

TABLE 4.1 WORKING DRAWING

	Mechanical	Electrical	Instrument and Control	Architectural and Structural
(a) Erection work specification	For mechanical work	For electrical work	For instrument and control work	For architectural and structural work
(b) Foundation drawings	Major and auxiliary equipment, etc.	Major and auxiliary equipment, Boards and panels, etc.	Control equipment and devices, etc.	<ul style="list-style-type: none"> . Temporary work . Concrete work . Steel structural work . Concrete block work . Waterproofing work . Tile work . Carpentry . Metal work . Plaster work . Doors, windows and louvers
(c) Building related drawings	Pipe sleeves (floor, ceiling, wall) foothold, grating, etc.	(the same as Mechanical)	(the same as Mechanical)	<ul style="list-style-type: none"> . Waterproofing work . Tile work . Carpentry . Metal work . Plaster work . Doors, windows and louvers
(d) Piping drawing	-	-	Instrument air	<ul style="list-style-type: none"> . Painting work . Interior finish work . Plumbing . Sewage and sanitary work
(e) Wiring cabling tubing and drawing	-	Major and auxiliary equipment, Boards and panels, etc.	Control equipment and devices Instrumentation, etc.	<ul style="list-style-type: none"> . Ventilating and air-conditioning work . Electrical work for building service facilities . Elevator work, etc.
(f) Installation procedure	Major and auxiliary equipment, etc.	Major and auxiliary equipment, etc.	-	
(g) Setting up drawing (Mounting)	-	For the same item (f) as above	Control equipment and devices, instruments	
(h) Wiring/Tubing connection drawing	-	Electrical equipment and devices, Boards panels, etc.	Control equipment and devices, instruments etc.	
(i) Others	Drawings requested by the Owner and Engineer			

TABLE 4.1 DESIGN DRAWINGS AND DATA SHEETS

	<u>Mechanical</u>	<u>Electrical</u>	<u>Instrumentation and Control</u>	<u>Architectural and Structural</u>
(a) Specifications	Major and auxiliary equipment (including performance curve)	Major and auxiliary equipment Boards and panels Cables and wires	Control equipment and devices, instruments, cables, wires and tubing	
(b) Arrangement drawings	Plan of floors, sections Footholding and grating Foundation load Indoor and Outdoor equipment arrangement, etc.	(the same as Mechanical)	Instrument and panel arrangement, etc.	<u>General</u> <ul style="list-style-type: none"> . Plan of floors, . Sections . Detailed drawings of the above
(c) Diagram	Flow diagrams Main and reheat steam and water, cooling water, fuel oil, auxiliary steam, plant water, service and instrument air, combustion air and flue gas, turbine oil, heat balance drain and vent, etc. turbine control mechanism, etc.	Main and auxiliary, one line diagram Plant interlock Phase diagram, etc.	Boiler and turbine control, local controls, Major and auxiliary equipment interlock Instrument connection Computer system diagram, etc.	<u>Structure and Foundation</u> <ul style="list-style-type: none"> . Pile arrangement . Foundation plans . Foundation sections . Framing plans . Structural elevations . Detail of steel structure and concrete reinforcement . Beam and column schedule for steel structure and concrete reinforcement . Miscellaneous details . Machinery foundations
(d) Lists	Design conditions, piping, piping support, valves, insulation, auxiliary equipment manufacturers names, shop and field test items, etc.	Motors, relays, auxiliary equipment and devices manufacturers names, shop and field test items, etc.	Control equipment and devices, instrument manufacturers names, shop and field test items I/O List, output format, etc.	<u>Facility & Utility</u> <ul style="list-style-type: none"> . Arrangement . Diagram . Piping (plan and section) . Duct (plan and section) . Cabling and wiring . Construction of equipment
(e) Calculation sheets	Pressure piping and parts strength, Major piping thermal stress and movement, Auxiliary equipment capacity, Service air consumption amount, cooling and other water consumption amounts, Insulation method Correction curves, etc.	Major cable strength Short-circuit strength Major and auxiliary equipment capacity and their constants, Battery and charger capacity Correction curves, etc.	Instrument air consumption amount, Instrument electric power capacity, Control valve capacity Correction curves, etc.	
(f) Sequence	-	Plant interlock, Major and auxiliary equipment, Instrumentation, etc.	-	
(g) Test procedures (Shop and field test)	Major and auxiliary equipment (material operation, performance test, etc.)	Major and auxiliary equipment test (material, sequence operation, performance test, etc.)	Control equipment and devices test, (Logic test, combustion, load swing test, etc.)	
(h) Composition drawings	Major (steam generator, turbine) and auxiliary equipment, combustion and flue gas duct, tanks, valves, etc.	Major (generator, transformer) and auxiliary equipment Board and panels, etc.	Control equipment Control board and panels instruments Computer hardware, etc.	
(i) Assambling drawings	For the same item (h) as above	For the same item (h) as above	-	
(j) Piping tubing and cable tray drawings	Composite piping Individual piping, etc.	Tube and cable tray, etc.	-	
(k) Others	Drawings requested by the Owner and Engineer			

