

ENGINEERING STANDARD

FOR

PLANT TECHNICAL AND EQUIPMENT MANUALS

(ENGINEERING DOSSIERS)

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0. INTRODUCTION

The Standard Practice Manuals titled as "Fundamental Requirements for the Project Design and Engineering" is intended for convenience of use and pattern of follow-up and also a guidance.

These Standard Engineering Practice Manuals, also indicate the check points to be considered by the process engineers for assurance of fulfillment of prerequisites at any stage in the implementation of process plant projects.

It Should be noted that these Iranian Petroleum Standards (IPS), as Practice Manuals do not profess to cover all stages involved in every process project, but they reflect the stages that exist in general in process projects of oil, gas and petrochemical industries of Iran.

These preparation stages describe the following three main phases which can be distinguished in every project and include, but not be limited to:

- Phase I)** : Feasibility Studies, Process Evaluation and the Basic Design Stages (Containing Six Standards).
- Phase II)** : Detailed Design, Engineering and Procurement Stages (Containing Three Standards).
- Phase III)** : Start-Up Sequence and General Commissioning Procedures (Containing Two Standards).

The Process Engineering Standards of this group include the following 11 Standards:

STANDARD CODE	STANDARD TITLE
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I) Manuals of Phase I (Numbers 1-6)

IPS-E-PR-150	"Basic Design Package and Recommended Practice for Feasibility Studies"
IPS-E-PR-170	"Process Flow Diagram"
IPS-E-PR-190	"Layout and Spacing"
IPS-E-PR-200	"Basic Engineering Design Data"
IPS-E-PR-230	"Piping & Instrumentation Diagrams (P & IDs)"
IPS-E-PR-250	"Performance Guarantee"

II) Manuals of Phase II (Numbers 7-9)

IPS-E-PR-260	"Detailed Design, Engineering and Procurement"
IPS-E-PR-300	"Plant Technical and Equipment Manuals (Engineering Dossiers)"
IPS-E-PR-308	"Numbering System"

III) Manuals of phase III (Numbers 10-11)

IPS-E-PR-280	"Start-Up Sequence and General Commissioning Procedures"
IPS-E-PR-290	"Plant Operating Manuals"

This Engineering Standard Specification covers:

"PLANT TECHNICAL AND EQUIPMENT MANUALS (ENGINEERING DOSSIERS)"

1. SCOPE

This Engineering Standard Specification covers the minimum requirements of format and essential instructions for preparation of "Plant Technical and Equipment Manuals (Engineering Dossiers)" in OGP industries.

The purpose of this Manual is also to standardize the content and format of the plant technical and equipment manuals which shall be prepared by the Contractor. Although the manuals differ to some extent from process to process, the basic philosophy and general aspects shall conform to the concepts of this Standard.

2. REFERENCES

Throughout this Standard the following standards and codes are referred to. The editions of these standards and codes that are in effect at the time of publication of this Standard shall, to the extent specified herein, form a part of this Standard. The applicability of changes in standards and codes that occur after the date of this Standard shall be mutually agreed upon by the Company and the Vendor/Consultant.

IPS (IRANIAN PETROLEUM STANDARDS)

IPS-E-PR-200	"Basic Engineering Design Data"
IPS-E-PR-308	"Numbering System"

3. DEFINITIONS AND TERMINOLOGY

Company or Employer/Owner

Refers to one of the related affiliated companies of the petroleum industries of Iran such as National Iranian Oil Company (NIOC), National Iranian Gas Company (NIGC), National Petrochemical Company (NPC), etc., as parts of the Ministry of Petroleum.

Contractor

Refers to the persons, Firm or Company whose tender has been accepted by the "Employer", and includes the Contractor's personnel representative, successors and permitted assigns.

Project

Refers to the equipment, machinery and materials to be procured by the "Contractor" and the works and/or all activities to be performed and rendered by the "Contractor" in accordance with the terms and conditions of the contract documents.

Unit or Units

Refers to one or all process, offsite and/or utility Units and facilities as applicable to form a complete operable Refinery/And or Plant.

