PROJECT: PP-PE PILOT PLANT	client:
TITLE: DATA SHEET FOR ROTARY VALVES (BW-531, BW-541, BW-542, BW-543, BW-544, BW-545)	شرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی

DATA SHEET FOR ROTARY VALVES (BW-531, BW-541, BW-542, BW-543, BW-544, BW-545)

	Document No.:	**Rev.: 0**
	Owner Job No.:	**Type: DAS**
		Page A

PROJECT: PP-PE PILOT PLANT	CLIENT: شرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی
TITLE: DATA SHEET FOR ROTARY VALVES (BW-531, BW-541, BW-542, BW-543, BW-544, BW-545)	

REV. / PAGE	0	1	2	3	4	5	REV. / PAGE	0	1	2	3	4	5	REV. / PAGE	0	1	2	3	4	5
A	X																			
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Rev.	Date	Prepared By	Checked By	Approved By	Status

Document Revision

	Document No.:	Rev.: 0
	Owner Job No.:	Type: DAS
		Page B

PROJECT : PP-PE PILOT PLANT

Client:

شرکت ملی صنایع پتروشیمی
شرکت پژوهش و فناوری پتروشیمی

TITLE: DATA SHEET FOR ROTARY VALVES (BW-531, BW-541, BW-542, BW-543, BW-544, BW-545)

APPLICABLE TO: ○ PROPOSAL ● PURCHASE ○ AS BUILT ○ DATE REVISION

FOR: NPC R&T | UNIT: 500

SITE: NPC R&T CENTRE - ARAK - IRAN | SERIAL NO.: BW-531, BW-541, BW-542, BW-543, BW-544, BW-545

SERVICE: ROTARY VALVE | NO.REQUIRED: 6

MANUFACTURER

NOTE: ○ INDICATES INFORMATION TO BE COMPLETED BY PURCHASER ☐ BY MANUFACTURER

● GENERAL

FAN/BLOWER MFR. MODEL SERIAL NO

DRIVER MFR. DRIVER TYPE RATED KW RPM

DRIVER. SYSTEM ☐ DIRECTED COPLED ☐ OTHER

OPERATING CONDITIONS

OPERATING TEMPERATURE (C):	80-95
OPERATING PRESSURE (Bar):	0.27-0.42
AMBIENT TEMPERATURE (C):	-28/+44
CONVEYING GAS TEMPERATURE (C):	80-85
GAS HANDLED	NITROGEN/HYDROCARBONS
SOLID AT SUCTION	POLYMER (LLDPE) POWDER
KW REQUIRED	1

CONSTRUCTION FEATURES

SIZE:	Top and Buttom = 200 mm (8")
Flange drilling pattern	ANSI 150 lbs
O-ring seals in side plate	Viton
Shaft sealing	WLF(Viton)
Bearing set	Standard
Purging gas	Yes
Connecting Flange Ratings	150 lbs
Motor Fitting	Delivery CWA

MATERIALS

HOUSING	Cast Aluminum Alloy AA 356.0
SIDE PLATE	Cast Aluminum Alloy AA 356.0
ROTOR	S.S. 1.4541
Air Venting Device	With flexible Joint
Pick-Up Tee	Flange 2" ANSI, 150 lbs

SITE & UTILITY DATA (NOTE 3)

LOCATION:

○ INDOOR ○ HEATED ○ UNDER ROOF

● OUTDOOR ● UNHEATED ○ PARTIAL SIDES

○ ELECTRICAL AREA CLASS: **EX**

CLASS **I** GROUP **C** DIVISION **2**

Protection **IP55**

● WINTERIZATION REQ'D. ○ TROPICALIZATION REQ'D.

SITE DATA: **(Note 2)**

● ELEVATION **1889** m BAROMETER **810** (mBAR)

● RANGE OF AMBIENT TEMPS:

	DRY BULB	WET BULB
SITE RATED °C		
NORMAL °C		
MAXIMUM °C	44	
MINIMUM °C	-28	

UNUSUAL CONDITIONS: ● DUST ● FUMES

○ OTHER

REMARKS:

UTILITY CONDITIONS:

STEAM		DRIVERS		HEATING	
INLET	MIN.	___ (BARG) (KPa)	___ °C	___ (BARG) (KPa)	___ °C
	NORM.	___ (BARG) (KPa)	___ °C	___ (BARG) (KPa)	___ °C
	MAX.	___ (BARG) (KPa)	___ °C	___ (BARG) (KPa)	___ °C
	MIN.	___ (BARG) (KPa)	___ °C	___ (BARG) (KPa)	___ °C
	NORM.	___ (BARG) (KPa)	___ °C	___ (BARG) (KPa)	___ °C
	MAX.	___ (BARG) (KPa)	___ °C	___ (BARG) (KPa)	___ °C

ELECTRICITY:

	DRIVERS	HEATING	CONTROL	SHUT-DOWN
VOLTAGE	400			
HERTZ	50			
PHASE	3			

COOLING WATER

TEMP. INLET (°C) TEMP. RETURN (°C)

PRESS. NORMAL (BARG) (KPa) DESIGN (BARG) (KPa)

PRESS. RETURN (BARG) (KPa) MAX ALLOW DP (BARG)

WATER SOURCE (Kpa-ABS)

INSTRUMENT AIR: PRESS (barg)

	DOCUMENT No. :	**Rev.: 0**
	Owner Job No.:	**Type: DAS**
		Page 1 of 3

PROJECT : PP-PE PILOT PLANT

Client:

شرکت ملی صنایع پتروشیمی
شرکت پژوهش و فناوری پتروشیمی

TITLE: DATA SHEET FOR ROTARY VALVES (BW-531, BW-541, BW-542, BW-543, BW-544, BW-545)

SPECIFICATIONS

APPLICABLE SPECIFICATIONS:
● MANUFACTURER'S STD. ○ OTHER

PAINTING:
● MANUFACTURER'S STD. ○ OTHER

● SOUND LEVEL 85 dB @ 1 m FROM ENCLOSURE

UTILITY CONSUMPTION (NOTE 3)

☐ COOLING WATER _____ m^3/h
☐ STEAM, NORMAL _____ kg/h
☐ STEAM, MAX. _____ kg/h
☐ INSTRUMENT AIR _____ m^3/h
■ KW (DRIVER) 1 KW

INSTRUMENTATION

☐ BY MMR. ○ BY PUR.

GAUGE REQUIREMENTS:	LOCALLY MOUNTED	LOCAL PANEL
DISCHARGE PRESSURE	☐ ○	☐ ○
DISCHARGE TEMPERATURE	☐ ○	☐ ○
Speed Sensor	■ ○	☐ ○
COOLER(S) INLET & OUTLET TEMP.	☐ ○	☐ ○

ALARM & SHUTDOWN SWITCHES :	ALARM	TRIP
☐ ○ HIGH DISCHARGE PRESSURE		
☐ ○ HIGH DISCHARGE TEMPERATURE		
☐ ○ HIGH SUCTION PRESSURE		
☐ ○ HIGH SUCTION TEMPERATURE		
☐ ○ MOTOR SHUTDOWN		
☐ ○ HIGH INLET FILTER/STRAINER ΔP		

ACCESSORIES

VENDOR SHALL FURNISH THE FOLLOWING ACCESSORIES:

DRIVER: ● ELECTRIC MOTOR ○ STEAM TURBINE ○ _____
● LOCAL CONTROL PANEL ○ LOCAL GAUGE BOARD
● BASEPLATE COMMON TO ALL EQUIPMENT
● ANTI-VIBRATION PADS
● SOUND ENCLOSURE (WHEN REQUIRED)
○ SUCTION FILTER ○ SUCTION STRAINER
○ EXPANSION JOINTS ○ SUCTION ○ DISCHARGE
○ SILENCER ○ SUCTION ○ DISCHARGE
● DAMPER ● SUCTION ○ DISCHARGE
○ INLET GUIDE VANE ○ WITH ACTUATOR & POSITIONER
○ BY-PASS CONTROL VALVE ○ WITH ACTUATOR & POSITIONER
○ CHECK VALVE ○ RELIEF VALVE
● SEAL LIQUID SYSTEM INCLUDING:
● PUMP ● COOLER ● INSTRUMENTATION
○ THERMAL INSULATION INCLUDING: ○ SUPPORT

WEIGHT & DIMENSIONS

☐ WEIGHTS (KG):
COMPLETE UNIT _____
MAX. FOR MAINTENANCE _____
TOTAL SHIPPING WEIGHT _____
☐ DIMENSIONS (MM):
COMPLETE UNIT L _____ W _____ H _____
SHIPPING DIM. L _____ W _____ H _____

SHOP INSPECTION AND TESTS

	REQ'D	WITNESS	OBSERVE
SHOP INSPECTION	●	○	○
HYDROSTATIC	●	●	○
COMBINED MECH. & PERFORMANCE TEST	●	●	○
COMPLETE WITH DRIVER	●	●	○
NOISE LEVEL TEST	●	○	○

PACKING AND SHIPMENT

● DOMESTIC ● EXPORT ● EXPORT BOXING REQ'D
● LONG TERM STORAGE FOR 12 MONTHS

NOTES:

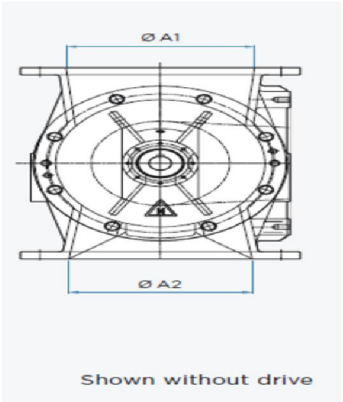
1- All Electrical Motors shall be in accordance with "Technical Specification for LV Motors" DOC.No.900-SPC-A4-EE-0005 .

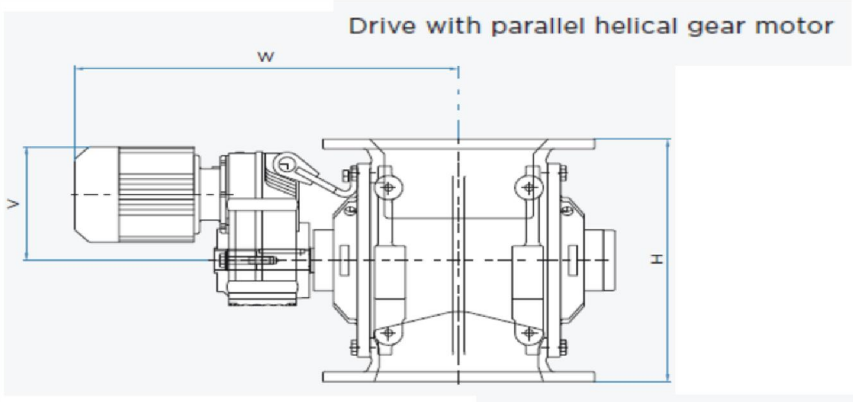
2- Max. relative humidity is 86%.

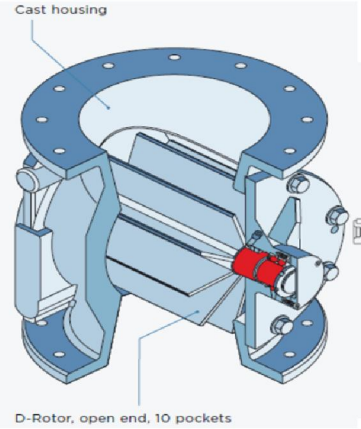
3- See DOC. NO. 900-SPC-A4-PR-0006

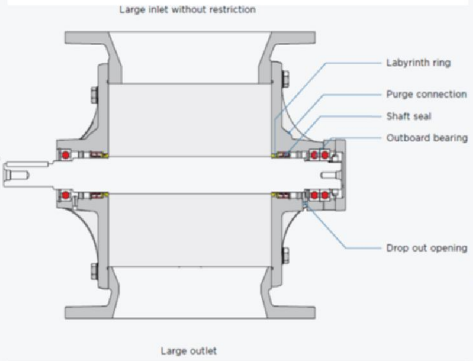
DOCUMENT No. :	**Rev.: 0**
Owner Job No.:	**Type: DAS**
	Page 2 of 3

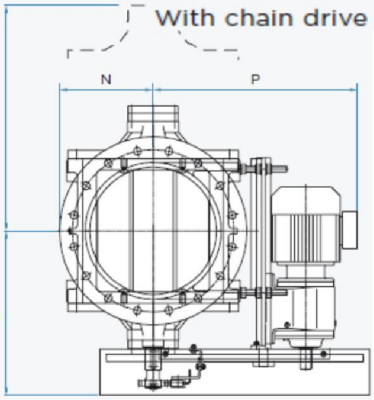
PROJECT: PP-PE PILOT PLANT	client:
TITLE: DATA SHEET FOR ROTARY VALVES (BW-531, BW-541 , BW-542, BW-543, BW-544, BW-545)	شرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی











	Inlet* / Outlet*				Other dimensions							Weight*** appr. kg	
	A1/A2 (DIN)	A1/A2 (ANSI)	Ø A1	Ø A2	H	P**	Y	N	V**	W**	Z	SS/GG	AC
ZRD 150	ND 150	6"	166	155	260	320	250	143	165	455	650	36	20
ZRD 200	ND 200	8"	210	200	340	350	290	170	180	565	681	53	30
ZRD 250	ND 250	10"	265	250	400	476	350	203	200	640	755	80	40
ZRD 320	ND 300	12"	316	300	500	520	390	242	235	685	932	140	60
ZRD 400	ND 350	14"	360	350	600	570	440	267	260	760	1034	260	120
ZRD 480	ND 400	16"	410	400	750	680	510	300	310	940	1271	490	270
ZRD 550	ND 500	20"	500	480	800	850	590	350	310	1000	1345	690	370
ZRD 630	ND 600	24"	600	590	900	865	670	408	385	1110	/	1200	700
ZRD 700	ND 700	28"	710	695	1000	1010	690	560	445	1260	/	1600	800
ZPD 800	ND 700	28"	700	680	1140	1175	800	756	417	1260	/	3010	1420

Dimensions in mm * Drilled according to DIN PN 10 or ANSI 150 lbs ** Dimensions may vary depending on installed drive *** Without drive

	Document No.:	Rev.: 0
	Owner Job No.:	Type: DAS
		Page 3 of 3

Nitrogen Specification

Supply conditions at Pilot Plant Battery Limit (B.L.)