PA.5. INSTRUCTION BOOKS, OPERATION AND MAINTENANCE MANUALS

- (1) The Contractor shall provide twenty eight (28) sets of the instruction books, operation and maintenance manuals which are well structured, comprehensive and coordinated with all aspects of design, operation and maintenance of all equipment and systems provided under the Contract.

The submittal time of the instruction books, operation and maintenance manuals shall be twelve (12) months before the Provisional Taking Over.

Twenty-five (25) copies of the equipment and system instruction books for installation, operation and maintenance and two (2) copies of each additional document shall be furnished to the Engineer. In addition, one (1) copy of the instructions pertaining to equipment erection (the entire instruction book, if necessary) shall be packed in one of the shipping crates or boxes containing the equipment items to be shipped to the jobsite. Such packed instructions shall be suitably protected from water or oil damage by enclosing in a plastic bag and shall also be noted as one of the items on the bill of lading or packing list so that it can be easily located in the field.

- (2) The instruction books, operation and maintenance manuals shall include instruction for actual equipment supplied under the Contract, and not for alternative or optional equipment. They shall provide all necessary information for Plant, equipment and procedures.

All documents, drawings, illustrations, specifications, and instructions shall be in English.

The format shall be on standard metric A4 size sheets.

Drawings and schedules to be bound into the instruction book, operation and maintenance manuals shall also be A4 or folded to A4 size.

(3) The covers and binders to be used for the instruction books, operation and maintenance manuals shall be robust and oil-resistant. The materials, colors, titling and its lettering used shall be approved by the Owner.

(4) The Engineer will check and approve before the submission of the instruction books, operation and maintenance manuals to confirm the format and contents which shall include, but not be limited to, the materials listed below.

(a) Design Part

(i) General description of the system

o System description, including design basis, function, location and modes of operation.

o System diagrams, block diagrams showing sub-systems and connection with other systems.

(ii) Design data including performance curves, heat balance, material specifications, running clearances, settings, limitation, etc.

(iii) Instrument, valve, trap, lists itemizing function, with type, number, range, connections, etc.

(iv) Equipment list itemizing function with type, number, capacity, manufacturer, etc.

(v) Other information for design

(b) Operation Part

(i) Operating procedures, instructions for commissioning, startup, normal operation, shutdown, standby, emergency, and fault conditions, and other information such as normal range of system variables, operation limits and hazard.

(ii) Testing and checking requirements

(iii) Alarm and trip setting value list

(iv) Typical startup and shutdown curve

(v) Quality control of cycle water

(vi) Other information for operation

(c) Maintenance Part

(i) Preventive maintenance and inspection schedule for all equipment

(ii) List of name and address of liaison office for all equipment

(iii) Lubrication schedule showing requirements and specifications for all equipment

The specifications shall include the equivalent lubricants available in Pakistan.

(iv) Complete overhauling procedures and data required with associated tests and checks prior to returning equipment to service

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- (v) Assembly drawings to complement the above assembly procedures including parts list and numbers for replacement ordering
- (vi) Setting, running clearance, tolerances
- (vii) Method for troubleshooting
- (viii) Cleaning and conservation procedures
- (ix) Instrumentation calibration requirements and procedures
- (x) Lift limits for equipment and parts
- (xi) Other information for maintenance

(5) The spare parts list shall be prepared in accordance with the requirements stated in Clause 17 in the Section IV, and shall contain the following items.

- o Name of spare parts
- o Identification number
- o Manufacturer's drawing number
- o Mounted quantities and spare quantities
- o Outline sketch diagram
- o Materials
- o Required period for delivery and replacement

PA.6. TESTS AND INSPECTIONS

- (1) All tests and inspections shall be conducted strictly in accordance with available International Standards or equivalent. The Contractor shall give the Owner and the Engineer a reasonable notice (at least thirty (30) days) when

the various factory tests will be made on equipment specified herein so that the Engineer and the Owner can have their representatives present during such tests. Should the Owner or the Engineer ask the Contractor to conduct any factory tests on the equipment that are nonstandard or not specified herein, the Contractor will perform these tests, provided he has the facilities to do so. The expense of such nonstandard tests will be over and above the price as given in the Contract. Copies of certified inspection and test certifications shall be supplied within thirty (30) days following the making of all standard and nonstandard factory tests.

