit> - <location> - <pin>				
CONSIGNEE					
MATERIAL					
CUSTOMER REF.				MO. NO.	
DESPATCH ADVICE NOTE NO				CASE NO	
DIMENSIONS(MM) L x B x H				NET WT –KGS	GROSS WT –KGS
SPECIAL INSTRUCTIONS	HANDLE WITH CARE - KEEP DRY DO NOT DROP - DO NOT TILT				

Figure 4 – TYPICAL MARKING PLATE

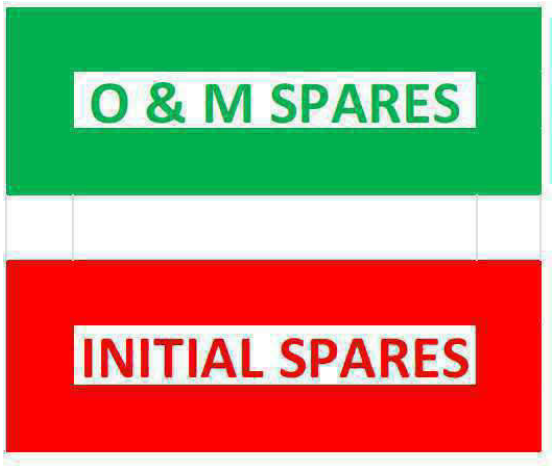


Figure 5

Easy spares [Initial and O&M] Traceability and Identification at units and as well as at sites:

10 RECYCLING OF INCOMING WOODEN PACKING CASES

OBJECTIVES

– To utilize useable wood of incoming packing cases, for manufacturing of new packing boxes.

– To recycle incoming wooden packing cases, as such, wherever possible.

1) All incoming wooden packing cases received from suppliers /customers will be opened carefully, with the intention of reusing them, by Shop.

2) After carefully taking out the contents, the empty wooden packing cases will be shifted by Shop to the specified locations i.e. bin / nearly spaces, already earmarked in stores.

3) Material shifting contractor engaged by store, will collect all such wooden packing cases and scrap wood from specified points, on a regular basis.

4) After collecting / loading the empty packing cases/ scrap wood, contractor will take the carrier first to Weighment Bridge for weighment, thereafter; he will go to Carpentry, where Carpentry representative will identify the packing cases which can be used by Carpentry for manufacturing of New Packing Boxes. All such identified packing boxes will be unloaded and handed over to Carpentry by contractor.

5) These packing boxes will be made re-useable after necessary rectification and additional work.

6) Contractor will again take the carrier for weighment and this second reading will also be recorded on the same “Weighment Slip”.

7) Weight of empty packing cases / scrap wood taken will be calculated on the basis of 1st and 2nd weighment readings recorded on the “Weighment Slip”. A copy of“Weighment Slip” (where both the weighment readings are recorded) will be given by the contractor to the carpentry representative. Based on this “Weighment Slip”, carpentry will maintain a register in which details of quantity received will be recorded.

8) All “Weighment Slips” will invariably be signed by carpentry representative (even when no boxes have been unloaded by carpentry). Store will accept the scrap wood only if “Weighment Slips” are signed by carpentry representative.

9) Balance empty packing cases / scrap wood will be handed over by contractor to Store, for storing in scrap yard.

10) A separate area in Scrap yard will be provided, for executing the work of denailing of wooden packing cases, under supervision of carpentry.

11) Carpentry contractor will identify packing cases / scrap wood for denailing, which will behanded over to him by Store, at Scrap yard, for denailing and further operation.

12) Quality and Carpentry will jointly inspect the wood generated by de-nailing process and will prepare “INSPECTION CUM RECEIPT REPORT OF USEABLE WOOD RECEIVED FROM TPS –STORE BY CARPENTRY”.

13) After acceptance of the wood by Quality and Carpentry, the same will be shifted to carpentry for receipt and its record will be maintained by carpentry.

14) This will be a Permanent Productivity Project executed by carpentry. “Productivity Savings “duly verified at the current Purchase Order rate of wood, will be sent every month to Resource Management Department, for highlighting it in their monthly progress report.

11 STANDARD METHOD OF PACKING

Table 5

STANDARD METHOD OF PACKING

DESCRIPTION	CASE	CRATE	SKID	BUNDLE	BARE	DRUM	METAL DRUM	FIBRE DRUM
PRESSUE VESSELS								
TOWERS					O			
TANKS					O			
VESSELS					O			
GASKETS	O							
FASTENERS	O							
COVERS		O						
EXCHANGERS								

STANDARD METHOD OF PACKING

DESCRIPTION	CASE	CRATE	SKID	BUNDLE	BARE	DRUM	METAL DRUM	FIBRE DRUM
HEAT EXCHANGERS					O			
TUBE BUNDLE	O							
SHELL					O			
AIR FIN COOLERS					O			
COLOUMNS, MOTOR SUSPENSIONS, PLENUM CHAMBERS, SCREEN GUARDS, ETC					O			
BEARING BLOCKS	O							
FANS	O	O						
MOTORS	O							
GASKETS	O							
FASTENERS	O							
TEST FLANGES			O					
TEST RINGS			O					
COVERS			O					