4. SYMBOLS AND ABBREVIATIONS

BEDD	Basic Engineering Design Data.
CDU	Crude Distillation Unit.
CS	Carbon Steel.

DCS	Distributed Control System.
HCU	Hydro-Cracker Unit.
HVAC & R	Heating, Ventilation, Air Conditioning, Cooling and Refrigeration.
IPS	Iranian Petroleum Standards.
PO	Purchase Order.
VDU	Vacuum Distillation Unit.
VOL	Volume.

5. UNITS

This Standard is based on International System of Units (SI), except where otherwise specified.

6. FORMAT

6.1 General

Separate Plant technical manuals shall be prepared for each process and/or utility Unit. All subjects common to the Refinery/Plant process and/or utility Units shall be presented in separate plant technical manuals under Unit number "00".

The common subjects covered in the manuals of Unit "00" shall not be repeated in the individual manuals of each Unit.

Plant equipment manuals shall be prepared in accordance with the equipment categories and Vendor information throughout the refinery/plant.

6.2 Covers and Size

The format of the manuals shall essentially conform to the following requirements:

6.2.1 Size of covers:

225 mm (width) × 300 mm (length), bound on 300 mm side.

6.2.2 Size and type of bottom covers:

a) Size

Free thickness, up to 70 mm maximum.

b) Type

Integral types with covers.

6.2.3 Color of front and bottom covers:

Dark blue without window.

6.2.4 Color of title on front and bottom covers:

Golden.

6.2.5 Form of title character:

Helvetica light.

6.2.6 Printing of character:

Leafstamping.

6.2.7 Size of papers shall be A4 size (210 mm × 297 mm).**6.3 Titles****6.3.1** The manuals shall be named as follows where applicable:

- Plant Technical Manual, or;
- Plant Equipment Manual (Engineering Dossiers).

6.3.2 The titles on the front cover shall include the following phrases or requirements in order of precedence:

- a)** Islamic Republic of Iran.
- b)** Ministry of Petroleum.
- c)** Company's emblem.
- d)** Company's name (e.g., National Iranian Oil Company).
- e)** Name of Company relevant Organization, (if any), (e.g., Refineries Engineering and Construction).
- f)** Name of Refinery or plant.
- g)** Plant Technical Manual, or;
Plant Equipment Manual (Engineering Dossiers).
- h)** Unit number and name (only for plant technical manuals).
- i)** Equipment category (see 6.3.4 below) for plant equipment manuals only.
- j)** Volume number.
- k)** Date; (it shall be referred to the month and year of the plant commissioning date).
- l)** Contractor's name and logo.

6.3.3 The titles on the bottom cover shall include all requirements as outlined in 6.3.2 above.**6.3.4** Equipment category in order of precedence shall be as follows:

- General (including basic design data, drawing's index, overall Refinery/Plant block flow diagrams and utilities consumption tables and all general items common to all Units throughout the refinery/plant).
- Civil (including all civil works such as excavation and grading, concrete and structure).
- Buildings.
- Tanks.
- Field fabricated vessels, towers and reactors.
- Shop fabricated vessels, towers and reactors.
- Fired heaters and boilers.
- Heat exchanging equipment including air and water coolers, process/process heat exchangers, reboilers, chillers, condensers, tank heaters and heating/cooling coils.
- Compressors and power generators.
- Pumps, drivers and turbines.
- Filtration units.
- Mixers.

- Dryers.
- Refrigeration units.
- Material handling equipment.
- Miscellaneous equipment including package Units, filters, silencers, desuperheaters, etc.
- Instrumentation and control system.
- Electrical.
- Piping and miscellaneous piping components.
- Insulation and protective coatings.
- Miscellaneous items.

6.4 Dividers

Dividers should be provided to separate each chapter or section with appropriate designations of the concerned subject.

6.5 Size of Drawings

Drawings larger than A4 size which are supposed to be inserted in the manuals shall preferably be reduced size with 297 mm from top to bottom for folding in one direction only. The reduced drawings must be of sufficiently high quality to maintain legibility.