	Licensor requirements		Guaranted
Purity			%mol N_2
Oxygen	10	ppm. vol. max	10
Water	20	ppm. vol. max	5
Dew Point			°C

High Pressure

	Max.	Nor.	Min.
Pressure (barg):			
Temperature (°C):			

Mechanical design conditions:

Pressure (barg):	
Temperature (°C):	

Bottle: 150/180 bar

Medium Pressure **NIT**

	Max.	Nor.	Min.
Pressure (barg):	7	6.1	4
Temperature (°C):	Amb	Amb	Amb

Mechanical design conditions:

Pressure (barg):	8
Temperature (°C):	-30/+100

Low Pressure **NIL**

	Max.	Nor.	Min.
Pressure (barg):	4	3.5	
Temperature (°C):	Amb	Amb	

Mechanical design conditions:

Pressure (barg):	5
Temperature (°C):	100

Air Specification

Supply conditions at Pilot Plant Battery Limit (B.L.)

	Licensor requirements	Guaranted
Oil	free	free
Dust	free	free
Dew point (°C)		- 40 ºC

Instrument air **INA**

	Max.	Nor.	Min.
Pressure (barg):	8.5	6.6	4.5
Temperature (°C):	Amb.	Amb.	Amb.

Mechanical design conditions:

Pressure (barg):	10/35
Temperature (°C):	100

Plant Air or Utility Air **UTA**

	Max.	Nor.	Min.
Pressure (barg):	9.5	6.8	
Temperature (°C):	Amb.	Amb.	

Mechanical design conditions:

Pressure (barg):	10
Temperature (°C):	100

Steam Specification

Header conditions at Pilot Plant Battery Limit (B.L.):

High Pressure NOT AVAILABLE

	Max.	Nor.	Min.
Pressure (barg):			
Temperature (°C):			

Mechanical design conditions:

Pressure (barg):	
Temperature (°C):	

Medium Pressure **MPS**

	Max.	Nor.	Min.
Pressure (barg):	25	20	18
Temperature (°C)	sat.+ 30		sat.
Calculated Temp. (	226 - 256	220 - 250	210 -240

min. = sat.
max. = sat. + 30ºC
Mechanical design conditions:

Pressure (barg):	30
Temperature (°C):	256

Low Pressure (LPS) **LPS**

	Max.	Nor.	Min.
Pressure (barg):	6.5	5.5	5
Temperature (°C):	180	162	sat.

Mechanical design conditions:

Pressure (barg):	10
Temperature (°C):	185

Water Specification

Cooling Water (CW) CWS/CWR

(1) Specification: suitably treated to inhibit biological growth, corrosion and scaling

(2) Supply and return conditions at Pilot Plant Battery Limit (B.L.):

	Pressure (barg)		Temperature (°C)	
Supply:	**6 / 5.5 / 2.5**	max/nor/min	**27**	max
Return:	**2.5**	norm	**37**	max

(3) Mechanical design conditions:

Pressure (barg)	**10**
Temperature (°C)	**185**

Industrial Water IWA

(1) Specification: filtered water suitable for process

(2) Supply conditions at Pilot Plant Battery Limit (B.L.)

Pressure (barg)	5	max
Temperature (°C)	Amb.	max

(3) Mechanical design conditions:

Pressure (barg):	6
Temperature (°C):	100

Demineralized Water DWA

(1) Supply conditions at Pilot Plant Battery Limit (B.L.)

Pressure (barg)	8	max
Temperature (°C)	70	max

(2) Mechanical design conditions:

Pressure (barg):	10
Temperature (°C):	185

TECHNICAL SPECIFICATION FOR LV MOTOR

PROJECT: PP-PE PILOT PLANT	شرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی
TITLE: TECHNICAL SPECIFICATION FOR LV MOTOR	

REV. / PAGE	0	1	2	3	4	5	REV. / PAGE	0	1	2	3	4	5	REV. / PAGE	0	1	2	3	4	5
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Rev	Date	Prepared By	Checked By	Approved By	Status
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0	2021-05-29	M.A	M.N	N.N	AFC

Document Revision

		Document No.: 900-SPC-A4-EE-0005	Rev.: 00
		Contract Job No.:	Type : SPC
			Page : B

CONTENTS

1. GENERAL

SCOPE

1.1.1 This specification covers the minimum requirements for design, construction, inspection and testing of industrial type low voltage, 50 Hz squirrel cage induction motors for PP&PE – PILOT PLANT of Research and Technology Center of petrochemical Co. Arak, Iran..

1.1.2 The scope covers motors for use in class I Divisions 1 & 2, or equivalent, in classified areas and also for general purpose industrial use in safe areas. The motors are mainly intended for centrifugal pump drives, cooling fans and compressors.

1.1.3 Detailed specific design requirements for each motor or group of motors are given in Data Sheets.

1.2 STANDARDS & CODES

1.2.1 All motors shall generally be designed, manufactured and tested in accordance with the latest edition of International Electrotechnical Commission (IEC) standard and Iranian Petroleum Standard(IPS).

1.2.2 Metric SI system of units shall be applied to all dimensions and relevant documents.

1.3 LANGUAGE

1. All correspondences and submittals shall be in English.

1.4 SITE CONDITIONS

The equipment and all its components shall be entirely suitable for the site conditions specified as below:

1.4.1 Temperature

a) Max. ambient temperature	44°C
b) Min. ambient temperature	-28°C
c) Design temperature for outdoor equipment	50°C
d) Equipment exposed to sunlight	83°C

1.4.2	Relative humidity	Max. 86% in Jan.
1.4.3	Altitude above sea level	1889 m
1.4.4	Wind velocity	Max. 120 Km/h
1.4.5	Seismic factor	In acc. With zone 3 of UBC
1.4.6	Special atmosphere	Dusty & corrosive

1.5 DOCUMENTS PRIORITY

In the event of any conflict between this specification, the data sheets, drawings, codes and standards, the priority shall be given in the following order.

a) Purchase order

b) Data sheets and/or drawings

c) This specification

d) Codes and standards

In any case vendor shall refer the matter with purchaser and obtain clarification before proceeding with any work.

2. DESIGN CHARACTERISTICS

2.1 RATING AND APPLICATION

2.1.1 Voltage and output rating shall be:

RATING	VOLTAGE	PHASE
Below 0.25 KW	230 V	1
0.25 KW and above	400 V	3

2.1.2 Performance duty of motors shall be “S1” according to IEC 34-1, unless stated otherwise.

2.1.3 All equipment covered by this specification shall be designed for severe duty outdoors, totally unprotected from weather unless otherwise specified and for use in a corrosive atmosphere. Motor frames shall be cast iron or steel. Aluminum frames are not acceptable.

2.1.4 Motor driving compressors and reciprocating pumps shall be sized so that the product of the motor name plate rating and the motor service factor shall be at least 110% of the greatest horsepower required (including gear and etc.) for any of the compressor and reciprocating pump operating conditions.

2.1.5 Motors driving centrifugal pumps shall have horsepower rating at least equal to the following percentage of pump design point brake horsepower:

Motor Rating (KW)	Percent of Pump BHP
18.5 and less	125
22 to 55	115
75 and above	110

2.2 SUPPLY VARIATIONS

Motors shall be capable of operating continuously at their rated torque under the above conditions at any frequency between minus 2% and plus 2% of the nominal frequency together with any voltage between minus 10% and plus 10% of the nominal rating.

2.3 STARTING CONDITIONS

2.3.1 Unless otherwise specified, motors shall be designed for direct-on-line starting.

2.3.2 Motors shall be capable of two normal starts in succession under the above conditions with the motor at normal running temperature, also a minimum of 3 starts/hour, equally spaced, during normal running conditions.

2.3.3 Starting characteristics shall meet the requirements of IEC 34-12.

2.3.4 The pull up torque at nominal volts shall not be less than 0.5 times the locked rotor torque and not less than 0.5 times the rated load torque for motors rated less than 100 KW.

2.3.5 For motors rated 100 KW and above, the pull up torque at nominal volts shall not be less than 0.5 times the locked rotor torque and not less than 0.3 times the rated load torque.

2.3.6 Motors shall be able to overcome starting load inertia as well as accelerating the load to rated speed under both rated and at 20% reduced voltage conditions during starting without injurious heating.

2.3.7 When motors are furnished separately or with the driven equipment as a package, the torque characteristics and speed specified shall be the responsibility of the driven equipment vendor.

2.3.8 Unless otherwise specified, all motors are for coupled service.

2.4 ENCLOSURE

2.4.1 Unless otherwise specified, all motor enclosures shall be of Totally Enclosed Fan-Cooled (TEFC) construction. For outdoor use shall additionally be weatherproof without further protection and equivalent to IP 54 per IEC 34-5.

2.4.2 Motor enclosures shall be suitable for the area classification in which they are to be installed.

2.4.3 For general purpose use in class I Div.1 classified areas all motors to be explosion-proof flameproof.

2.4.4 For general purpose use in class I Div. 2 classified areas all motors to have type of protection “e” (increased safety) or “n” (non-sparking).

2.4.5 All single phase motors in classified areas shall be explosion-proof.

2.4.6 All motors specified suitable for classified areas shall be certified by an approved and official certifying agency/authority such as UL, FM, BASEEFA, etc.

2.4.7 The maximum surface temperature class in classified areas shall be as stated in the Data Sheets

2.4.8 Outdoor motors shall be rated for continuous operation under the direct sunlight.

2.4.9 Where specified in Data Sheets, anti-condensation space heaters for use on 230 V single phase, 50 Hz shall be provided. Terminations are to be brought-out to a cable box separate from the main power lead cable box.

2.4.10 All motors shall be provided with means for preventing the accumulation of moisture inside the motor.

2.4.11 All motors exceeding 20 kg in weight shall be equipped with suitable lifting eyes.

2.5 COOLING

2.5.1 Unless otherwise specified, method of cooling shall be totally Enclosed Fan Cooled (TEFC) and to be suitable for either direction of rotation of the motor. On motors with unidirectional fans, the direction of rotation shall be clearly and permanently marked by an arrow on the non driving end.

2.5.2 The flow direction of the external air shall be from the non-driving end.

2.5.3 Fans for motors shall be of brass, bronze or aluminium. Aluminium alloy fans shall not contain more than 0.2% copper. Fans shall be inherently balanced.

2.5.4 Plastic, fiberglass or other non-metallic fans are not acceptable.

2.6 STATOR WINDINGS

2.6.1 The motor windings shall be braced to prevent any excessive movement during transportation and all operating conditions.

2.6.2 Windings of three phase motors up to and including 75 KW shall be connected in delta. Winding of motors larger than 75 KW shall have six winding ends brought out to the terminal box for either delta or star connection.

2.6.3 Aluminum stators are not acceptable.

2.7 INSULATION AND TEMPERATURE RISE LIMITS

2.7.1 The stator windings shall be fully insulated for an unearthed system.

2.7.2 Unless otherwise specified, the insulation shall be class F according to IEC-85.The temperature rise as measured by increase in resistance method shall not exceed 80 ºC for all type of motors, based on 50 ºC maximum ambient shade temperature and maximum continuous rating.

2.7.3 The method of application and details of the insulating material shall be clearly stated in Vendor proposal documents.

2.7.4 All windings shall have a tropicalised finish or have an extra insulation coating (double dip and bake).

2.8 ROTOR

2.8.1 Rotors shall be free of inherent axial thrust. They shall be statically and dynamically balanced.

a. With full driven key
   or
b. With motor half couplings keyed on the shaft.

2.8.2 Except for motors ordered as spares or replacements, supply of half couplings or pulleys will be in the responsibility of the driven machines manufacturer and shall be delivered rough or pilot bored to the motor manufacturer to finish bore, fit and balance.

2.8.3 Balancing by means of lead or other unstable material is not acceptable. If solder is used, it shall have a melting point not less than 185ºC.

2.8.4 Rotor bars shall be securely located in their slots throughout their length.

2.8.5 Brazed copper or copper alloy cage construction is preferred for all rotors. However, cast aluminum rotor cages are acceptable as an alternative for all small motors with ratings up to and including 45 KW.

2.9 BEARINGS AND LUBRICATION

2.9.1 For horizontally mounted motors, preferred types of bearing and lubrication are ball and roller with grease (lithium base).