- (2) The Contractor shall provide the Engineer with all test reports, data, and results (including calibration curves and any necessary information to correct data) and three (3) certified copies shall be sent directly to the Owner.

All reports shall be in English.

(3) Factory Inspections and Tests

- (a) Mechanical and electrical equipment and materials may be inspected and tests witnessed the during manufacture by the Owner and/or the Engineer.
- (b) All materials, mechanical, hydraulic, and electrical tests carried out during manufacture shall be in accordance with the applicable test procedure submitted by the Contractor to the Owner and the Engineer and approved by the Engineer. The Contractor must describe in detail the degree to which

each equipment, auxiliary, or any part thereof will be assembled in the factory and the material, mechanical, hydraulic, and electrical tests to be carried out on the parts assembled.

- (c) The time and duration of visits by the Owner and the Engineer's representative shall be finalized by the Owner after the submission of the Contractor's workshop test schedule.

Inspection visits shall, as far as possible, be arranged to coincide with the performance of key activities indicated in the inspection programme.

- (d) The Contractor shall perform all workshop tests and inspections necessary to ensure that the material and workmanship conform to the Contract and design drawings, and that such tests are adequate to demonstrate that the equipment will comply with the requirements of this Specification and meet the guarantees specified.

- (i) Type, sample, and routine tests shall be to the relevant Codes and Standards, or be specifically approved for other equipment, where the test requirements are not specified in these clauses.

- (ii) With the approval of the Engineer, the Contractor may offer test results for identical equipment in lieu of the tests specified, in which case the specified tests may be waived by the Engineer. If type test results

for identical equipment are offered in lieu of the specified tests, the Contractor shall also provide evidence as to the similarity of the equipment tests and the Contract equipment.

(iii) The Contractor shall submit evidence to the Engineer that the instruments used for the testing have been calibrated at an approved testing laboratory within a period of up to six (6) months for a portable instrument and twelve (12) months for a fixed instrument.

(4) The tests to be carried out shall include, but not be limited to, the following.

The detailed information for the factory tests are specified in the related section of each equipment in the Tender Specifications.

(a) Boiler Part

Equipment	Witness by	
	Owner	Engineer
Boiler drum	0	0
Headers	-	0
Wall panels	-	0
Boiler safety valves	0	0
Automatic boiler control system (ABC)	0	0
Auto burner system (ABS)	0	0

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(b) Auxiliaries for Boiler and Others

Equipment	Witness by	
	Owner	Engineer
Forced draft fans (A, B)	0	0
Gas recirculation fan	0	0
Residual oil pumps (A, B)	-	0
Service air compressors (A, B)	-	0
Instrument air compressors (A, B)	-	0

(c) Turbine and Turbine Auxiliary

Equipment	Witness by	
	Owner	Engineer
Turbine casing (HP, IP, LP) & Turbine rotor (HP, IP, LP)	0	0
Turbine assembly (HP, IP, LP)	0	0
Turbine rotor high speed balance	0	0
Turbine major valves (MSV, CV, CRV)	-	
Boiler feed pumps (Including booster pumps)	0	0
Feed water heaters (LP-1,2,3, HP-6,7, Deaerator)	0	0
Circulating water pumps (A, B)	0	0
Condensate pumps (A, B)	0	0
Cooling water pumps (A, B)	-	0
Air extraction pumps (A, B)	-	0
Turbine lubricating oil system (MOP, AOP, TGOP, EOP, Tra. P, etc.)	0	0
Electro hydraulic governor control system (EHC)	0	0

(d) Ancillary System and Common Auxiliary

Equipment	Witness by	
	Owner	Engineer
Chlorination equipment (pump etc.)	0	0
Water treatment equipment	0	0
Yard instrument air compressor	-	0

(e) Laboratory

Equipment	Witness by	
	Owner	Engineer
Laboratory equipment	0	0
	(To be decided later)	
	0 : Witness	