7. CONTENTS OF THE MANUALS

7.1 Plant Technical Manuals

7.1.1 In order to standardize the quality of the manuals, the contents shall include but not be limited to the following information:

- Utility summary tables based on operation and design conditions for the alternate operations, and utility balance drawings.
- Basic Engineering Design Data (BEDD); reference should be made to IPS-E-PR-200 for format of BEDD information.
- Plant/complex block flow diagram.
- Unit process flow diagrams.
- Piping and instrumentation diagrams.
- Utilities distribution diagrams including: steam, condensate, water, power, fuel, air, nitrogen, etc.
- Plot plans and general arrangement diagrams showing location of all equipment and extent and type of structure, where required.
- Earth work such as rough-grading, surface preparation, landscaping, etc.
- Unit process description.
- Flare load summary tables.

- Power system single line diagrams.
- Electrical power load diagrams.
- Equipment specifications, data sheets and curves (where required) containing design information for vessels and tanks, compressors, pumps, heaters, heat exchangers (including water and air coolers, condensers, reboilers, chillers, tank heaters, etc.), motors, turbines, generators, piping, instrumentation and other miscellaneous equipment and/or devices.
- Job specifications including all project technical specifications for excavation and grading, concrete, steel structure, buildings, tanks, vessels, fired heaters, boilers, heat exchanging equipment, compressors and generators, pumps and turbines, motors, mixers, miscellaneous equipment (such as filters, silencers, desuperheaters, etc.), electrical, instrumentation and control system, piping, insulation, painting, welding, inspection, etc.
- Analyzers specification and data sheets.
- Electrical hazardous area classification.
- Pipeline lists and line schedules for all piping including piping specialty items.
- Fire fighting facilities drawings and data sheets.
- Pump and compressor performance curves stamped by the Manufacturer including head, capacity, efficiency, net positive suction head and brake horse power in kilowatts (kW). The curves shall include the information for the diameter of the impeller furnished and the maximum size impeller that can be used.
- Index of Contractor's drawings.
- Index of Manufacturer's drawings.
- Lubricating oil schedule and specification.

7.1.2 All general data/specifications applicable to all Units throughout the refinery/complex shall be presented as common technical information in the separate volumes apart from the individual items for each Unit. The common subjects shall not be repeated in the manuals prepared for each individual process, offsite or utility Unit.

7.1.3 A typical contents of plant technical manual for Unit "00" : common and Unit "01": "crude and vacuum Unit" of a refinery has been presented in Sections A.1 and A.2 of Appendix A. Some of the items specified in Appendix A may be modified and/or changed depending upon the particular process or utility Unit.

7.2 Plant Equipment Manuals

7.2.1 Plant equipment manuals shall contain all specifications, data sheets, drawings and equipment operation, maintenance and safety instructions and all other engineering documents necessary for safe operation of the equipment produced by the equipment Manufacturer.

7.2.2 The manuals shall contain all engineering documents prepared by the manufacturers/vendors in accordance with the equipment purchase order numbers. For equipment purchase order numbers reference should be made to IPS-E-PR-308, "Numbering System".

7.2.3 A general index should be provided for all plant equipment manuals containing of purchase order number, description, Vendor or manufacturer name and volume number. (For typical general index see Appendix B).

7.2.4 Contents of the manuals shall include the subjects according to the following categories in order of precedence:

- Civil including structure, concrete and buildings.
- Tanks.
- Vessels, towers and reactors (including all vessel internals such as trays, packings, etc.).

- Fired heaters and boilers.
- Heat exchangers (including water and air coolers, chillers, reboilers, condensers, tank heaters, coils, etc.).
- Compressors and power generators.
- Pumps drivers and turbines.
- Filtration units.
- Mixers.
- Dryers.
- Refrigeration units
- Package equipment.
- Other miscellaneous equipment (if any).
- Instrumentation.
- Control system.
- Electrical.
- Piping and miscellaneous piping items.
- Insulation.