2.9.2 For vertically mounted motors, bearing type and lubrication shall generally be as in clause 2.9.1 above except for larger machines vendor should put forward alternative proven design.

2.9.3 Grease lubricated bearings shall be packed with grease before dispatch.

2.9.4 Oil lubricated ball/roller bearings shall be provided with constant level oilers.

2.9.5 Fractional horsepower motors supplied with sealed pre-lubricated ball/roller bearings shall be factory sealed, long life type and trouble free guaranteed for five years normal operation under site condition.

2.9.6 The calculated life (ISO B10 “90% survival” under the estimated bearing loads) should comply with the following requirement:

Up to 75 KW	15000 hrs.
75 KW and above	25000 hrs.

2.10 VIBRATION AND NOISE LEVELS

2.10.1 Motors at all speed should be balanced in accordance with the limits of vibration as per IEC 34-14.

2.10.2 Motor noise emission rate for the driven equipment shall not exceed the noise level specified in IEC 34-9.

2.11 SHAFT AND FRAME SIZE

2.11.1 Shafts and frames shall be designed in accordance with IEC 34-7.

2.12 CABLE CONNECTION AND TERMINATION

2.12.1 Terminal boxes shall be located on the left hand side of the motor when viewed from the non-drive end and shall have means for entry from any of the four directions separated by 90º, vertical or horizontal.

2.12.2 An earthing terminal of the same capacity as the line terminal shall be fitted externally to the terminal box. Cable boxes are to be adequately designed to withstand internal faults. It may be assumed that all 400 V motors will be protected by MCCB's.

2.12.3 It shall be possible in all forms of cable entry to withdraw the motor without breaking or stressing the seal or cable.

2.12.4 Conduit entries are to be tapped ISO. Tapped entries on all motors shall provide not less than 5 full threads.

2.12.5 Type and size of cables for the main supply, anti condensation heaters and P.T.C. detectors, where applicable, shall be as specified in Data Sheets. All cable boxes shall be equipped with necessary terminal blocks, cable lugs, explosion proof/weatherproof and corrosion resistant brass compression type cable glands to receive the incoming cables.

2.12.6 Terminal markings and phase rotation shall be "A-B-C" counter clockwise.

2.12.7 All cable terminal boxes shall be made of steel or cast iron. All cover joints shall be fitted with gaskets of polychloroprene or like material to prevent the ingress of moisture and dust. The enclosure shall be suitable for the area classification in which it is to be installed and its degree of protection shall not be less than IP 55 to IEC.

2.13 THERMAL PROTECTION

2.13.1 When specified in Data sheets single phase motors shall be fitted with an automatic reset thermal over-current device (T.O.C) in the interior of the motor.

The device shall be matched to the particular application and duty of the "drive" and to be ambient compensated for the highest temperature likely to be encountered inside the motor under site service condition. Motors thus fitted shall carry a warning plate, in English, stating that such a device is fitted and to isolate at the starter or control switch before approaching the motor.

2.13.2 Where specified in Data Sheets, three phase motors shall be fitted with six thermal detectors, two per phase of the positive temperature coefficient (P.T.C) type adapted to the temperature rise of the winding and wired out to a separate terminal box.

Vendor shall supply the temperature/time relationship curve with the motor test certificate.

2.14 RADIO INTERFERENCE

2.14.1 Where specified in data sheets, motors shall be fitted with radio interference suppression device in compliance with B.S.800.

2.15 SERIAL NUMBER AND RATING PLATES

2.15.1 The serial number shall be stamped permanently on a non-removable part of the frame.

2.15.2 Rating plates shall be stainless steel or alternatively of a non-corrosive alloy. They shall be fixed to a non-removable part of the frame and show:

- Maker's name
- Frame size and serial number
- Class of rating (continuous or short time)
- Type of protection, gas group(s), temp. class
- Class of insulation
- Type of connection (star or delta)
- Volts, phase, frequency
- Output in KW at full power at tested temperature
- Full load current and full load speed
- Efficiency and power factor at full load
- Type of enclosure (TEFC, other)
- Type and size of bearings
- Standards (IEC or other)
- Purchase order No. and year of ordering
- Locked rotor torque in % FLT
- Locked rotor current in % FLC
- Net weight
- Type of the Lubricant(Grease)
- The lubrication period and the quantity of injection lubricant in every time

2.15.3 A separate nameplate shall be fixed to the frame indicating purchaser's tag number.

2.16 FINISH

2.16.1 Prepared surfaces shall be free from rust, scale, sand, dust and grease before painting.

2.16.2 Finish shall be suitable for highly corrosive and dusty environments.

3. QUALITY ASSURANCE AND PREPARATION FOR SHIPMENT

3.1 INSPECTION

Purchaser reserves the right for inspection at any stage of manufacturing, testing or preparation for shipment. Purchaser inspection shall not relieve vendor of his commitments under the terms of purchase documents and this specification.

3.2 ITP FORMS

The inspection and test plan (ITP) forms covers the minimum verifications, checks, and tests required for LV motors to comply with codes, specification, and/or contractual requirements.

3.3 PREPARATION FOR SHIPMENT

3.3.1 Unless otherwise specified, preparation for shipment shall be in accordance with the manufacturer's standard. The manufacturer shall be solely responsible for the adequacy of the preparation for shipment employed with respect to materials and applications, and provide materials to their commercial carrier systems.

3.3.2 Electric motors shall be shipped with bearings lubricated.

3.3.3 Silicagel or similar dehydrating compound shall be enclosed in each motor package. Vents shall be waterproof sealed.

3.3.4 Rotors shall be locked.

3.4 GUARANTEE

Unless exception is recorded by Vendor in his proposal, it shall be understood that Vendor agrees to the guarantee terms described below:
All equipments and component parts shall be guaranteed by Vendor against defective material, design and workmanship when operated under normal condition for 12 months after being placed in specified service but not exceeding 18 months after date of shipment. If any mal-performance or defects occurs during the guarantee period, Vendor shall make available repaired, altered or replacement parts free of any charges whatsoever direct on the purchaser's job site. Vendor shall make available free of charge to the purchaser qualified representatives as he deems necessary to supervise the removal, repair and replacement of the defective parts in such manner that the guarantee be maintained.

The guarantee period for repaired or replaced parts shall be 12 months after start up of repaired equipment but not more than 18 months after the repaired parts and/or equipment are shipped. The guarantee period for the remaining equipment whose operation is dependent upon the proper performance of the repaired part shall be extended by the number of days of fraction thereof that the equipment had been inoperative because of defects. Field labor charges for works during the guarantee period shall be subjected to negotiation between purchaser and Vendor.

National Petrochemical Company
Petrochemical Research & Technology Co.

PP-PE Pilot Plant

Title: INSTRUCTION FOR VENDOR DOCUMENTATION

Page: A

REV. / PAGE	٠	١	٢	٣	٤	٥	REV. / PAGE	٠	١	٢	٣	٤	٥	REV. / PAGE	٠	١	٢	٣	٤	٥
A	X																			
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Document Revisions

CONTENTS

۱. Purpose

The purpose of this procedure is to give instructions for preparation of Vendor's data book (mechanical catalogue) applicable to the contract.

۲. Difinition

VENDOR — Companies Awarded by Owner for Procurement Services, Inspection Affairs or Transportation, Providing of Project's goods, following up all transport activities from VENDOR workshop to final destination as defined in the purchase order.

OWNER: — Petrochemical Research & Technology Company

۳. Content

The Vendor's Data Book shall contain comprehensive detailed information covering design and engineering, inspection and testing, installation, operation and maintenance manual of the equipment and accessories included in, and supplied for the plant.

In addition, VENDOR shall submit the drawings and documents according to the "LIST OF DOCUMENTS REQUIRED FROM VENDOR "given in the requisition / purchase order.

For a sample of the contents of VENDOR's data book refer to Attachment No. ۱.

٤. Instructions Concerning Vendor's Data Books Presentation

٤,۱ Language / Units

All documents and drawings for design and fabrication shall be written in English as well as all Maintenance and Operating Instructions.

All units and dimensions shall be in the metric system except for the following:
- Size of pipe and valve (Inch)
- Flange rating (Pound)

If necessary, other units and dimensions shall be used with OWNER approval.

٤,٢ Size Of Documents

- All drawings shall be prepared on ISO standard size sheets, i.e.

  A٠ : ٨٤٠ x ١١٨٨ mm
  A١ : ٥٩٤ x ٨٤٠ mm
  A٢ : ٤٢٠ x ٥٩٤ mm
  A٣ : ٢٩٧ x ٤٢٠ mm
  A٤ : ٢١٠ x ٢٩٧ mm

- Size A٠ should be used only with OWNER approval.
  Larger sizes are not allowed.
- In general all drawings shall be reduced to ٢٩٧ mm x random length size for convenience in handling.
- All documents other than drawings shall be prepared on standard A٣ or A٤ size sheets suitable for insertion in an A٤ hard-core binder.
- All reduced drawings, data, etc. shall be legible.

٤,٣ Class Of Documents

All drawings / data submitted must be of good quality that will allow production of legible copies.

- Documents submitted to OWNER for comments:
  These documents give all data necessary to understand operation and to appraise the construction method, assembly, disassembly, fastening and connections of equipment. They clearly indicate the scope of supply and specify all details necessary for installation.

- Final documents:
  These documents are certified, "As built" documents finally reviewed without comment by OWNER.
  OWNER comments on VENDOR documentation shall in no way relieve the VENDOR of his responsibility especially concerning the design of the equipment or facilities.

٤,٤ Books Form

All the documentation shall be inserted in A٤ (٢٩٧ mm x ٢١٠ mm) white color binder (Punch holes shall be two).

Other types, such as folders or boxes with loose sheets, are not acceptable.
The thickness of each volume shall under no circumstance exceed that of a normal file (٧ cm). The paper level inside each file shall be at least ٥ mm below the opening point of the binder.

Drawings and documents with sizes larger than A٣ will be folded in plastic jackets inserted in the file, with opening upward.

٤,٥ Identification

Each Vendor's data book shall be identified on its back and on the cover by a standard label, the format of which is given in Attachment No.٢.

٤,٦ Internal Presentation

All drawings and documents shall be written in English.
Cardboard division sheets shall separate different groups of documents, sheets and directions. At least rigid index sheets with numbering shall separate the different chapters.

The wording and presentation of the reports will be controlled with utmost care.

Consequently, any loose presentation, which may give the OWNER impression of careless work, will be rejected. This applies in particular to:

- All manuscripts or type texts with handwritten comments (except for technical documents on OWNER or Vendor's standard forms).
- All texts in any language other than English, unless they are transmitted together with a translation in compliance with the above requirement.
- All copies that might be questionable: writing too light, dark background areas, dark edge due to poor centering, titled copy, perforation marks, etc.

٤,٧. Vendor Document Numbering

In addition to the Vendor's document number, VENDOR shall add
OWNER's document number.
The block shown here below will be placed on each "first page" of specification, data sheet and each drawing in addition to the Vendor's label.

National Petrochemical Company / Petrochemical Research & Technology Company PP-PE Pilot Plant				
NPC-RT PP-PE Pilot Plant	Owner Project No.	Rev.	Date	Signature
	Owner Doc/Dwg. No.			
	Sh. Of			

All other pages of the specifications and data sheets shall have the following block.

Project No.	Owner Project No.	Rev. Sh. Of
OWNER DOC. No.		

٥. Number Of Vendor's Data Books Per Purchase Order

If the purchase order includes several separate requisitions or covers several items, which are to be shipped with different vessels, the VENDOR shall supply as many separate Vendor's data books, as there are separate requisitions and/or shipments.

If the requisition covers a large number of items, a common part and specific chapters by item may be planned in agreement with OWNER.

VENDOR shall prepare:

- ٣ Copies of the complete VENDOR Data Book.
- Copy of electronic file in CD
- ٢ Reproducible copy of final drawings / documents

٦. Delivery Time

Documents submitted for review are forwarded in compliance with the dates specified on the Attachment # ٢ of requisition.
Final documents shall be forwarded ١٥ days after receipt of documents commented by OWNER.

Delivery dates are mandatory and a payment installment may be conditioned by the receipt of documents and/or drawings (refer to the order provisions).

٧. Transmittal Of Documentation

All drawings and documents shall be transmitted with a transmittal note to the address indicated in the Purchase contract. Purchase order number should be clearly indicated.

Any drawing, which is unreadable, will be returned without fail to the VENDOR who shall in no case use this as an excuse for delivery delay.

Any revision made on documentation should be highlighted with a cloud mark.

٨. Documents For Engineering

This paragraph is to clarify OWNER requirements concerning the presentation of some essential engineering documents and drawings submitted for approval. The items indicated below refer to the items listed in the "LIST OF DOCUMENTS REQUIRED FROM THE VENDOR" shown in the attachment # ٢ of requisition.

٨,١ Vendor Drawing And Documentation List

The VENDOR'S shall provide an exhaustive list of the documentation to be delivered. It should be sent together with the first issue of documents.

٨,٢ Plate Arrangement Drawing And Material List

This drawing shall be in proper scale.