(f) Plant computer

Equipment	Witness by	
	Owner	Engineer
Hardware and software	0	0
	0 : Witness	

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(g) Electrical

Equipment	Witness by	
	Owner	Engineer
Generator	0	0
Excitation control cubicle	0	0
Main transformer	0	0
Starting and auxiliary transformers	0	0
Metal clad switchgears	0	0
Power centers	(To be decided later)	
Control centers	-	0
B.T.G. Board	0	0
Emergency diesel engine/generator	-	0
SF ₆ gas circuit breakers	0	0
	0 : Witness	

(h) Full Size Inspection

Equipment	Witness by	
	Owner	Engineer
Boiler steel structure	0	0
Main powerhouse steel structure	-	0
	0 : Witness	

(i) Finished Materials Inspection

Equipment	Witness by	
	Owner	Engineer
Boiler steel structure	0	0
Air conditioning package	-	0
Main powerhouse steel structure	-	0

O : Witness

(5) The Contractor shall permit free access at all times to his manufacturing facilities, for the Owner and the Engineer for purposes of inspection and expediting.

(6) When the Contractor gives to the Owner and the Engineer notice of factory tests, he shall also submit in detail the type and extent of the tests to be made so that a decision can be made by the Owner as to whether they will witness the same or not.

PA.7. NOT APPLICABLE

PA.8. TIME SCHEDULE

Further to the requirements of Section IT, the Contractor shall, within 30 days award of Contract, submit a detailed Contract Programme, in the form of a bar chart, for the Contract Works to the Owner/Engineer for comments or approval. Copies of the approved bar chart as required by the Owner/Engineer shall be provided by the Contractor.

If required by the Owner/Engineer, a further programme shall be provided as a Critical Path Network or similar and shall show the

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interfaces between the respective phases and sections of the Contract Works. In addition, the Contractor shall prepare and submit during the Contract detailed subnetworks of certain phases of the Contract programme as required by the Owner/Engineer covering erection, testing and commissioning. The updating period shall be four weeks.

If at any time during the execution of the Contract it is found necessary to modify the approved programmes, the Contractor shall inform the Owner or the Engineer and submit modified programmes for his approval. Any approval of changes to the approved programmes shall not constitute approval of an extension to the guaranteed completion date.

PA.9. PROGRESS OF WORK AND REPORTS

PA.9.1 PROGRESS OF WORK AND REPORTS

At monthly intervals during the Contract the Contractor shall submit detailed progress reports. The reports shall show clearly and accurately the position of all activities associated with design, material procurement, manufacture, works tests, shipping, site erection, testing and commissioning with regard to the agreed Contract programme.

The design aspect of the progress report shall include a comprehensive statement on drawings, calculations, proposals and schemes submitted for approval.

The report on material procurement shall give the date and details of orders placed and indicate the delivery quoted by the

manufacturer. If any delivery has an adverse effect on the Contract programme the Contractor shall state the remedial action taken to ensure that delays do not occur.

The shipping of each order or part order shall be monitored on the progress report giving the date by which the equipment will be available for shipping, the estimated time of arrival on Site and the dates actually achieved.

The Site erection portion of the progress report shall be segregated into the main and ancillary items of civil, mechanical and electrical work and each item of work shall be monitored giving the percentage completion and the projected completion date of the work in accordance with the agreed Contract programme.

Any delay which will affect the completion, testing and commissioning dates of any items of Plant shall be detailed by the Contractor who shall state the action he is taking to effect completion to the Contract programme.

The Contractor shall submit a report in respect of the various sections of the works, the erection equipment in use or held in readiness, a return of labour and supervisory staff, and details of any matters arising which may generally affect the progress of the work.

The Contractor shall give a summary of the detailed progress report giving the position with regard to the agreed Contract programme.

The progress reports shall be set out in a format to the approval

of the Engineer, and forwarded promptly so that on receipt the the information contained therein is not more than 21 days out of date.

If during execution of the Contract the Owner considers the progress position of any section of the work to be unsatisfactory, or for any other reason relating to the Contract, he will be at liberty to convene a meeting and the Contractor's Representatives are to attend such meetings.

The Contractor's Site Office shall prepare and submit 6 copies of a weekly progress report to the Owner/Engineer's Site Office. This report shall summarize site activities and record any details where difficulties in maintaining the agreed programme are being experienced or are likely to cause subsequent delay.

The Contractor's Site Office shall also prepare and submit to the Owner/Engineer's Site Office 6 copies of a Daily Activity Report summarizing the main activities to be under taken each day, noting special activities such as hydraulic tests, alignment checks, motor rotational checks etc.