DESCRIPTION	CASE	CRATE	SKID	BUNDLE	BARE	DRUM	METAL DRUM	FIBRE DRUM
CRYOGENIC VESSELS								
COLD CONVERTERS					O			
HORIZONTAL STORAGE TANKS					O			
TRANSPORTATION TANK					O			
COLD BOX					O			
DRYING UNIT					O			
DRYING BOTTLES					O			
MOISTURE SEPARATORS					O			
SILENCERS					O			
ONGC SKIDS					O			
VAPORISER		O						
SPECIAL PRODUCTS								
SI/VI PIPING		O						
CRO BIO CONTAINERS	O							
AIR BOTTLES	O							
TITANIUM BOTTLE	O							
WAR HEAD CONTAINER	O							
MISSILE CONTAINER	O							
FUEL CONTAINER	O							
AIR LOCK ASSEMBLY	O							

DESCRIPTION	CASE	CRATE	SKID	BUNDLE	BARE	DRUM	METAL DRUM	FIBRE DRUM
BOILERS								
BOILER DRUMS					O			
BOILER ITEMS								

CORPORATE STANDARD

COILS			O					
PANELS					O			
HEADERS			O		O			
FEEDERS								
MACHINED ITEMS								
SHELL SEGMENTS					O			
SHELL SEGMENTS IN STACKS					O			
SPHERE PETALS								
COLOUMNS, BASE PLATES, TIERCOS, PIPES, NOZZLE E1, F1, INTERNAL PIPES, PADS ETC.					O			
ROLLERS	O							
VALVE TRAYS								
VALVE TRAY COMPONENTS	O							
LATTICE GIRDERS		O						
FASTENERS	O							
GASKETS	O							

DESCRIPTION	CASE	CRATE	SKID	BUNDLE	BARE	DRUM	METAL DRUM	FIBRE DRUM
SUB CONTRACTS								
FAB STRUCTURALS					O			
SUPPORTING STRUCTURALS					O			
STRUCTURE SUB ASSEMBLY					O			
FAB PIPES					O			
GRATINGS					O			
STAIR CASES					O			
HANDRAILS/ PLATFORMS					O			
BOUGHT OUT COMPONENTS								
IRON & STEEL (LIKE PLATES, BEAMS, ANGLES, CHANNELS ETC.)					O			
PIPE FITTINGS								
CS PIPES, TUBES					O			
SS PIPES, TUBES					O			
FIN TUBES	O							
ELBOWS		O			O			
FLANGES	O	O						
VALVES	O							
GAUGES	O							
DEMISTERS		O						
DESCRIPTION	CASE	CRATE	SKID	BUNDLE	BARE	DRUM	METAL DRUM	FIBRE DRUM
ABSCRBANTS (LIKE MOLECULAR SIEVES, ACTIVATED ALUMINA, MOBILE SORBID)						O		

PAINT TINS		O						
PAINT DRUMS						O		
IGNITORS	O							
SPRAY NOZZLES	O							
ELECTRICAL INSTRUMENTATION								
MOTORS, PUMPS, COMPRESSORS, TURBINES	O							
SWITCH BOARDS, DISTRIBUTION BOARDS, STARTERS, JUNCTION BOXES		O						
INDICATORS, VIBRATOR SWITCHES	O							
CABLE BUNDLES, CABLE DRUMS					O			
CABLE TRAYS, CABLE RACKS, EARTHING MATERIAL		O						
OPERATIONAL SPARES	O							

12 PROCEDURE FOR HANDLING OF COMPONENTS

The purpose of this procedure is to protect the quality of the components/equipment while handling in various stages of manufacturing packing & despatching.

12.1 Adequate care shall be taken in handling the material, and components to avoid damage during receipts, storage issue manufacture & despatch operations.

12.2 Appropriate material handling equipment like fork lifters, cranes etc. shall be used where needed.

12.3 Lifting by crane and transportation by trolley of critical items and large components like rotors castings etc. shall be done carefully.

12.4 For critical items, where specified, special handling fixtures shall be used for lifting.

12.5 Slings and shackles used for lifting the components/equipment shall be checked for fitness and suitability before use.

12.6 Slings used on machined surfaces shall be suitably padded. No slings shall be used on journal surfaces.

12.7 Precision machined components like blades, catches, rollers etc. shall be lifted using suitable wooden pallets.

12.8 HANDLING OF COMPONENTS ON RECEIPT/DESPATCH

Before loading/unloading a packing case from the carrier look for the following shipping instructions painted on the packing case.

a) The markings showing the upright position.

b) The markings showing the sling position

c) Markings showing the fragile contents.

d) Other required markings as per clause no.9

12.8.1 Appropriate cranes and slings should be used for different components/ cases. Slings should normally make an angle as minimum as possible (width wise) but in no case more than 15º.

12.8.2 Handling and lifting should be done without jerks or impacts.

12.8.3 Immediately after receipt of the goods, the packing should be examined all-round for any sign of damage. If necessary, lift the cover or a number of boards of the case so as to make the contents visible. In the event of sealed packing being used the plastic sheeting should not be damaged. It is imperative that the packing material is restored in original condition after the inspection.