The plate arrangement drawing or sketch shall indicated as a minimum:

- A general outline of the equipment (shells, heads, supports, skirt, lugs, saddles, stiffeners,etc.) ;
- For columns, shell / cone / skirt development including all internal & external attachments;
- Position of circumferential and longitudinal weld seams in accordance with plates sizes;
- Head shape (and plate arrangement in case of composed head);
- Shape of reduction cone (straight flange, knuckle radius, etc.) ;
- Plate thickness after plate forming;
- Material specification;
- Material list

Approval of this document enables order of main materials to be finalized.

The material list for nozzles shall be presented in schedule form. It shall be established from the nozzles list shown on the engineering arrangement drawing or process data sheet, and shall include:

- Identification (or item), quantity and diameter of nozzles;
- Type, rating, facing and material of flanges;
- Schedule or thickness of nozzle necks;
- Diameter, thickness and material of reinforcements;
- Material, thickness, rating of blind flanges (if any);
- Diameter, quantity, length, thread type, material of stud bolts and nuts;
- Definition, rating, materials of gaskets

This document is prepared from information known when equipment is ordered. Its approval will allow the above accessories to be supplied.

Any modifications of one of the items listed above will involve revision of the documents and be followed by new approval.

After approval, the material list shall be transferred on the VENDOR general arrangement drawing.

Note: these documents do not apply to storage tanks.

۸,۳ Item: General Arrangement Drawing

The VENDOR can start fabrication only after receiving OWNER approval of this document as a minimum.

This drawing shall be in proper scale.
This drawing shall give the following technical information:

- Main dimensions, overall length, minimum thickness of major components;
- Design code, design pressure and temperature, hydrostatic test pressure, non-destructive tests, heat treatment, etc.;
- Corresponding material specification;
- Location and orientation of weld seams (shells, heads, skirt, etc.);
- Shape of heads or, type/ angle of roof for storage tanks;
- Location, orientation of nozzle gussets and other external welded Attachments;
- Location & orientation of internals (trays supports, coils, demisters, baffles, etc.);
- List of nozzles and connections in accordance with material list (dia., type, rating, schedule, etc.);
- Gaskets and bolting (type, material, etc.);
- All information of scope of supply;
- All information on anchoring system;
- Fabricated weight;
- Empty weight;
- Hydro test weight;
- Operating weight;
- Net weight of removable parts;
- Type of paint and its surface preparation;
- North direction;
- List of detail drawings;
- Insulation / fire proofing support detail;

Note: OWNER guide drawings shall not be used as construction drawings.

۸,٤ Detail Drawings

These drawings shall include references to general arrangement drawing and show:

- Detail of all accessories, internal and external attachment (gussets, etc.): With weld geometry and specification in accordance with approved welding procedure;
- Weight and dimension of removable internals;
- Part list of the various elements;
- Weld geometry and specification in accordance with approved welding procedure;
- All information required on manufacturer name plate;
- Insulation / Fire proofing support detail;
- All construction details not covered above;

All this information may be shown on general arrangement drawing, at Vendor's choice.

۸,٥ Calculation Notes

Calculation notes shall be in accordance with general arrangement drawing.
VENDOR shall establish calculation notes for each equipment.
They shall in all cases be included in "manufacturer file".

These documents shall be clearly marked with identification numbers as other VENDOR documents.

They shall include full reference to information sources (codes, formulas, etc.) used for design.

These documents shall be transmitted for review / approval to OWNER.
These documents shall be approved prior to general arrangement drawing approval.
OWNER approval shall in no case relieve the VENDOR from his responsibilities.

۸,٦ Spare Parts List

SPARE PARTS LIST AND INTERCHANGEABILITY RECORD (SPIR form) to be filled out by VENDOR according to it's filling procedure.

۹. Description Of Inspection And/Or Acceptance Documents

This paragraph clarifies OWNER requirements for documents relating to inspection and acceptance of equipment.
The items indicated below refer to the items listed in the "LIST OF DOCUMENTS REQUIRED FROM THE VENDOR" included in the requisition.

۹,۱ Material Certificates

All pressurized parts shall be considered as main components requiring certificates type ۳.۱. B including:
- Shell, heads, cones
- Skirt, saddles, support brackets
- Tubes, flanges, forging, internal piping, nozzle necks
- Bolting for nozzle and shell flanges
- Welding material

۹,۲ Welders Qualification

This document shall contain all the information concerning:
- Welders (name, number, mark)
- Welding procedure
- Base material (specification, thickness, etc.)
- Welding material (specification, diameter, etc.)
- Electrode type
- Destructive tests results (bending, tensile, impact tests)

All information required on the QW ٤٨٤ forms given by ASME section IX shall be considered as a minimum.

۹,۳ Hydraulic Test Report

This document shall contain the following information:
- Type and volume of equipment
- Contained gas analysis
- Description of equipment (length, width or diameter, nature of base material, thickness)
- Construction number and date
- Hydrostatic test pressure in letters
- Date of inspection (before test) and inspector's name
- Hydrostatic test data
- Signatures of inspectors

۱۰. Issuance Schedule

Final Vendor's data books should normally be shipped to the OWNER as per agreed delivery schedule specified in PO of the relevant equipment.
Such final Vendor's data books shall be an integral part of the Vendor's services set forth in the purchase order and the following precautions must be taken in order to meet the above shipping requirements:

At the latest ۲ months before the scheduled delivery date, the VENDOR shall transmit the Vendor's data book model to OWNER for comments and approval.
The model shall be in conformity with the final internal and external presentation and shall contain all documents required for the final report.

A non- completed form will replace the final acceptance documents, which do not exist at that stage.

Note: Recommendation for handling, transport and storage shall be shipped in box together with the equipment.

ATTACHMENT # ۱

VENDOR DATA BOOK'S CONTENT (SAMPLE)

PART ۱ : General Descripton Of The Equipment

۱,۱. OWNER's requisition
۱,۲. General description including OWNER's specifications and data sheets and drawings

PART ۲ : Recommendations For Storage, Handling And Lifting

۲,۱. Special precautions for handling prior erection (۱)
۲,۲. Recommendations for storage prior and during erection

PART ۳: Erection

۳,۱. List of components to be erected/installed on site
۳,۲. Detailed schedule of the erection including hypothesis taken into account
۳,۳. Procedures for erection and installation of the equipment
۳,٤. Schedule of connection points detailing locations and dimensions
۳,٥. Electrical terminal wiring diagrams
۳,٦. Details of site assembly, and filed welds
۳,۷. List of special tools for site erection and assembly
۳,۸. Procedures for site assembly, leveling and welding
۳,۹. Welding specifications for field welds
۳,۱۰. List of checks and tests to be performed on site
۳,۱۱. Site testing and acceptance procedures
۳,۱۲. Procedures for preparation of the equipment for commissioning (including the calibration of instruments)
۳,۱۳. List of works to be implemented on site instead of Vendor's shop (When required)
۳,۱٤. Weight (empty, full of water)

PART ٤ : Start-Up Running Instructions

٤,۱. General
٤,۲. Principle
٤,۳. Operation
٤,٤. Description of the apparatus
٤,٥. Commissioning
٤,٦. Running instructions

PART ٥ : Maintenance Instructions

٥,١. Maintenance
٥,٢. Safety instructions
٥,٣. General maintenance
٥,٤. Lubricant table and equivalence
٥,٥. Trouble shooting check lists and diagrams
٥,٦. Maintenance Schedule

PART ٦: Spare Parts (٢), (٦)

٦,١. Spare parts for erection, precommissioning, commissioning and start-up
٦,٢. Spare parts for ٢ years operation
٦,٣. Sectional drawings

PART ٧: Manufacturer's Documents / Drawings (٣)

٧,١. List of drawings (٤)
٧,٢. Manufacturer's data report
٧,٣. Drawings (٥)
٧,٤. Calculation notes
٧,٥. Curves and technical data (including P.W.H.T. if applicable)
٧,٦. MANUFACTURER name plate photography

PART ٨: Quality Assurance And Manufacturing Documents

٨,١. Material test certificates
٨,٢. Welding Inspection controls and test reports
٨,٣. Welding procedure specification
٨,٤. Welding procedure qualification reports
٨,٥. Welder qualification reports
٨,٦. Weld identification
٨,٧. Plate identification sketch with heat numbers
٨,٨. Certificate of shop inspection (before hydrostatic test)
٨,٩. X-Ray identification
٨,١٠. Radiographic procedure qualification
٨,١١. Radiographic reports along with radiographs
٨,١٢. Batch test certificates from manufactures for electrodes
٨,١٣. Hydrostatic and other test results and reports (such as visual control and N.D.T., etc.).
٨,١٤. Precommissioning / commissioning check Lists & procedures
٨,١٥. All other requirements as specified in the respective specifications

Remarks

(١) Including a copy of transportation drawing
(٢) No spare parts price must be incorporated in this book
(٣) Only issues approved by as "FINAL"
(٤) Only the drawings included in this part ٧.
(٥) Drawings larger than A٣ format must be folded and inserted in individual plastic skirts.
(٦) Sufficient information to be prepared for spare parts Such as: materials of construction sizes / three proposed Vendor's, etc.

ATTACHMENT # ۲

VENDOR'S DATA BOOK

COVER

Attachment #8 Instruction for making Data CD

- CD Title CASE

VENDOR DATA BOOK

<Project Name>

<P.O No.>
<P.O Description>

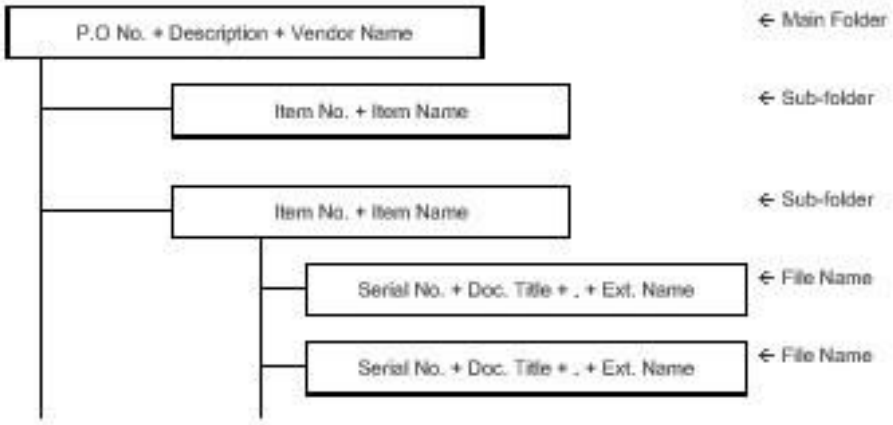
<Vol. No.>

<Client Name>

<Purchaser Name>

<Vendor Name>

- Construction of the Data Folder



National Petrochemical Company
Petrochemical Research & Technology Co.

PP-PE Pilot Plant

Title: PACKING AND MARKING PROCEDURE

Page: A

REV. / PAGE	٠	١	٢	٣	٤	٥	REV. / PAGE	٠	١	٢	٣	٤	٥	REV. / PAGE	٠	١	٢	٣	٤	٥
A	X																			
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١							
٠	٢٠-Oct-٢٠	M.Asgari	M.Nazeri Nasab	AA.SH	M.Asadi	N.Nouhjah	IFA

Document Revisions

CONTENTS

۱. Scope

۱,۱ This procedure gives the information for Packing and Marking and it is to be applied to vendors for the preparation, protection and packaging of materials, equipment, requiring export shipments for the PP-PE Pilot Plant Project to be built in Petrochemical Research & Technology Company, Arak/Iran.

The following instructions are intended as minimum requirements, and adherence to these instructions in no way, absolves or relieves Vendors of any responsibility or obligation outlined in the Purchase Order.

۲. Purpose

This document defines the criteria required by the Project in relation to the packing and marking of both Project's Equipment and materials including Electrical Panels and Instruments.

۳. Definitions

OWNER	Petrochemical Research & Technology Company
PROJECT	PP-PE Pilot Plant
GOODS	All kind of materials and equipment to be incorporated in the Project.
VENDOR	Companies Awarded by Owner for Procurement Services, Inspection Affairs or Transportation, Providing of Project's goods, following up all transport activities from VENDOR workshop to final destination as defined in the purchase order.

٤. Packing For Equipment And Materials

٤,١ Equipment and material shall be exported packed in compliance with General Purchase Conditions and the best established practice for overseas construction jobs in accordance with the following directives. In the event of any divergence between this specification and the established practice, this specification shall govern.

٤,١,١. **"Seaworthy and tropical proof " according to international standard.**

٤,١,٢ Packing and conservation of goods shall be sufficient to protect them from damage during transit from point of manufacture to the delivery at job site under conditions

which may involve multiple handling, extended storage, exposure to moisture and the possibility of pilferage. The contents must withstand one year transit conditions without suffering damage and Vendors shall give recommendations for a further two(۲) years storage under SITE conditions.
Required storage facilities and procedure shall be advised by manufacturer/seller in advance.

۴,۱,۳ The packing of the equipment and materials shall be carried out in order to comply with transport conditions.

۴,۱,۴ Individual packages shall be kept as small in bulk as possible.

۴,۱,۵ Individual packages exceeding a gross weight of ۳،۰۰۰ kgs shall be avoided, if possible.

۴,۱,۶ Kind and dimension of packages shall be chosen to suit overseas transport in contáiners and to fully utilize the size of containers.

۴,۱,۷ The following inside dimension of containers are to be observed :
۴۰-feet-containers : ۱۱۹۵x۲۲۰x۲۰۵ cms.
۲۰-feet-containers : ۵۹۵x۲۲۰x۲۰۵ cms.