The Contractor shall be responsible for expediting the delivery of all material and equipment to be provided by him and his sub-contractors.

PA.9.2 PHOTOGRAPHS

As soon as work commences on Site the Contractor shall provide photographs of the works from positions to be selected by the Engineer. Each photographic print shall not be less than 80 mm x

120 mm and shall bear a printed description, a serial number and the date when taken.

The negatives of all photographs shall be held at the Contractor's Site Office, numbered and handed-over to the Owner at the completion of the Contract.

The Contractor shall provide a number of selected photographs for submission with each copy of the monthly progress report as required by the Owner/Engineer. The Contractor shall also provide from time to time as and when required by the Owner, further photographs of the Contract Works to record or illustrate specific events.

PA.10. SUB-CONTRACTS AND SUB-ORDERS

As soon as practicable after entering into the Contract the Contractor shall, having obtained the Owner's consent in accordance with the Conditions of Contract, enter into the sub-contracts he considers necessary for the satisfactory completion of the Contract Works. Three unpriced copies of the Contractor's sub-orders shall be supplied to the Owner.

One copy of any drawing to which the sub-order refers shall also be submitted at the request of the Engineer or with the sub-order as appropriate.

Each sub-order and drawing shall contain the following references

Karachi Electric Supply Corporation Ltd.,

West Wharf Thermal Power Station

and the instruction that the equipment is subject to inspection by the Engineer.

PA.11. DOCUMENTS, GOODS, MATERIALS, TO BE HANDED-OVER TO THE OWNER

In addition to the requirements of the corresponding Clauses of the Conditions of Contract on Provisional Taking Over, the Contractor shall obtain a signed receipt by the Engineer or the Owner for all documents, goods, materials, maintenance equipment, spare parts, instruments, required by this Specification to be handed-over to the Owner other than the permanent works erected on Site.

The receipt shall state clearly that all items have been received in a satisfactory condition as required under the Contract. The Contractor shall as required be responsible for demonstrating the satisfactory condition of all items delivered to the Owner including the repacking for storage on Site.

PA.12. CONSUMABLES

- (1) The Contractor shall furnish consumables including lubricating and hydraulic oils, chemicals and resins.

In addition, the Contractor shall furnish a complete tabulated list of all consumables required for all equipment furnished by him, keeping in mind that the Owner must purchase his consumables from Pakistan market.

The list shall include the following minimum data:

- (a) Full identifying description of each consumable alongwith applicable specifications, manufacturers' identification

numbers, make, type, viscosity, and special characteristics that may be required, such as viscosity number, flash point, fire point, purity, chemical analysis etc.

- (b) Quantity of lubricants and other consumables required initially alongwith their unit prices
- (c) Quantity of lubricants and other consumables required for one (1) year's operation

- (2) All lubricants, insulating oils and other consumables must be shipped with the equipment items where such lubricants (or insulating oils) or other consumables, are furnished as part of the Contract. If this condition is not strictly adhered to, the Contractor shall be liable to pay the difference (if any) in custom duty.

PA.13. TOOLS

Special tools are specified in some instances under the Technical Specifications. Where not specified, the Contractor shall nevertheless furnish, suitably boxed, one (1) complete set of new and unused tools including special wrenches and tools, slings, etc., which are necessary or convenient for operation, maintenance, overhauling, or complete replacement of all equipment under his supply. Complete lists of all such tools shall be submitted to the Owner soon after completion of manufacture of equipment and before its actual shipment. Shipment containers shall be suitable for permanent storage of tools by the Owner.

PA.14. SPARE PARTS

- (1) The spare parts specified in the Schedule of Prices shall be mandatory spare parts (minimum requirements) for the Owner and Tenderer's recommended spare parts shall be proposed. The Tenderer shall quote the sum and unit prices of the mandatory spare parts for the Owner listed in the Schedule of Prices, and shall indicate the quantity and unit prices of Tenderer's recommended spare parts for five (5) years in the attached forms of lists. The cost of the recommended spare parts will not be evaluated by the Owner. The lists shall be accompanied with literature and drawings of the equipment to enable the Owner to select his requirements. The Owner will decide the scope of the spare parts to be supplied under the Contract at a later date. All spare parts shall be duplicates of the original parts furnished and interchangeable therewith.

The Contractor shall guarantee that such spare parts will be available for a period of ten (10) years from the date of Provisional Taking Over.