8. TIMING

Plant equipment and plant technical manuals shall be furnished by the Contractor to the employer/Company before the works are taken over. The manuals should be provided together with drawings (other than shop drawings) of the project as completed, in sufficient detail to enable the Company to operate, maintain, dismantle, reassemble and adjust all parts of the works. The project shall not be considered as completed for the purpose of taking over under the conditions as required in the contract for test and acceptance until such requirements are follows:

- a)** At least ninety (90) days before commencement of performance test, the Contractor shall prepare in draft and deliver to the Company for approval two copies of complete plant technical manuals and two copies of plant equipment manuals.
- b)** The Contractor shall carry out all corrections, amendments and additions to such manuals as may be instructed by the Company. Within 15 days after the Company's approval, the Contractor shall deliver to the Company, the required numbers of copies of approved plant technical and plant equipment manuals.

APPENDICES

APPENDIX A
 PLANT TECHNICAL MANUAL INDEX OF COMMON (TYPICAL) AND
 INDEX OF UNIT (TYPICAL)

SHEET 1 OF 4

A.1 PLANT TECHNICAL MANUAL, INDEX OF COMMON (TYPICAL)

A.1.1 UNIT "00": COMMON		<u>VOL No.</u>
SECTION 1.	CONTRACTOR'S DOCUMENT LIST	I
SECTION 2.	GENERAL	II
2.1	OVERALL UTILITY SUMMARY	II
2.2	BASIC ENGINEERING DESIGN DATA	II
2.3	REFINERY BLOCK FLOW DIAGRAM	II
2.4	GENERAL PLOT PLANT	II
2.5	EARTH WORK	II
2.6	OVERALL SEWER DIAGRAM	II
2.7	KEY SINGLE LINE DIAGRAM	II
2.8	SINGLE LINE DIAGRAM FOR TELECOMMUNICATION SYSTEMS	II
2.9	FIRE FIGHTING FACILITIES	II
	- DRAWINGS	II
	- DATA SHEETS	II
SECTION 3.	JOB SPECIFICATIONS	III
3.1	EXCAVATION AND GRADING	III
3.2	CONCRETE/UNDERGROUND FACILITIES	III
3.3	STEEL STRUCTURE	III
3.4	BUILDING	III
3.5	MACHINERY AND EQUIPMENT GENERAL	III
3.6	VESSEL	III
3.7	COMPRESSOR AND GENERATOR	III
3.8	HEAT EXCHANGER	IV
3.9	FIRED HEATER/BOILER	IV
3.10	PUMP	IV

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APPENDIX A (continued)

SHEET 2 OF 4

		<u>VOL No.</u>
3.11	MATERIAL PROCESSING EQUIPMENT	IV
3.12	MATERIAL HANDLING EQUIPMENT	IV
3.13	MISCELLANEOUS EQUIPMENT	IV
3.14	PIPING	V
3.15	ELECTRICAL	VI
3.16	INSTRUMENTATION	VI
3.17	INSULATION AND PROTECTIVE COATING	VII
3.18	WELDING, INSPECTION AND UNCLASSIFIED	VII

A.2 PLANT TECHNICAL MANUAL, INDEX OF UNIT (TYPICAL)

A.2.1 UNIT "01": CRUDE/VACUUM UNIT

SECTION 1.	PROCESS DESCRIPTION	VIII
SECTION 2.	EQUIPMENT INDEX	VIII
SECTION 3.	GENERAL	VIII
3.1	UTILITY SUMMARY	VIII
	CHEMICAL LIST	VIII
	FLARE LOAD SUMMARY	VIII
3.2	PROCESS FLOW DIAGRAM	VIII
3.3	PIPING AND INSTRUMENTATION DIAGRAM	VIII-IX
3.4	UTILITY FLOW DIAGRAMS	IX
3.5	PLOT PLANT	IX
3.6	AREA CLASSIFICATION	IX
SECTION 4.	LUBRICATION SCHEDULE	IX

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APPENDIX A (continued)

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VOL. No.