۴,۲ Modes of Packing

In accordance with the nature of the contents, the following modes of packing shall be considered:

a) wooden cases
b) wooden crates
c) skid-construction (for vessels etc.)
d) non-returnable steel drums (export variety)
e) non-returnable cable reels
f) bales
g) ۲۰ ft - ۴۰ ft non-refundable containers

۴,۳ General Rules for Packing

۴,۳,۱ Cases and crates shall be made from new, sound and seasoned lumber. Sheathing shall be of min ۲۴ mm thickness.
If so required for static reasons, thicker sheathing shall be used, in accordance with size and weight of the package. Timber crates and boxes shall be strong enough to withstand without any damage , transport on ship board at sea and numerous handling between the works and the port of origin and between the port of destination and the site.

٤,٣,٢ Cases and crates with gross weight up to ١٠٠٠٠ kgs shall be provided with bottom cleats of min. ٤٠ mm thickness to ensure clearance for handling by forklift.
Cases and crates exceeding gross weight of ١٠٠٠٠ kgs shall be provided with skid runners, number and size according to weight of package.

٤,٣,٣ The contents of cases shall be protected by waterproof and strong plastic foil which shall be sealed by welding. An adequate quantity of moisture absorbent (silica gel) shall be added to protect the contents for sufficiently long time from corrosion.

٤,٣,٤ Felt , cellophane paper, polyester cuttings , crepe cellulose and some equally efficient materials may be used for padding or cushioning.
Wood shavings and other paper shall not be used for padding or cushioning.

٤,٣,٥ Materials shall be protected against corrosion during transit as necessary.
All bright and machined parts shall be coated with a recognized rust preventative suited to the particular application concerned. All internal parts of machinery shall be treated with lubricant containing rust and oxidation inhibitors to protect equipment from any damage possible. Such lubricants shall be compatible with those which will subsequently be used in service and shall be identified by appropriate tagging.

٤,٣,٦ When required, materials shall be painted or coated in accordance with the particulars contained in the purchase order and/or specifications.

٤,٣,٧ All flanges, machined working surfaces and threaded parts of all equipment shall be suitably protected . All flanged connections of vessels shall be protected by metal plates correctly gasketed by wooden plugs or plastic caps suitably secured in position.

٤,٣,٨ Units or parts belonging to main equipment but separately packed shall be clearly marked for easy identification with the main equipment to which they relate.

٤,٣,٩ Packages containing "FRAGILE" articles shall be appropriately packed and in addition to the words "FRAGILE-HANDLE WITH CARE" being stenciled on two opposite sides, internationally recognized symbols shall also be used “This Side Up”.

٤,٣,١٠ Pipe, structural steel sections and plates shall be strapped in bundles of convenient size and weight for handling. Rolled and shaped plates shall be provided with suitable bracing to eliminate distortion during transit, and shall be bundled in uniform lengths.
The weight of each bundle shall be within the breaking strain of the steel wrapping. Each bundle shall be marked with a metal tag ,hard stamped, secured under steel wrapping. A ٢٠٠٠ kg limitation shall be imposed for lifts in this category. Where praticable long lengths shall be limited to ١٢,٢ meters to avoid long length carriers. All small steel sections, handraíl stanchions, gusset plates etc. shall be boxed.

٤,٣,١١ Black steel pipes with an outside diameter of up to ١٦٨,٣ mm shall be bundled by strapping cleats above and below the load, with boards between each pipe layer and secured by bolts.

Black steel pipes exceeding the above outside diameter shall be treated as an individual package and marked accordingly.
All black steel pipes shall be protected by means of TECTYL spray. The pipe ends shall be closed with plastic caps.
If, in case of pipes with large diameters, the pipe ends cannot be closed with plastic caps, the interior of the pipes shall also be protected and sprayed with TECTYL.

٤,٣,١٢ Bitumen coated pipes shall be prepared, packed and handled according to established practice.

٤,٣,١٣ Stainless steel pípes shall be packed in wooden cases.
Protection with TECTYL is not necessary.

٤,٣,١٤ All valves and fittings (pipe elbows, flanges,etc.) shall be suitably protected and their method of shipment shall be:

a) All valves and fittings shall be suitably packed and shipped in metal strapped or wood re-enforced waterproof wooden cases with metal corner protection .
b) All treaded fittings shall be greased and provided with plastic caps.
c) Control valves shall be packed in wooden cases having adequately designed interior support with interior water proof protection .

٤,٣,١٥ Apparatus and vessels shall, where possible, be packed on skid constructions and secured with adjustable steel straps. All unprotected surfaces shall be sprayed with TECTYL. Manholes and other major openings shall be protected with either plastic caps or wooden lids, which shall be firmly secured. Smaller openings shall be closed with plastic plugs.

٤,٣,١٦ All vessel internals and items not installed by the vendor at works including accessories such as small parts, bolts, nuts, gaskets etc. shall be packed in wooden cases separately for each vessel or apparatus and marked with the same item number as the vessel/apparatus in order to protect all parts from loss or damage in transit. Internals, bolts and gaskets for service/ testing operations shall be supplied with the vessels/items by the vendor and all internals, boxed separately and marked according to marking procedures. Each item shall be supplied correctly and identified for field installation by others.

NOTE: It is imperative that all these items be clearly listed on the packing list.

٤,٣,١٧ Fire bricks, special tiles and insulation refractories shall be boxed after sealing in a polyethylene liner. These boxes shall be skid mounted. Instructions regarding storage prior to installation shall be stenciled on each box with particular reference to adverse weather/temperature/humidity conditions.

٤,٣,١٨ All electrical motors whether coupled or uncoupled, generatorors and electrical equipment shall have all openings sealed with protective tape, shall be packed in suitable weather proof skid mounted boxes, and protected from moisture ingress by desiccant as described above.

Items with brushes shall be brushed and rust removed before shipment.
All electrical equipment shall be suitably protected to withstand ١ year transit conditions and Vendors shall give recommendations for a further , ٢ years storage under site conditions
Batteries shall be shipped dry with electrolyte packed separately and shall include charging instructions.

٤,٣,١٩ All electronic and pneumatic instruments to be packed in accordane with given instructions and must be suitably protected to withstand ١ year transit conditions and Vendors are to give recommendations for a further ٢ years storage under site conditions.

٤,٣,٢٠ Pipeline / vessel insulation shall be packed in double water-proof wooden plywood cases and secured to pallets.
Drums of insulation mastic will also be shipped on pallets.

٤,٣,٢١ Spare parts for two years operation, which shall be individually tagged, must be covered with a suitable preservative and wrapped with greaseproof paper and be packed in separate cases from the base item. The cases are to bear the markings as specified and in addition the words "SPARE PARTS FOR TWO YEARS OPERATION".

٤,٣,٢٢ Commissioning spares shall be individually tagged and marked "COMMISSIONING SPARES" and shall be packed and shipped with the base item.

٤,٣,٢٣ All vessels/heat exchangers or items of such kind shall be dried, thoroughly cleaned inside and be free of all dirt and loose materials.

٤,٣,٢٤ Should any materials be scheduled to be freighted as deck cargo, additional packing instructions may be required; the Vendor will advise, for vessels and columns, which shipment cradles will be used throughout the transportation. Cradles to be secured to vessels and columns, by strapping.

٤,٣,٢٥ Paper bags suítably boxed, or water tight Steel Drums will be used for shipping cement, special aggregate, etc. Paperbags must not be less substantial then ٦٠ lbs outer wall, ٤٠ lbs inner wall and one moisture craft inner wall.

٤,٣,٢٦ Unless otherwise specified, all export cases, boxes, bundles and containers are to be securely metal strapped with a minimum of two unanealed steel straps in each of two right angled and opposite directions, or where applicarle wood re-enforced.

NOTE: Should consignments arrive at the shipment point of origin visually damaged, the shipping agent will advise and await instruction before onward shippings.

٤,٣,٢٧ All bulk items, lighting, fittings, cable glands, switches etc. are to be packed in batches sufficient for a specific volume of work.

٤,٣,٢٨ Cases and crates shall, according to their weight and size , be provided with two or more steel straps made of unannealed steel, applied with a stretching tool and secured with crimped steel seals.

٤,٣,٢٩ Fittings (valves, pipe elbows, flanges, etc.) must be packed in wooden cases and must be protected.

٤,٣,٣٠ Accessories for apparatus and vessels (small parts, bolts, nuts, washers, gaskets, etc.) are to be packed in wooden cases, separatelly for each apparatus or vessel. These cases must be marked with the same item No. as the apparatus/vessel to which it belongs (see also Item ٥ - packing lists).
All commissioning spare parts to be packed separately, being the packing marked with the relevant main item.

٤.٤ Marking of Packages

٤,٤,١ All packages shall be clearly stencílled on two opposite sides with black, indelible and seawater proof paint, as follows:
Wherever possible , the stenciled characters shall be ٨ cms high.
In case the surfaces of a package are too small to permit stenciling, sheet metal tags shall be embossed with the above marking and shall be securely fastened on two opposite ends of the package.

٤,٤,٢ If necessary, packages shall be additionally marked with cautionary symbols on two opposite ends.

٤,٤,٣ Packages which may be stored in the open but under a tarpaulin, shall be marked with a red "double roof" symbol.

٤,٤,٤ Packages which are to be stored in closed and dry places shall be marked with a red "double roof" symbol.

٤,٤,٥ The system of package-numbering shall be indicated to the OWNER in due course of time.

٤,٤,٦ The gross weight shall be determined by the party who is responsible for the packing of the items/materials.

٤,٤,٧ **Example for marking of packages is shown in attach ١.**

٤,٥ Packing list

The packing lists shall be prepared on standard forms :
The necessary number of forms will be made available to OWNER , who shall advise about the quantity required.
The packing list forms shall be filled in ENGLISH language.

OWNER shall supply VENDOR with a specimen packing list showing how it is to be filled in.
At the same time OWNER shall be informed of the package numbers required for marking the packages. one column of the packing list shall be filled in with OWNER "ITEM NO. " These item numbers shall be taken from the order form. Special attention shall be paid to the order form that the item number is correctly attributed to the goods to which it belongs . If any question should arise in this respect VENDOR shall contact the OWNERS Representative.
Special care shall be taken that all accessory parts loose or detachable, belonging to the main item under dispatch, shall also be individually listed in the packing list. In the event these accessory parts are not listed in the packing list , they shall be considered by OWNER as not delivered.
Two copies of the packing list in a water-proof plastic envelope shall securely be mailed under a galvanized steel sheet on the outer surface of the package The final packing list in ٢-folds shall be available in OWNERS office ١٠ (TEN) working days prior to dispatch of the goods from the manufacturer's premises.

٤,٦ Liability and Guarantee

The party responsible for the packing shall be fully liable for and guarantee proper, sufficient and adequate packing, completeness of the contents, protection of the contents for a storage time of ١٢ month starting from the date when the equipment is loaded on the ship, and the correct preparation of the packing list.
All cost whatever resulting from inadeguate or insufficient packing shall be fully charged to the responsible party.

٥. Packing And Marking For Electrical Panels And Instruments

٥,١ Scope

This section covers the method for packaging of electric and instrument panels for export delivery, which are to be provided with full protection against physical damage and atmospheric attack during transit and possible long periods under adverse storage conditions which may extend to two years.

٥,٢ General

This specification is for the package Vendor’s guidance only.
Vendor shall remain fully responsible for selecting suitable materials for proper packaging and shall comply with the latest issues of the following European or British Standards: Where standards conflict with this specification, specification shall govern .

- Packing Code
- Silica gel for use as desiccant for packages
- Method of determining the permeability of materials used for packaging.

The Vendor shall provide written instructions for the removal of protective coatings and devices.

٥,٣ Method

٥,٣,١ The instrument or panel which shall be thoroughly clean, dry and free from rust shall be totally enclosed in a polythene shroud after sharp projections on the instrument or panel have been padded . Silica gel or other approved desiccant shall be strapped inside the shroud, but shall not come into contact with the paint work.
After the desiccant is strapped into position, the open ends of the shroud shall be heat sealed , only leaving an opening large enough for the insertion of an air extracting pipe. After extraction of the air from the shroud, the opening shall be completely sealed.

٥,٣,٢ Packing Case Materials

- All wood shall be thoroughly seasoned and thoroughly sound without knots, knot holes, shakes and checks .
- Wood which can cause metallic such as oak , western red cedar and sweet chestnut shall not be used .
- The case shall be of sill base type. All sheating shall be tongued and grooved.

٥,٣,٣ Packing Case Lining

The packing case shall be lined with completely multilayer waterproof.
The lining shall have as few joints as possible. If joints are necessary, the pieces shall be overlapped so that any rain water which may penetrate the case is shed automatically when the case is upright. Overlaps shall be ٧٥ mm minimum Joints shall be made with Bostik 'C".

٥,٣,٤ Securing Instruments or Panels Inside Packing Case.
a)The instrument or panel shall be completely secured by wooden battens faced with suitable rubber or other shock absorbing materials.
b)Wood, wool and other hydroscopic shall not be used.
c)Hay and straw shall not be used.

٥,٣,٥ Sealing of Packing Case

After nailing, joints in the case shall be sealed with Bostik Sealing Compound and the outside bound with steel strapping .