12.8.4 On receipt of the equipment it should be checked with the shipping list and missing or damage if any should be reported immediately. It is important to arrange for immediate examination to determine the extent of the damage, the cause of the damage and where applicable the person

or persons responsible for the damage. According to general practice when transporting by railway or by road vehicle the carrier concerned should be immediately called upon (within specified periods) for jointly establishing a statement of the damage. This is essential as a basis for a subsequent claim and possible damage report to the insurance company.

12.8.5 Protective coating applied on machined surfaces should not be disturbed. The plastic covering should be put back carefully so that it prevents ingress of dust and moisture. Some packing may have vapour phase inhibitor (VPI) paper enclosed inside the packing cases. This should be restored to its original place as far as possible.

12.8.6 Silica gel and such other chemicals kept in the box as desiccants and indicators should also be left in the box itself.

13 GENERAL GUIDELINES FOR ODC TRANSPORTATION/DESPATCH

Based on the Dimensions/Weight indicated in the Transportation Sketch, the type of Trailer is decided and indicated in the Tender Enquiry.

13.1 TRANSPORTATION:

1. LOW BED TRAILERS (LB 8):
   - Well Bed Length: 10000mm
   - Over Gooseneck: 13000mm
   - Width: 3000mm
   - Carrying Capacity: 40MT

2. LOW BED TRAILERS (LB 16):
   - Well Bed Length: 12000mm
   - Over Gooseneck: 16000mm
   - Width: 3000mm
   - Carrying Capacity: 75MT

3. TOW TYPE TRAILERS (WITH FRONT DOLLEY 16 TYRES): 12000MM length
   (for Exceptional equipment length: 30000mm and above)

   Bigger Dia equipment are loaded in the Well with overhanging.

   Smaller Dia equipment with excess length are loaded over Gooseneck with rear hanging.
   The Vehicle Dimensions are defined above are only guidelines for selection based on actual Dimensions/ Weight of the Consignment

13.2 PACKING:

For all ODCs, Wooden Saddles are cut to the diameter of equipment as per the Transportation Sketch.

Wooden Saddles	For Diameter up to 4000mm	For Diameter above 4000mm
Length:	1836/2743mm (6'0"/9'0")	3353mm (11'0")
Width:	300mm (1'0")	300mm (1'0")
Height:	Saddle + one/two wedges a top	Saddle + three/four wedges a top

Number of Saddles:	
Minimum	3 in case of Loading inside Well +1 when loaded on Gooseneck
Maximum:	4 in case of Loading inside Well +2 when loaded on Gooseneck

For Securing the equipment firmly on the Trailer, 19mm (3/4”), wire rope with 25mm (1”) Heavy Duty Turn Buckles / BD Clamps are used as Lashing for the equipment.

13.3 NUMBER OF LASHINGS ARE:

	CONSIGNMENT LOADED INSIDE WELL BED	CONSIGNMENT LOADED OVER GOOSENECK
a) up to 40MT	4 (2 Single Line lashing 2 Double Line Lashing)	5 (3 Single Line Lashing 2 Double Line Lashing)
b) 40MT to 60MT	5 (3 Single Line Lashing 2 Double Line Lashing)	5 (Single Line Lashing 3Double Line Lashing)
c) 60MT and above	5 (2 Single Line Lashing 3 Double Line Lashing)	6 (3 Single Line Lashing 3 Double Line Lashing)

14 GUIDELINES FOR HANDLING/LOADING/LASHING

14.1 HANDLING

Figure 6

Before unloading the jobs Completely painted and neatly stencilled will be checked.

Pipes with split type end cover will be checked

Figure 7

All Coil Tubes to be provided with End Caps.

Figure 8

Neatly stacked Coil Assemblies.

Figure 9

Columns to be lifted with Nylon belts. This protect painting, edges and attachments.

Figure 10

14.2 LOADING

All the components to be transported by putting inside the properly fabricated Crating

Figure 11

Small components may fall down while transporting without closed crating and there are chances of missing of small parts. Hence, it is always better to transport small components in closed containers/crating. Loose to be being shipped in a closed crating.

Figure 12

No component loaded over the crating.

Figure 13

Headers supported with wooden V blocks at 3 meters interval.

Figure 14

Spacers in between each coil assembly.

Figure 15

Goose pipe to be provided with rubber pad protects removal of painting and damage to the job.

Figure 16

14.3 LASHING

Use Nylon belts only for lashing of all components. It prevents removal off painting and cut in the materials.

Figure 17

Nylon Belts used for lashing the beams.

Figure 18

15 PRODUCT WISE SPECIAL INSTRUCTION

Additional instructions of packing not included in this standard shall be covered by individual product standard

16 REFERRED STANDARDS (Latest publications including amendments):

1) AA51420	2) AA55619	3) AA51414	4) IS:3401	5) AA10108
6) AA56126	7) AA51402	8) AA51401	9) IS:1234	