- (2) All spare parts must be delivered to the Site in advance of the trial Operation Test. The Contractor shall ultimately prepare and deliver nine (9) copies of the final consolidated spare parts list, arranged with the unit prices and quantities.
- (3) The Contractor shall follow a system of designating and tagging each and every spare part for ease of inventory storekeeping. The final consolidated Spare Parts List shall bear such tagging

particulars as will be convenient to locate the spare part without any loss of time.

- (4) The Contractor shall organize the delivery and systematic storage of spare parts before the initial operation is required to avoid post erection difficulties and delays. Any spare part consumed by the Contractor before Provisional Taking Over shall be expeditiously replaced without cost to the Owner.
- (5) All spare parts must be prepared and protected for long term storage to preclude damage during this period. Storage requirements shall be submitted to the Owner and the Engineer.

PA.15. PRESERVATION

All equipment shall be preserved to resist deterioration due to specific climate or other possible hazards. Such preservation shall include but not be limited to all insulation, windings, etc., but not be confined to extra coatings of weather protective material, electric heaters for electrical equipment, and similar items.

PA.16. PACKING

All items supplied under this Contract shall be robustly packed for export shipment to tropical climates. The Contractor shall be entirely responsible for the safe transport and storage of all materials, and the standard of packing shall be not less than as specified below.

Each item shall be packed properly or protected for shipment and

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transport from the place of manufacture to the Site.

Tube ends and other similar open ends shall be protected against external damage and ingress of dirt and moisture during transit and while awaiting erection at Site. Flanged pipes shall have their open ends protected by adhesive tape or jointing and then be covered with a wooden blank flange adequately secured.

Lids and internal cross battens of all packing cases shall be fixed by screws and not nails.

Hoop metal bindings of cases shall be sealed where ends meet, and if not of rustproof material they shall be painted.

Where parts are required to be bolted to the sides of the cases, large washers shall be used to distribute the pressure and the timber shall be strengthened by means of a pad.

Woodwool shall be avoided as far as possible for packing purposes.

Waterproof paper and felt linings shall overlap at least 13 mm and the seams shall be secured together in an approved manner, but the enclosure shall be provided with screened openings to obtain ventilation.

Where practicable, all indoor items such as electric motors, switch and control gear, instruments and panels, matching components, etc. shall be cocooned or covered in polyethene sheeting, sealed at the joints and the enclosures provided internally with an approved desiccant.

In the case of ball or roller bearings installed in any item of

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plant, the Contractor shall include and ship with the plant, one complete set of spare bearings. If replacement of any bearing is required due to either damage during shipment or other causes during the maintenance period, the spare bearings shall be used to replace the faulty ones and the Contractor shall replace those used, free of charge, so that at the date of Provisional Taking-Over the plant is in full running order and a full set of spare bearings is available.

The Engineer/Owner may require to inspect and approve the packing before the items are despatched. The Contractor shall be entirely responsible for ensuring that the packing is suitable for transit and such inspection will not exonerate the Contractor from any loss or damage due to faulty packing.

PA.17. SAFETY

(1) ENSURING SAFETY

The Contractor shall continuously take special care to ensure the safety and prevention of human and equipment accidents and maintain good sanitary conditions on and around the Site in accordance with the Labor Standards Law.

(2) CONTRACTOR'S SAFETY ENGINEER

(a) The Contractor shall appoint a safety engineer for accident prevention, who shall work together with the Owner's safety engineer.

The Contractor shall submit in writing in the specified form the names and personal histories of the safety engineer and

his staff in charge of accident prevention to the Owner/ Engineer prior to the commencement of the execution of Works, and this shall be approved by the Owner/Engineer.

- (b) The Contractor's safety engineer for accident prevention shall be constantly on the Works, and shall plan and conduct proper measures to prevent accident throughout the entire Works area in conformity with the provisions specified in the Specifications.
- (c) Whenever the Contractor's safety engineer for accident prevention is off the Site on temporary leave or for other reasons, the Contractor shall assign a deputy and report this matter to the Owner/Engineer in advance, and this matter shall be approved by the Owner/Engineer.
- (d) The Contractor's safety engineer for accident prevention shall wear the safety engineer mark on the Site for easy identification.

(3) SAFETY FACILITIES

The Contractor shall install the following facilities in order to ensure the safety of the structures installed by the Owner on, in and around the Site.

- (a) The Contractor shall install the facilities necessary to keep safe the structures of the Owner or the third party when the Works are executed in the vicinity of these structures.
- (b) Walkways on the Site, such as catwalks, ladders and temporary bridges, shall be protected and shall be equipped with safety provisions for workers and materials.
- (c) Slope protection works, nets, hole covers, fences and other

protection works shall be installed at excavated areas and other places where an accident may occur.