٥,٤ Marking of Packing Cases

٥,٤,١ Cases which are for Carriage by sea shall be marked "*HOLD STORAGE*".

٥,٤,٢ All cases shall be marked to indicate the correct way up and bear the marking described here in above.

ATTACHMENT No.۱

MARKING OF PACKAGES

PROJECT :

PROJECT No. :

L/C No. :

OWNER :

ORDERED BY :

ORDER No. :

FINAL DESTINATION : Pouyesh Site, Arak / Iran

STORAGE CODE :

DIMENSION : L x W x H

GROSS WEIGHT :

NET WEIGHT :

PACKAGE No. :_____OF_____ .

MADE IN :

National Petrochemical Company
Petrochemical Research & Technology Co.

PP-PE Pilot Plant

Title: SPARE PARTS PROCEDURE

Page: A

REV. / PAGE	٠	١	٢	٣	٤	٥	REV. / PAGE	٠	١	٢	٣	٤	٥	REV. / PAGE	٠	١	٢	٣	٤	٥
A	X																			
١	X																			
٢	X																			
٣	X																			
٤	X																			
٥	X																			
٦	X																			
٧	X																			
٨	X																			
٩	X																			
١٠	X																			
١١	X																			
١٢	X																			
١٣	X																			
١٤	X																			
١٥	X																			
١٦	X																			
١٧	X																			
١٨	X																			
١٩	X																			
٢٠	X																			
٢١	X																			
٢٢	X																			
٢٣	X																			
٢٤	X																			
٢٥	X																			
٢٦	X																			
٢٧	X																			
٢٨	X																			
٢٩	X																			

Rev	Date	Prepared By	Checked By	Approved By	Approved By	Approved By	Status
		Discipline			PEM	PM	
٥							
٤							
٣							
٢							
١							
٠	٢٠-Oct-٢٠	M.Asgari	M.Nazeri Nasab	AA.SH	M.Asadi	N.Nouhjah	IFA

Document Revisions

These instructions outline the requirements for providing original manufacturer's pre-commissioning, commissioning and two years operation spare parts for a PP-PE Pilot Plant to be built in Petrochemical Research & Technology Company, Arak/Iran.

CONTENTS

Attachments:

١) General Information

These instruction outline the requirements for providing original manufacture's pre-commissioning, commissioning and two years operation spare parts for PP-PE Pilot Plant to be built in Petrochemical Research & Technology Company, Arak/Iran.
The Vendor is obliged to provide with an original equipment manufacturer spare parts data package, containing full and complete spare parts information and prices for each item of equipment supplied.
The Vendor shall recommend those spare parts that are deemed necessary on the basis of Vendor's recommendations and experience.

٢) Definitions

٢,١ "Erection, Precommissioning, Commissioning and start-up spare parts" are those material, equipment or components necessary during the erection, precommissioning, commissioning and start-up activities of the Plant.

٢,٢ "Operating Spare Parts" are spare parts material, equipment or components necessary for the continuous operation of the plant after commissioning completion for a period of two years.

٢,٣ GOODS: All kind of materials and equipment to be incorporated in the Project.

٢,٤ VENDOR: Companies Awarded by Owner for Procurement Services, Inspection Affairs or Transportation, Providing of Project's goods, following up all transport activities from VENDOR workshop to final destination as defined in the purchase order.

٢,٥ OWNER: Petrochemical Research & Technology Company.

٣) Spare Parts Required

٣,١ Capital spare parts

Capital spare parts are defined in documentation prepared by technical department.

٣,٢ Erection, precommissioning, commissioning and start-up Spare Parts

Vendor is requested to submit a Spare Parts proposal togheter with base quotation. Such spare parts shall be packed in separate boxes and shipped together with the main equipment/material purchased in order to be available at the site together with the base order supply.

Minimum required quantities are shown in attachment ١.

٣,٣ Two years operation spare parts

Vendor is requested to submit a Operation Spare Parts quotation based on his experience together with base quotation
The necessary and sufficient two years spare parts include those parts that are normally required to mantain the plant in a satistactory working condition for a period of two years of continuous operation after plant start-up.
These Operation Spare Parts shall be packed in separate boxes.
Guidelines for selection of two years spare parts are shown in attachment ٢.

٤) Required Information

٤,١ All information and drawings must be in English language.

٤,٢ Data sheets, engineering drawings. manufacturer's catalogs and operating and maintenance manuals required to identify the function of and fully describe all parts associated with the equipment

٤,٣ The interchangeability of spare parts must be completely assured between all units contained on the parent equipment purchase order.

٤,٤ The Vendor shall guarantee the spare parts in accordane with the requirements requested for the parent equipment.

٤,٥ The offer must be valid for supply either for total or partial quantities.

٤,٦ All Spare Parts list shall be filled-in using the attached "Spare Parts Card" according also to the instructions attached herein.
Photocopied or hand-written documents are not acceptable.
Twelve (١٢) months price validity is required

٥) Identification

All spare parts shall be individually identified by one of the followlng methods:

٥,١ A stainless steel label imprinted with letterine approximately ٦ mm (١/٤) high and secured to the part with S.S. wire.

٥,٢ Inscribing with an electric spark erosion pencil

٥,٣ On large items inscribing with non-fading,moisture resistant marking ink, figures/ letters to be at least ٢٥ mm (١) high. Ink shall be Pannier ١٠٠١ Yellow Industrial or equal.

٥,٤ Items such as Ball Bearings which in actual storage will remain in their packing may be identified with an adhesive label firmly attached to the outside of the carton.

٥,٥ Alternative methods which are standard industrial practice may be used provided SP's approval has been obtained in writing in advance. Stamping directly into spare parts will not be allowed.

٥,٦ The following shall appear on each spare or spare part label:
Manufacturer's real part number.
Short description (one word will suffice if space is limited).
Tag number of equipment (if applicale).

٦) Packing And Protection

٦,١ Packing protection and marking of the packing container shall be as described in Project Packing and Marking Procedure ٠٠٠-PCR-PRC-٠٠٠٢. Spare parts shall be packed separately from main equipment and the packing containers shall clearly be marked “erection, pre-commissioning, commissioning, and start-up spare parts” or "two years operating spare parts" as applicale. The following additional comments apply :

٦,٢ Packing cases and other shipping containers must be capable of giving adequate protection to contents for a period of one year after despatch from Vendor work-shop (i.e. cases may after receipt at the Plant Site be stored outside before being unpacked).

٦,٣ Two years operating spares are to be protected and packed in such a manner as to ensure a minimum shelf life of four years in an un-air-conditioned warehouse sited in extremely dusty heavy industrial and coastal area with salt pollution location where the maximum shade temperature may exceed -١٤ +٤٥ C. and where relative humidity reaches ٩٠٪.

٦,٤ Consumables items such as bolts and nuts shall be adequately oiled to prevent corrosion.

٦,٥ Other unpackaged items shall be protected by a rust preservative oil, hard drying type. if the nature of the item permits the removal of the deposited tar oil skin by means of petroleum based solvents or the use of hot dip strippable coating.

٦,٦ Any protection for stainless steel parts shall not contain chlorides or harmful metal salts such as Zinc, Lead, Copper. etc. Also marking paint or ink shall not contain similar harmful components.

٦,٧ Electronic and instrument parts shall be packed in sealed clear plastic bags along with a bagged amount of dessicant.

٧) Special Storage Items

٧,١ Vendor must advise of any spares which cannot be stored under the conditions stated in para. ٦,٢ and which require special storage conditions

٧,٢ Special Storage Items are to be clearly labelled with storage instructions such as:
STORE IN A COOL DRY PLACE AT C
STORE IN DARK PLACE
KEEP HUMIDITY BELOW %
etc.

٧,٣ Owner must be notified of all such items without delay before order placement since a restricted shelf life may require an amendment to order quantity and an appropriata re-ordering procedure.

ATTACHMENT ١

ERECTION, PRECOMMISSIONING, COMMISSIONING AND START UP SPARE PARTS

١)	FURNACES	
	Gaskets for coil:	٥٠٪
	-Burner Tiles	١٠٠٪
	-Burner Tips	٥٪
	-Fire eyes	١٠٪
	-Gas valves seat	١٠٠٪
	-Solenoid valves	٢٥٪
٢)	EXCHANGERS, REACTORS & DRUMS/TANKS	
	Gaskets for Girth Flange, M/H& H/H	١٠٠٪
	Stud Bolts and Nuts for the Above	٥٪(Min. ٢ Sets)
	Field-Installed Trays:	
	-Bolts and Nuts	١٥٪ (Min. ٢ Sets)
	-Washers (Metal and Asb.)	٢٠٪ (Min. ٢ Sets)
	-Tray Clamps	١٠٪ (Min. ٢ Sets)
	-Asb. Rope and Tape	٢٥٪ (Min. ٢ Sets)
	Field-Installed Internals, Piping and Other Bolted Internals:	
	Stud Bolts (Alloy and C.S.)	١٠٪ (Min. ٢ Sets)
	Washers and Nuts	١٠٪ (Min. ٢ Sets)
	Packing:	
	-Inert Balls	١٥٪
	-Raschig Rings / Sllotted Rings	١٥٪
	-Gaskets Sets And O-Rings	١٠٠٪
	-Fan for Air Cooler	
٣)	STEEL STRUCTURE AND PLATFORM	
	Bridge Crane:	
	-Bolts & Washers	١٥٪

-Gashels	١٠٪
-Contactors	٥٪
-Tension Springs	١٠٪
-Fuse Elements	١٠٪
-Gaskets	١٠٪
-Oil Seals	٢٥٪
-Relays	٥٪
-Collectors	١ set Each Size
-Contact Shoes	١ set Each Size
-Limit Switches	١ set Each Size
-Welding Rod	١٠٪

٤) MACHINERY / PACKAGES

Please see the relevant engineering specifications of each equipment for commissioning spares.

Electrical Equipment:	See item ٩
Instrumentation:	
- Control panel	See item ١٠
- Board instruments	See item ١٠
- Field Transmitters	See item ١٠
- Field instruments	See item ١٠
- Others	٠٪

٥) H.V.A.C.

Bolts, Nuts, Gaslets for Field installation of Pipe/Duct	٥٪
Rotating Equipment	See item ٥
Heat Exchangers	٠٪
Filter Element	١ Set Each Size/Material
Electrical	See Item ٩
Instrumentation:	
-Control panel	See Item ١٠
-Board Instruments	See Item ١٠
-Field Transmitters	See Item ١٠

-Field Instruments	See Item ١٠
-Others	٥٪

٦) SPECIAL EQUIPMENT

Heat Exchanger	See Item ٢
Rotating Equipment	See Item ٥
Filter Element	١ Set Each Size/Mat'l
Piping	٠٪
Electrical	See Item ٩
Instrumentation:	
-Control panel	See Item ١٠
-Board Instruments	See Item ١٠
-Field Transmitters	See Item ١٠
-Field Instruments	See Item ١٠
-Others	٠٪

٧) PIPING

Gaskets, all sizes	٢٠٪
Stud Bolts less than١"	١٥٪
Stud Bolts ١" to ١ ٧/٨"	١٠٪
Stud Bolts ٢" and over	٥٪
Welding Rods	١٠٪
Coating and Wrapping	١٠٪

	Carbon Steel	Alloy/SS	Cast Iron
Pipe ٢" and below	١٥٪	٤٪	٠٪
٣" to ٦"	١٠٪	٢٪	٥٪
٨" and over	٥٪	١٪	٥٪
(*) Valves ٢" and below screwed and welded	١٠٪	٥٪	٠٪
(*) flanged	٢٪	٢٪	٠٪

(*) Valves ۳" to ۱۰"	۲٪	۲٪	۰٪
(*) Valves over ۱۰"	۰٪	۰٪	۰٪
(*) Flanges up to ۱۲"	۵٪	۳٪	۰٪
(*)۱٤" and over	۲٪	۲٪	۰٪
(*) Fittings welded up to ۲"	۱۰٪	٦٪	۰٪
(*)۲ ½" to ۱۰"	۵٪	۳٪	۰٪
(*)۱۲" and over	۳٪	۲٪	۰٪
(*) Fittings Screwed up to ۲"			
(*) ۳" and over	۵٪	۳٪	۰٪
(*)Flanged all sizes	۵٪	۳٪	۰٪
(*) Hub and Spigot ۳" to ۱۲"	۰٪	۰٪	۵٪
(*) ٤" and over	۰٪	۰٪	۳٪

Note: as indicated with (*), where the percent gives the quantity consisting of a whole number plus a decimal less than ۰،۵, the decimal portion will be dropped; where the decimal portion is ۰،۵ and more, the next higher whole number quantity will be selected.