SECTION 5.	CONCRETE/UNDERGROUND FACILITIES	IX
5.1	SPECIFICATIONS (SEE COMMON PART VOL III)	
5.2	UNDERGROUND LAYOUT DRAWINGS	IX
SECTION 6.	STEEL STRUCTURES AND BUILDINGS	
6.1	SPECIFICATIONS (SEE COMMON PART VOL III)	
6.2	BUILDINGS (ARCHITECTURAL DRAWINGS)	IX
6.3	MAIN STRUCTURE (SINGLE LINE DRAWING)	IX
SECTION 7.	VESSEL/TANK/TRAY	IX
7.1	SPECIFICATIONS (SEE COMMON PART VOL III)	
7.2	VESSEL SCHEDULE	IX
SECTION 8.	HEAT EXCHANGER/AIR COOLER	
8.1	SPECIFICATIONS (SEE COMMON PART VOL IV)	
8.2	INDEX	IX
8.3	DATA SHEETS	IX
SECTION 9.	FIRED HEATER/BOILER	
9.1	SPECIFICATIONS (SEE COMMON PART VOL IV)	
9.2	DATA SHEETS AND CURVES	X
SECTION 10.	GENERATOR/COMPRESSOR/PUMP/TURBINE/MIXER	X
10.1	SPECIFICATIONS (SEE COMMON PART VOL III, IV)	
10.2	INDEX	X
10.3	DATA SHEETS AND CURVES	X
SECTION 11.	PACKAGE EQUIPMENT	X
11.1	SPECIFICATIONS (SEE COMMON PART VOL IV)	
11.2	INDEX	X
11.3	DATA SHEETS	X

(to be continued)

APPENDIX A (continued)

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		<u>VOL No.</u>
SECTION	12. INSTRUMENTATIONS	X
	12.1 SPECIFICATIONS (SEE COMMON PART VOL VII)	
	12.2 INSTRUMENTATION LIST AND RELIEF VALVE LIST	X
	12.3 DATA SHEETS	X
SECTION	13. ELECTRICALS	X
	13.1 SPECIFICATIONS (SEE COMMON PART VOL VI)	
	13.2 ELECTRICAL POWER LOAD SUMMARY, SINGLE LINE DIAGRAMS AND SUBSTATION EQUIPMENT DATA SHEETS ARE INCLUDED IN UNIT "21"	
SECTION	14. PIPING	X
	14.1 SPECIFICATIONS (SEE COMMON PART VOL V)	
	14.2 LINE INDEX	X
	14.3 SPECIALTY ITEMS CATEGORY LIST	X
	14.4 DATA SHEETS	X
SECTION	15. MISCELLANEOUS	X
	15.1 SPECIFICATIONS (SEE COMMON PART VOL IV)	
	15.2 DATA SHEETS AND CURVES	X

**APPENDIX B
PLANT EQUIPMENT MANUAL, TYPICAL GENERAL INDEX**

SHEET 1 OF 5

B.1 BUILDINGS

<u>PO NUMBER</u>	<u>DESCRIPTION</u>	<u>VENDOR NAME</u>	<u>VOL No.</u>
1753-PO-01-1004	BULK MATERIAL FOR HVAC&R SYSTEM		I ÷ XLII
1753-PO-01-1005	ABSORBTION COLD GENERATORS		XLIII
1753-PO-01-1006	WALK-IN COLD ROOM		XLIII
6000-PO-04-1096	AIR CONDITIONER FOR ANALYZER HOUSE		XLIV
6000-PO-04-1097	HVAC&R FOR BUILDING		XLIV ÷ XLVIII

B.2 TANKS

<u>PO NUMBER</u>	<u>DESCRIPTION</u>	<u>VENDOR NAME</u>	<u>VOL No.</u>
1753-PO-08-1001	SPHERES		LXXXII ÷ LXXXIII
1753-PO-08-1002	STORAGE TANKS (CDU/VDU/HCU)		LXXXIV ÷ XXXIX
6000-PO-08-1029	STORAGE TANKS		XC-XCI

B.3 VESSELS, TOWERS, REACTORS

<u>PO NUMBER</u>	<u>DESCRIPTION</u>	<u>VENDOR NAME</u>	<u>VOL No.</u>
1753-PO-07-1001	BULLETS		XLIX
1753-PO-07-1002	REACTORS		XLIX-L
1753-PO-07-1003	COLUMNS		L ÷ LIII
1753-PO-07-1004	COLUMNS & DRUMS		LIII ÷ LVIII
1753-PO-07-1007	PRESSURE VESSELS		LVIII ÷ LXII
1753-PO-07-1008	PRESSURE VESSELS		LXIII ÷ LXVI