(d) The Contractor shall in connection with the Works provide and maintain at his own cost all lights, guards, fencing and human watch when and where necessary or as required by the Owner/Engineer or by any duly constituted authority for the protection of the works or for the safety and convenience of the public or others.

(e) Safety guide posts, marks, signs, etc., indicating falling stones and landslide, traffic sign posts when blasting, and other necessary guide posts shall be installed whenever and wherever they are necessary throughout the entire Site.

(f) The Contractor shall take sufficient measures so as not to cause any danger, hazard or obstruction to the public by installing work sign boards, traffic sign posts, lighting and protection facilities and/or other necessary safety devices whenever the works are executed in the vicinity of the public.

The Contractor shall maintain close communication with the police and the administrators of the roads and rivers in advance regarding traffic and other security measures.

(g) The Contractor shall install the road guard facilities in accordance with the standards of the police and the road administrators.

(h) The Contractor shall install any/all other proper guard facilities necessary for the execution of the Works in addition to above-mentioned facilities.

- (i) Scaffolds and steps needed for work at/in high place shall be provided wherever necessary and possible. All measures shall be taken to prevent falling accidents, such as by preparing safety ropes, catch nets, etc.
- (j) In case there are any holes or openings within the construction site into which workers may fall, safety measures against this shall be provided by covering the said area or by constructing handrails when the said holes or openings are not in use.
- (k) All personnel working at/in high places which may be dangerous shall wear life ropes, and preventive measures against the droppage of tools and materials shall be taken.
- (l) A person in charge of safety shall be appointed for each safety facility such as scaffolds, handrails, safety ropes, etc. The names and places where the persons in charge can be contacted shall be clearly indicated on/near/at the said safety facility.
- (m) All work in the vicinity of equipment and facilities having live electricity shall be avoided whenever possible. However, when work in the vicinity such places is unavoidable, the area of danger shall be clearly indicated and the person in charge of safety shall be present at all times during the work.
- (n) Before heavy equipment such as drum, transformers, generators, etc. are transported, sufficient investigation to ensure the strength of roads and road shoulders shall be carried out.

(o) For equipment such as cable conduits and cable pits which can not be inspected after installation, sufficient measures against damage shall be taken during construction.

(4) MEASURES IN CASE OF ACCIDENTS

The Contractor shall carry out all necessary measures and submit the report to the Owner or the Engineer without delay when a human and/or facilities accident occurs or damage to the third party happens.

(5) SAFETY PLANS

The Contractor shall submit to the Owner/Engineer plans on accident prevention in such manners as directed by the Owner.

(6) ORDERLY SITE

The Contractor shall maintain an orderly Site and keep the Site in a clean, neat and easy workable condition for the safety of the Works.

(7) SIGNS

(a) General

Signs of plant identification during the erection period must be to the Owner's approval.

The signs shall be of a material which is weather-resistant and has sufficient life under the conditions prevailing on Site.

The position for the signs must be chosen so that they are within the field of vision of the persons to whom they apply.

The signs shall be permanently attached. Temporarily

dangerous areas (e.g. construction sites, assembly areas) may also be marked with portable signs. The safety signs must be mounted or installed in such a manner that there is no possibility of misunderstanding.

(b) Traffic Signs

Traffic signs are for ensuring the safety of traffic on the site. An adequate number of warning signs and prohibiting signs shall be erected by the Contractor at the appropriate places. Special attention must be paid to the following: right of way, one-way streets, speed limits, maximum height or width restrictions, weight restrictions, fire-access, roads etc.

(c) Information Signs

Information signs shall supply the necessary information to acquaint personnel with the physical arrangement and structure of site, buildings and equipment.

For example:

Floor numbers, load-carrying capacities including marking of floor areas, working loads of cranes, lifting gear and lifts, room identification, etc.

(d) Signs for Emergencies

In the event of accidents, all necessary information should be available immediately to those affected.. Therefore a sufficient number of signs of appropriate size shall be installed such as, for example: escape routes (including marking of floor areas), emergency

exits, fire alarms, fire extinguishers, instructions for special fire-extinguishing agents, warnings against fire-extinguishing agents (CO₂), first aid equipment, first aid points, accident-reporting points, telephones, etc.

(e) Signs to be obeyed

Signs to be obeyed must be installed wherever certain action is necessary, for example:

Do not obstruct entrance, keep right, etc.