۸) ELECTRICAL EQUIPMENT

Switchgear, Motor Control Centers MV/LV:	
-Fuse elements	۵۰٪
-Bulb for Signal Lamps	۵۰٪
Local Control Panels & control stations:	
-Fuse elements	۵۰٪
-Bulb for Signal Lamps	۵۰٪
Electirc Motors:	
-Grease Nipples where applicable	۱۰٪+power terminal (in J.B.) ۲٪
Lighting Fixtures	۳٪
Flag Relay	۲٪
Time Relay	۲٪
Terminal Block	۲٪
Auxiliary Relays	۱٪
Moving Contacts	۱۵٪

Fixed Contacts	۱۵٪
Coils for Contactors	۱۰٪
Boucholz Relay	one of each type and size
Thermometer	
Local Control Station:	۵٪
-Ammeter	
-Push button	۵٪
-Selector Switch	۵٪
UPS:	
-Fuse	*
-MCB (miniature circuit breaker)	*
-SCR	*
-DIOD	*
-Transistor	*
-Control cards	*
-Signaling lamps	*
-Batteries	*
Battery Charger:	
-Fuse	*
-MCB(miniature circuit breaker)	*
-SCR	*
-DIOD	*
-Transistor	*
-Control cards	*
-Signaling lamps	*
-Batteries	*
Fire Alarm System	*
Telephone System	*
Paging System	*
Radio System	*
Emergency Diesel Generator	*
Sockets (٤٠٠V, ٢٣٠V, ٢٤V)	۵٪

Plugs(٤٠٠V, ٢٣٠V,٢٤V)	٥٪
Portable ١١٠V AC, ٥٠Hz, with transformer	٥٪ each type
Socket and plug (ex-type)	
Hand lamp ٢٤V AC, ٥٠Hz(ex-type)	١٠ no.

All special tools, equipment and spare parts required for commissioning and start-up shall be provided.

These are the spare parts that VENDORS shall recommend based on experience.

٩) INSTRUMENTATION

For control Panel:	
- Bulbs For Signal Lamps	٥٠٪
- Fuse Elements	٥٠٪
Boards instruments:	
- Fuse elements	٥٠٪
- Chart paper for recorders	٣ boxes each type
- Ink for Recorder	٧ sets each type
- Pens for Recorders	٥٠٪
Field transmitters:	
- Gasket	١٥٪
Field instruments:	
- Air pressure regulators	٥٪
- Temperature Indicators	١٠٪ each range
- Pressure gauges	١٠٪ each range
Solenoid Valves	٢٪ each type(min ١ set)
Selonoid coils	٣ coil each type
Valve positioners	٢٪ each type(min ١ set)
Cable – Single Pair	٢٠٪
Cable – Multi Pair	١٥٪
Cable Glands	٢٠٪
Junction Boxes – Large	١ min.
Pipe and Tube	١٠٪

Fittings all type	١٥٪ each size
Valves	٢٠٪
Manifold Valves	١٠٪ each size
Cable Tray	٢٠٪
DCS:	
- Bulbs for signal lamps	٥٠٪
- Fuse elements	٥٠٪
- Printer paper, Chart paper	٤ boxes each type
- Printer Ribbon	١٠ sets each type
- Blank Floppy disks/magnetic tape cartridge	١٠ pieces
Gas Chromatograph:	
-Filter elements	١٠٪
-Calibration gas cylinders	١ cylinder (١٠٠ liter) each type
-Standard gas cylinders	١ cylinder (١٠٠ liter) each type
-Other gas cylinders	١ cylinder (١٠٠ liter) each type
Other Analyzers:	
-Filter Elements	١٠٪
-Calibration Gas Cylinders	١ cylinder (١٠٠ liter) each type
-Standard gas cylinders	١ cylinder (١٠٠ liter) each type
-Other gas cylinders	١ cylinder (١٠٠ liter) each type

١٠) PAINT AND INSULATION

Paint	١٠٪
Insulation material	١٠٪
Insulation Band & Seal	١٠٪
Insulating Cement	١٠٪
Insulation Sheet Metal	١٥٪
Insulation Wire	١٠٪

١١) UTILITY EQUIPMENT

Heat Exchanger, Vessel, Tank and Tower	See item ٢

Rotating Equipment	See item ۵
Filter Elements	۱ Set Each Size/Mat'l
Piping	۰٪
Electrical	See item ۹
Insturmentation :	
-Control panel	See item ۱۰
-Board Instruments	See item ۱۰
-Field Instruments	See item ۱۰
-Others	۰٪

ATTACHMENT ٢

GUIDELINES FOR SELECTION OF ٢ YEARS OPERATION SPARE PARTS

Spare parts for equipment are shown in the following tables:

Table ١ – Spare parts for machinery/packages.

Table ٢ – Spare parts for electrical equipment

Table ٣ – Spare parts for instruments

Table ٤ – Spare parts for pressure vessels and heat exchangers

Table ٥ – Spare parts for piping.

TABLE ۱

SPARE PARTS FOR MACHINERY / PACKAGES

Note ۱: Please see the relevant engineering specifications of each equipment for recommended ۲-years spares.

Note ۲: Please see tables ۲ and ۳ of attachment-۲ for the electrical and instrument spare parts requirements of machinery / packages for ۲ -years.

TABLE ٢

MINIMUM SPARE PART FOR ELECTRICAL EQUIPMENT

Item:		Quantities
١) Switchgears:	MV Fuses	١٥٪
	Protecting and Flag Relay	٢٪
	Time Relay	٢٪
	Lamps	١٠٪
	Space Heaters	١٠٪
	L.V. Fuses	٢٪
	Auxiliary Relays	١٪
	Moving Contacts	١٥٪
	Fixed Contacts	١٥٪
	Circuit Breakers(MCCB,MCB)	١٠٪
	Contactors	١٥٪
	Metering	١٥٪
	CT	٢٠٪
	PT	٢٠٪
٢)Power Motors Control Center:	L.V. Fuses	١٥٪
	Time Delayed Relays	٨٪
	Lamps	١٠٪
	Space Heaters ١٠٪	
	Terminal Blocks ٧٪	
	Auxiliary relays	To be determined later in conjunction with the equipment vendor
	Contactors	
	Thermal overload Relays	
	Isolators for each trip	٢١٪
	Current Setting	١١٪

	Motor Circuit Brakers Complete Unit for Each Type & Size(incoming & bus tie)	۱۵٪(min ۱)
	Moving Contacts	۲۰٪
	Fixed Contacts	۲۰٪
	Metering	۱۵٪
	CT	۲۰٪
	PT	۲۰٪
	Circuit Breaker	one per each type
۳) Transformers :	Bucholz Relays	one each type & size
	Thermometer	۱۰٪
	Bushing HV/LV	۵۰٪
	Measuring and cintrol devices	۲۰٪
	CT of natural resistor	۱۰٪ (of each type)
٤) Power Material:	a) Local Control Stations	۵٪
	b) Sockets ٤۰۰V AC	۱۰٪
	c) Plugs ٤۰۰V AC	۱۰٪
۵) Lighting Materials:	a) Switches	۱۰٪
	b) Fuses	۳۰٪
	c) Sockets(۲۳۰ V, ۲٤V)	۱۰٪
	d) Plugs(۲۳۰ V, ۲٤V)	۱۰٪
	e) Lighting Fixtures	۱۰٪
	f) Ballast Lamps	۵٪
	g) Lamps	۲۰٪
	h) Portable ۱۱۰V AC,۵۰Hz with transformer (ex-type)socket and plug	۱۰٪
	i) hand amp ۲٤V AC, ۵۰Hz (ex-type)	

٦) Motors:

No of Machines	۱	۲	۳	٤	۵	more
set of Bearing	۱	۱	۱	۲	۲	٤۰٪

Fan, terminal, blocks, space heater (MV)per type ۵٪

۷) UPS:

Fuses	۳۰٪
MCB(miniator circuit breaker)	۱۵٪
SCR	۳۰٪
Signaling lamps and protection device	۱۵٪
DIOD	۱۰٪
Transistor	۳۰٪
Control cards	one per each type
Batteries	۵٪
Isolator switch (make before break)	one per each type

۸)Battery charger:

Fuse	۳۰٪
MCB	۱۵٪
SCR	۳۰٪
DIOD	۱۰٪
Signaling lamp	۱۵٪
Control cards	one per each type
Batteries	۵٪

۹)Telephoned system *

۱۰) Paging system *

۱۱) Radio system *

۱۲) Fire alarm system *

۱۳) Neutral grounding system *

۱٤) Bus duct *

These are the spare parts required for two years operation. Vendor shall recommend the spares based on their experience.

(*)The Quantities indicated are only preliminary estimation, so the firm quantities will be specified later in conjunction with recommendations of equipment vendors.

The quantities which shall be ordered by VENDOR shall be approved By OWNER.

TABLE ۳

SPARE PARTS FOR INSTRUMENTS

Item	Quantities
Flow Instruments	To be determined
Level Instruments	in conjunction with
	the equipment Vendor
Temperature Instruments	(based on Vendor's
	experience on similar
Pressure Instruments	type of plant)
Analyzers	
Control Valves : Valve Bodies	None unless service
	is corrosive or erosive.
	For corrosive or
	erosive services,
	shall be determined
	in conjunction with
	the equipment Vendor.
Valve Plugs	۱ of each size/min.
	۱۰٪ or ۱
Seat Rings	۱ of each size/min.
	۲۰٪ or ۱
Actuators	۱۰٪ (min ۱ per type / size)
Valve Stems	۱ of each diameter.
	These vary in length
	depending on valve
	size. Purchase the
	longest of each dia.
	These can be cut to
	the correct size.

Stem packings	۳ boxes of each size used/min. ۲۰٪
Grease	۳ boxes of each type used/min. ۲۰٪
Diaphragms	۱ of each size used min. ۲۰٪
Blank Orifice Plates	
Dial Thermometers	
Manual Loading Stations	
Instrument Air Filters (Regulation sets)	
Pressure Gauges	
Pressure Switches	
Plug-in Assemblies for Elect. Instr.	
Plug-in Assemblies for Pneum. Instr.	۱۰٪
Seal, Condensate and Vent Pots	(for all)
Solenoid Valves	
Thermocouples	
Thermowells	
Signal Lights	
Pneumatic relay and/or boosh(if any)	
Valve Positioners	۱۰٪
I/P Convertes	(for all)

DCS/ESD/PLC (for each system the following items):

-I/O cards	۵٪ for each type (min ۱ for each type)
-Main cards	one set
-Power supply (AC, if any)	one set
-Power supply (DC, if any)	one set
-Barriers cards	۵٪ for each type (min ۱ for each type)

On-line gaschromatographs:

-Main mother board	one set
-Column	one per type

TABLE ٤

SPARE PARTS FOR

PRESSURE VESSELS & HEAT EXCHANGERS

ITEM	QUANTITIES
١) Heat Exchangers-Shell and Tube (U Type included)	
- Tubes	Straight tubes sufficient to retube the largest bundle of each tube size and material.
- Bolts and nuts	(Special or Alloy) of each exchanger minimum one set.
- Gaskets	٢٠٠٪
٢) Pressure Vessels	
- Gaskets	٢٠٠٪
- Bolts and nuts	١٠٪ (Special, Alloy or size ٢" diam or greater), minimum one set.
٣) Air Cooled Exchangers	
- Plugs	Steel ١٪; Non-ferrous ٢٪ (min. one number)
- Plug Gaskets	٥٪ (min. one number)
-Cover plate gaskets	١٠٪
-Tube support boxes	١٠٪ (min. one number)

٤) Number of Air-fin Coolers Using Part. ١ ٢ ٣ ٤ ٥ ٦ ٧ or more

(i) V-Belts-Sheaves (Driven & Driver) ٠ ٠ ٠ ٠ ٠ ٠ ١

- Set of Belts ١ ٢ ٣ ٤ ٥ ٦ ١٠٠٪

(ii) Fan Shaft Bearing (Upper & Lower) ١ ١ ١ ٢ ٢ ٣ ٥٠٪ of No of Air Fins

(iii) Speed Reducers (Gear Box) Shaft

and pinion

- Bearing Set ۱ ۱ ۱ ۲ ۲ ۳ ۵۰٪ of No of Air Fins
- O-Rings, Seals, Lock-washers, Locknuts

(iv) Couplings – Complete Coupling,

-Flanges, Gaskets, Seals ۱ ۱ ۱ ۱ ۱ ۱ ۱

(v) Fan Assemblies ۱ ۲ ۳ ٤ ٥ ٦ ۱۰۰٪ of No of Air Fins

-Automatic Pitch Control

-Hub Assembly Parts Guide Bushing,

-Pithc Blocks, O-Rings, Clam Gaskets

(vi) Bolt Assembles, Fork, Pins ۱ ۲ ۳ ٤ ٥ ٦ ۱۰۰٪ of No of Air Fins

(vii) Flexible Hose, Rotary Union ۱ ۱ ۱ ۱ ۱ ۱ ۲

(viii) Automatic or Manual Adjustments:

- Blade Retention Clamps, Pitch, ۱ ۱ ۱ ۲ ۲ ۲ ۳۰٪ of No of Air Fins

Change Forks, Puch Rod, Stub,(with pilot tubes),Bearing Retainer Rings

(ix) Spring Housing Gasket, Diaphragm, Blade Retainer Ring, Thrust cover Gasket ۱ ۱ ۱ ۱ ۲ ۲ ۲۰٪ of No of Air Fins

(x) Hub Assembly with Blades ۰ ۰ ۰ ۰ ۰ ۰ ۱ (b)

(*) NOTES

(a) Quantities shown are for each size and type of part

(b) Twenty units or more

(c) The parts listed are the principal parts only. Other parts shall be considered for recommendation in quantities consistent with the above table.