(to be continued)

APPENDIX B (continued)

B.4 FIRED HEATERS AND BOILERS

SHEET 2 OF 5

<u>PO NUMBER</u>	<u>DESCRIPTION</u>	<u>VENDOR NAME</u>	<u>VOL No.</u>
1753-PO-05-1002	VISBREAKER HEATERS		CX-CXI
1753-PO-05-1003	PLATFORMER HEATERS		CXII-CXIII
1753-PO-05-1004	CYLINDRICAL UP DRAFT HEATER		CXIV-CXV
1753-PO-05-1005	ASPHALT PLANT INCINERATOR		CXVI
1753-PO-05-1007	ELEVATED FLARES		CXVII
6000-PO-05-1038	FIRED HEATERS FOR CRUDE & VACUUM UNIT FIRED HEATERS FOR HYDROCRACKER		CXVIII-CXXI CXXII-CXXIII

B.5 HEAT EXCHANGERS

<u>PO NUMBER</u>	<u>DESCRIPTION</u>	<u>VENDOR NAME</u>	<u>VOL No.</u>
1753-PO-06-1001	SUCTION HEATERS		
1753-PO-06-1002	SHELL AND TUBE HEAT EXCHANGERS		
1753-PO-06-1003	SHELL AND TUBE HEAT EXCHANGERS		
1753-PO-06-1004	SHELL AND TUBE HEAT EXCHANGERS		
1753-PO-06-1005	SHELL AND TUBE HEAT EXCHANGERS		
1753-PO-06-1006	DOUBLE PIPE HEAT EXCHANGERS		

B.6 COMPRESSORS AND GENERATORS

<u>PO NUMBER</u>	<u>DESCRIPTION</u>	<u>VENDOR NAME</u>	<u>VOL No.</u>
1753-PO-04-1001	CENTRIFUGAL COMPRESSORS, STEAM TURBINE AUXILIARY		
1753-PO-04-100	RECIPROCATING COMPRESSORS		
1753-PO-04-1014	ASPHALT AIR BLOWERS		
6000-PO-04-1058	HCU RECYCLE GAS COMPRESSOR		
6000-PO-04-1059	RECIPROCATING COMPRESSORS WITH DRIVER		

(to be continued)

APPENDIX B (continued)

B.7 PUMPS AND TURBINES

SHEET 3 OF 5

<u>PO NUMBER</u>	<u>DESCRIPTION</u>	<u>VENDOR NAME</u>	<u>VOL No.</u>
1753-PO-04-1002	CENTRIFUGAL PUMPS		
1753-PO-04-1003	CENTRIFUGAL PUMPS		
1753-PO-04-1004	CENTRIFUGAL PUMPS		
1753-PO-04-1007	RECIPROCATING PUMPS		
1753-PO-04-1008	ROTARY SCREW PUMPS		
1753-PO-04-1009	PROPORTIONING PUMPS		
1753-PO-04-1011	STEAM TURBINES		
1753-PO-04-1016	CENTRIFUGAL PUMPS		
1753-PO-04-1017	RECIPROCATING PUMPS		

B.8 MIXERS

<u>PO NUMBER</u>	<u>DESCRIPTION</u>	<u>VENDOR NAME</u>	<u>VOL No.</u>
1753-PO-04-1010	MIXERS		
6000-PO-04-1081	TANK MIXER		

B.9 PACKAGE EQUIPMENT

<u>PO NUMBER</u>	<u>DESCRIPTION</u>	<u>VENDOR NAME</u>	<u>VOL No.</u>
1753-PO-09-1053	MECHANICAL AERATORS		
1753-PO-09-1055	DESUPERHEATERS		
1753-PO-09-1056	VENT SILENCER		
1753-PO-09-1057	MECHANICAL HOIST		
6000-PO-04-1030	HYDROCRACKER FEEDFILTER		
6000-PO-04-1031	COALESCERS		