٥) Plate type Exchangers

Plat gasket	١٠٠٪
Flow Plate	١٠٪
Nozzle Gasket	٢٠٠٪
Glue (١ Kg. Pot)	١
Special spanner tool	١ for each size/type

TABLE ٥

SPARE PARTS FOR PIPING

Item	Quantities
Valves up to ١ ½”	٥٪ for each size, type and material complete units
Valves from ٢” to ٦”	٢٪ (minimum ٢ pieces) for each size , type and material
Valves above ٦” to ١٠”	١ piece for each size, type and material complete units
Valves above ١٠”	١ only if installed valves quantity is more than ٣٠
Valves up to ١٠” Gland packing and bonnet gasket	١٠٪
Valves from ٢” to ١٠	٢ for each type , size and material set of changeable inner parts
Valves above ١٠”	١ for each type, size and material
Set interchangeable inner parts: bonnet gasket and stem packing	
Piping gaskets and bolts set for each size and type	١٠٪

ATTACHMENT ٣

GUIDELINES FOR THE COMPILATION OF SPARE PARTS INTERCHANGEABILITY RECORD (SPIR)

The manufacturer/supplier shall complete the following parts of th SPIR form as per listed sequence and in the English language:

Line ١: PLANT registration/item number or tag number of equipment/instruments, etc. as stated on requisitions and/or Purchase Orders.

Line ٢: Mode, type or other identification of eqipment/instruments, etc. ordered.

Line ٣: Serial number of each equipment/instruments, etc. ordered.

Line ٦: Purchase Order number reference of equipment/instruments, etc.

Line ٦a: Unit of measure, i.e. No., set, pair, kg,roll, etc.

Line ٤: Number of identical equipment, etc. of particular model or type being supplied against Purchase Order number mentioned under line ٦.

Line ٨: Parts description of all component parts considered by supplier as being required for maintenance of equipment, etc. listed in lines ١, ٢ and ٣. However, all items specified in the appropriate equipment list shall be shown separately.

Col. ٩: Drawing number/part number as per supplier's parts list or drawing.

Col. ١٠: Part identification number shoeing interchangeability within equipment manufacturer's organization.

Note: Identical parts, regardless of whether they have the same part number or drawing number, should be shown only once (see also line ٥).

Col.١١: Material specification of parts listed in column ٨.

Line ٥: Enter in appropriate sqare the nuber of parts (listed in column) fitted in each applicable unit. For groups of identical units, denote quantity per unit below quantity shown in line ٤.

Col. ٧: Total number of identical parts listed in colimn ٨ for all equipment, etc. For identical units multiply quantity in line ٥ by number in same column in line ٤ and enter overall total of each line in column ٧.

Col.۱۲: Total spar parts recommended for ۲ years operation and commissioning period.

Col.۱۸: Unit price (up to two decimals) for recommended spare parts of column ۱۲.

Col.۲۰: Original identification number for all items of third party manufacture (bought-out items) such as : ball/-roller bearings, mechanical seals, coplings, bearing lock nuts, bearing lock washers, V-bels, bolts/nuts, gaskets, O-rings, and the like. These items should be fully identified by manufacturers' numbers, types, sizes, etc.

V – for: Vital equipment, a breakdown of which would mean an immediate and serious interruption of vital operations in field or plant and with which no risk in the ordering and stocking of spare parts can be justified.

E – for: Essential equipment, engaged in primary operations, but with which a calculated risk can be taken in ordering and stocking of spare parts.

A – for: Auxiliary, general purpose and stand-by equipment, for secondary operations, the temporary lack of spare parts would not have a serious effect.
Under this heading also comes the equipment of which there is a large number of units in used, thus ensuring a sufficient degree of protection in case of failure of one or more units.

<u>The Owner MESC project team should complete the following part of the SPIR form</u>

Col.۱۶: For allocation of the final MESC number.

Col.۱۷: For the classification of spare parts, i.e.:

C – for: Parts wearing out or deteriorating during normal operations,thus shown a fairly regular consumption.

Q - for: Parts not normal stocked, but ordered on request only.

I - for: Insurance items.

O - for: Temporary code number.

THE VENDOR SHALL COMPLETE THE FOLLOWING PART OF THE SPIR FORM:

Col.۱۳: VENDOR'S recommended spare parts for ۲ years operation.

Col.۱٤: VENDOR'S recommended spare parts for the precommissioning, commissioning and start-up period.

Col.۲۲: This column has to be filled out for the respective parts purchase order-item reference. This number should be tagged to the respective material fro easy identification upon receipt at site.

Col.۱۹: Total price (up to ۲ decimals) of the spare parts for ۲ years operation and the commissionng period based upon the quantities approved by the OWNER'S Project Engineer (see column ۱٥)

NOTE: Columns ۱٥, ۱۷ and ۲۱ should be left blank, these are for OWNER's use.

THE OWNER'S PROJECT ENGINEER SHOULD COMPLETE THE FOLLOWING PART OF SPIR FORM:

Col.۱٥: Final quantity to be ordered and Approved by the OWNER's Project Engineer.

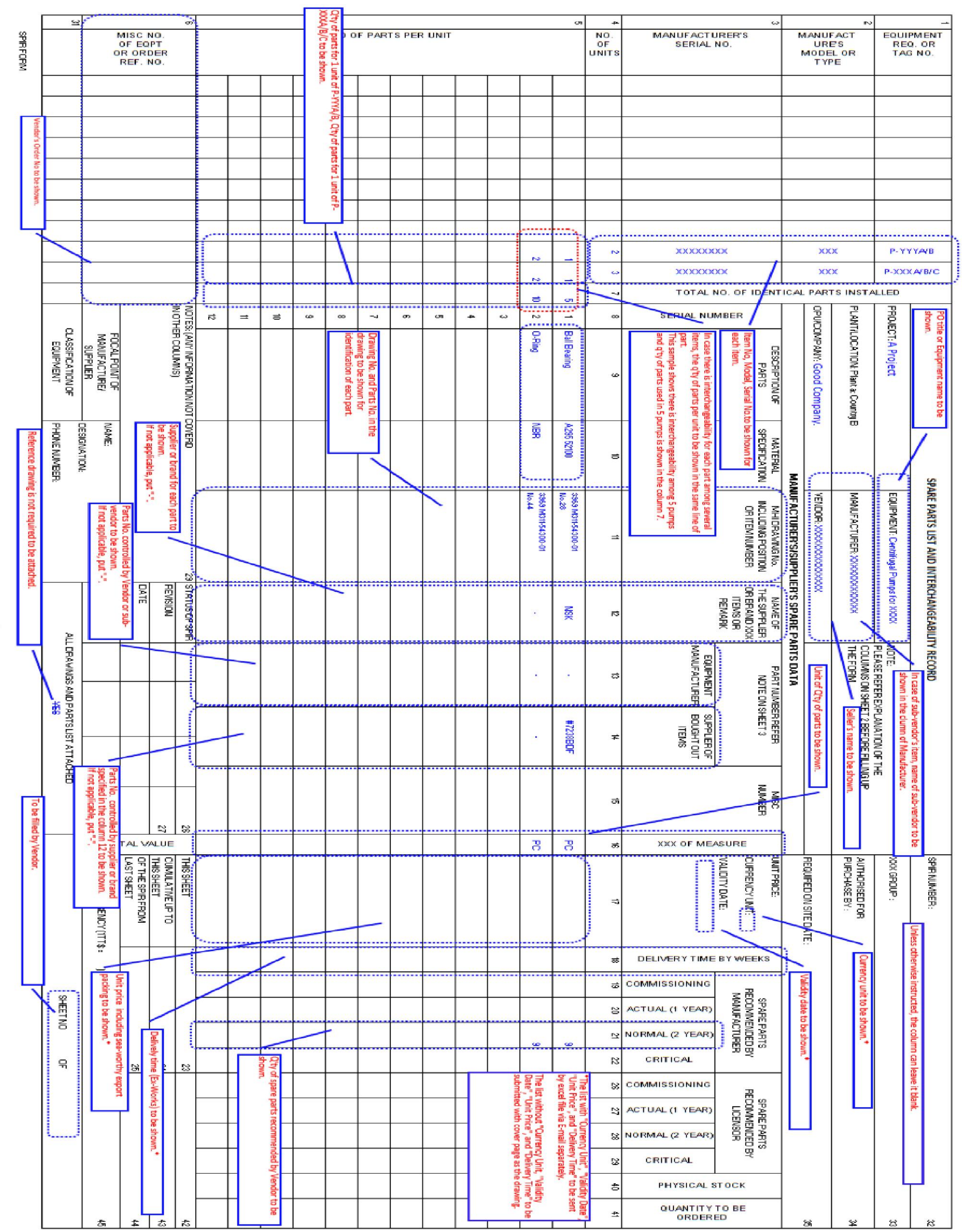
Col.۲۱: This column has to be used to indicate the equipment classe, i.e.

IMPORTANT NOTE:

The necessary provisions shall be made to fix the prices of spare parts for all equipment and materials for future purchasig of the spare parts by OWNER more than which shall be purchased by VENDOR for two years operations of the PLANT all EQUIPMENT AND MATERIALS for future purchasing of the spare

ATTACHMENT ٤

SPIR Form:


SPARE PARTS LIST AND INTERCHANGEABILITY RECORD
PROJECT: A Project
EQUIPMENT: Centrifugal Pumps for XXXX
PLANT/LOCATION: Plant a: Country B
MANUFACTURER: XXXXXXXXXXXX
OPU/COMPANY: Good Company.
VENDOR: XXXXXXXXXXXXXX
NOTE: PLEASE REFER EXPLANATION OF THE COLUMNS ON SHEET 2 BEFORE FILLING UP THE FORM.
SPIR NUMBER:
XXX GROUP:
AUTHORISED FOR PURCHASE BY:
REQUIRED ON SITE DATE:
MANUFACTURER'S/SUPPLIER'S SPARE PARTS DATA
EQUIPMENT REQ. OR TAG NO.
MANUFACTURE'S MODEL OR TYPE
MANUFACTURER'S SERIAL NO.
NO. OF UNITS
Q'TY OF PARTS PER UNIT
TOTAL NO. OF IDENTICAL PARTS INSTALLED
SERIAL NUMBER
DESCRIPTION OF PARTS
MATERIAL SPECIFICATION
MHI DRAWING No. INCLUDING POSITION OR ITEM NUMBER
NAME OF THE SUPPLIER OR BRAND XXX ITEMS OR REMARK
PART NUMBER REFER NOTE ON SHEET 3
EQUIPMENT MANUFACTURER
SUPPLIER OF BOUGHT OUT ITEMS
MISC NUMBER
XXX OF MEASURE
UNIT PRICE:
CURRENCY UNIT:
VALIDITY DATE:
DELIVERY TIME BY WEEKS
SPARE PARTS RECOMMENDED BY MANUFACTURER
SPARE PARTS RECOMMENDED BY LICENSOR
COMMISSIONING
ACTUAL (1 YEAR)
NORMAL (2 YEAR)
CRITICAL
PHYSICAL STOCK
QUANTITY TO BE ORDERED
P-YYYA/B
P-XXXA/B/C
XXX
XXXXXXXX
Ball Bearing
A295 52100
3969 M311-54300-01 No.28
NSK
#7238BDF
PC
O-Ring
NBR
3969 M311-54300-01 No.44
MISC NO. OF EQPT OR ORDER REF. NO.
NOTES: (ANY INFORMATION NOT COVERD IN OTHER COLUMNS)
FOCAL POINT OF MANUFACTURE/ SUPPLIER
NAME:
DESIGNATION:
PHONE NUMBER:
CLASSIFICATION OF EQUIPMENT
STATUS OF SPIR
REVISION
DATE
ALL DRAWINGS AND PARTS LIST ATTACHED
YES
TOTAL VALUE
THIS SHEET
CUMULATIVE UP TO THIS SHEET
OF THE SPIR FROM LAST SHEET
CURRENCY (ITT$):
SHEET NO OF
SPIR FORM
PO title or Equipment name to be shown.
In case of sub-vendor's item, name of sub-vendor to be shown in the clumn of Manufacturer.
Seller's name to be shown.
Unit of Q'ty of parts to be shown.
Unless otherwise instructed, the column can leave it blank.
Currency unit to be shown.*
Validity date to be shown.*
Item No, Model, Serial No.to be shown for each item.
In case there is interchangeability for each part among several items, the q'ty of parts per unit to be shown in the same line of part.
This sample shows there is interchangeability among 5 pumps and q'ty of parts used in 5 pumps is shown in the column 7.
Drawing No. and Parts No. in the drawing to be shown for identification of each part.
Q'ty of parts for 1 unit of P-YYYA/B, Q'ty of parts for 1 unit of P-XXXA/B/C to be shown.
"The list with "Currency Unit", "Validity Date", "Unit Price", and "Delivery Time" to be sent by excel file via E-mail separately.
The list without "Currency Unit, "Validity Date", "Unit Price", and "Delivery Time" to be submitted with cover page as the drawing.
Q'ty of spare parts recommended by Vendor to be shown.
Supplier or brand for each part to be shown. If not applicable, put "-".
Parts No. controlled by Vendor or sub-vendor to be shown. If not applicable, put "-".
Parts No. controlled by supplier or brand specified in the column 12 to be shown. If not applicable, put "-".
Delivery time (Ex-Works) to be shown.*
Unit price including sea-worthy export packing to be shown.*
Vendor's Order No to be shown.
Reference drawing is not required to be attached.
To be filled by Vendor.