B.10 INSTRUMENTATION

<u>PO NUMBER</u>	<u>DESCRIPTION</u>	<u>VENDOR NAME</u>	<u>VOL No.</u>
1753-PO-02-1002	ROTAMETERS		
1753-PO-02-1004	DISPLACEMENT LEVEL INSTRUMENTS		
1753-PO-02-1005	FLOAT TYPE LEVEL SWITCHES		

(to be continued)

APPENDIX B (continued)

SHEET 4 OF 5

1753-PO-02-1006	LEVEL GAGES
1753-PO-02-1007	PRESSURE SWITCHES AND TEMPERATURE SWITCHES
1753-PO-02-1008	PRESSURE GAGE AND DIAL THERMOMETERS
1753-PO-02-1009	THERMOCOUPLES, THERMORESISTANCE AND THERMOWELLS
1753-PO-02-1010	TANK GAGING SYSTEM

B.11 DISTRIBUTED CONTROL SYSTEM (DCS)

<u>PO NUMBER</u>	<u>DESCRIPTION</u>	<u>VENDOR NAME</u>	<u>VOL No.</u>
1753-PO-02-1024	DISTRIBUTED CONTROL SYSTEM		
6000-PO-02-3001A	DISTRIBUTED CONTROL SYSTEM		
6000-PO-02-3001B	DISTRIBUTED CONTROL SYSTEM		
6000-PO-02-3002	TRANSMITTERS AND CONVERTERS		
6000-PO-02-3032	FLAME SAFETY MONITORING SYSTEM		

B.12 ELECTRICAL

<u>PO NUMBER</u>	<u>DESCRIPTION</u>	<u>VENDOR NAME</u>	<u>VOL No.</u>
1753-PO-03-1001	6 kV & 10 kV INDUCTION MOTORS		
1753-PO-03-1002	400 V INDUCTION MOTORS		
1753-PO-03-1003	6 kV SWITCHGEAR		
1753-PO-03-1004	400 V SWITCHGEAR		
1753-PO-03-1005	DISTRIBUTION TRANSFORMER		
1753-PO-03-1006	ELECTRICAL ALARM PANEL AND MARSHALLING BOXES		

(to be continued)

APPENDIX B (continued)

SHEET 5 OF 5

1753-PO-03-1007	POWER CONTROL CABLES AND ACCESSORIES
1753-PO-03-1008	CONTROL STATIONS RECEPTABLE MAIN JUNCTION BOXES AND ACCESSORIES
1753-PO-03-1009	STEEL CONDUIT
1753-PO-03-1010	CABLE LADDERS AND ACCESSORIES
1753-PO-03-1011	LIGHTING PANELS
1753-PO-03-1012	LIGHTING MATERIAL
1753-PO-03-1013	STREET LIGHTING POLES

B.13 PIPING AND MISCELLANEOUS

<u>PO NUMBER</u>	<u>DESCRIPTION</u>	<u>VENDOR NAME</u>	<u>VOL No.</u>
1753-PO-11-1033	"Y" STRAINERS		
1753-PO-11-1034	SIGHT GLASSES		
1753-PO-11-1037	STEAM TRAPS		
1753-PO-11-1038	FLAME ARRESTORS		
1753-PO-11-1044	VARIABLE AND CONSTANT SPRING		
1753-PO-11-1048	JACKETED PLUG VALVES WITH ELECTRIC ACTUATOR		
1753-PO-11-1052	CAST VALVES		
1753-PO-11-1055	FORGED VALVES		
1753-PO-11-1056	CS GATE VALVES		
1753-PO-11-1077	CAST VALVES (OFF-SITE)		
1753-PO-11-1080	CS GATE VALVES		
1753-PO-11-1085	LUBRICATED AND SLEEVELINE PLUG VALVE		
1753-PO-11-1086	CAST VALVES (ON-SITE)		
1753-PO-11-1093	FORGED VALVES (ON-SITE)		
1753-PO-11-1094	FORGED VALVES (OFF-SITE)		