Signs to be obeyed should also indicate when the wearing of protective clothing and equipment is necessary, for example:

Protective goggles, protective clothing, helmets, head guards, breathing equipment, ear muffs, etc.

(f) Warning Signs

Warning signs should refer to the existence or possible existence of danger, such as:

inflammable substances, explosive substances, corrosive or noxious substances, suspended loads, general danger, width/height restriction, danger of trapping, steps, slipping, falling, etc.

In addition to warning signs, appropriate black and yellow stripe markings shall also be used where necessary.

(g) Prohibition Signs

Prohibition signs are as follows, for example:

No smoking; no fires; no naked lights or smoking;

no entry to pedestrians; use no water; no entry:

do not start; etc.

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PA.18. SHOP COATING AND FINAL PAINTING

All metallic surfaces subject to corrosion shall be protected by suitable coatings applied in the shop. Surfaces which will be inaccessible after assembly shall be protected for the life of the equipment and the structure. The surfaces shall be cleaned and prepared in the shop. All mill scale, oxides, and other coating shall be removed. Sand or grit of internal areas which will be exposed to steam or treated water will not be allowed. Exposed surfaces shall be finished smooth, thoroughly cleaned and filled as necessary to provide a smooth uniform base for painting. Surfaces to be finish painted after installation, or requiring paint for corrosion protection until installation, shall be shop painted with two or more coats of primer.

After the commissioning, the entire plant will be painted by the Contractor using the highest quality paint products, which will be in accordance with the specification described.

The Contractor shall supply the paint and apply it after the surfaces to be painted are properly cleaned and provided with the necessary treatment.

PA.19. MARKING, PARTS AND SHOP ASSEMBLIES

Equipment shall be shipped after being completely factory assembled, except when the physical size, arrangement or configuration of the equipment, or shipping and handling limitations make the shipment of completely assembled equipment impracticable. The Contractor shall submit to the Owner and the

Engineer status and dimension of the packages with the shipping schedule as specified in CC.62.

Each crate or package shall contain a packing list in a waterproof envelope. All items of material shall be clearly marked for easy identification against the packing list in accordance with Clause CC-22 of the General Conditions of Contract.

All cases, packages, etc., shall be clearly marked on the outside to indicate the total weight, the position of the center of gravity and the correct position of the slings and shall bear an identification mark relating them to the appropriate shipping documents.

All stencil marks on the outside of cases shall be of a waterproof material, etc., to prevent obliteration in transit.

All members comprising multipart assemblies e.g. steel frameworks, piping installations, storage tanks etc., shall be marked prior to shipment with distinguishing members and/or letters corresponding to those on the approved drawings or material lists. The Contractor shall provide, suitably marked, any temporary supports or bracing required to facilitate erection of the Contract Works.

PA.20. LOCAL CUSTOMS AND WAGES

The Contractor at all times during the continuance of this Contract shall in all his dealings with local labour for the time being employed on or in connection with the Works have due regard to all local festivals and religious or other customs. The Contractor

shall pay wages and observe conditions not less favourable than those observed by good employers engaged in like works within Pakistan.

The Contractor shall in respect of the Works and Temporary Works conform to all laws and all statutory rules, regulations and by-laws in force from time to time in the place where work is being or is to be executed which shall include the payment of contributions due by law to Provident Fund (if any) and shall give all notices and shall pay all fees that may be lawfully demanded by any public officer in respect of the Works and Temporary Works; and he shall perform all duties and pay all assessments and sums required to be paid in respect of employees and labourers employed by him on the Site under any law from time to time in force.

PA.21. OPPORTUNITIES FOR OTHER CONTRACTORS

The Contractor shall in accordance with the requirements of the Owner/Engineer afford all reasonable opportunities for carrying out their work to any other contractors employed by the Owner and their workmen and to the workmen of the Owner and of any other duly constituted authorities who may be employed in the execution on or near the site of any work not included in the Contract or of any contract which the Owner may enter into in connection with or ancillary to the Contract. If, however, the Contractor shall on the written request of the Owner/Engineer make available to any such other contractor or to the Owner or to any such authority any roads or ways for maintenance of which the Contractor is responsible or permit the use by any such of the contractor's

scaffolding or other plant on the Site or provide any other service of whatsoever nature for any such use the Owner shall pay to the Contractor in respect of such use and service, such sums as shall in the opinion of the Engineer be reasonable.

PA.22. SUPPLY OF PLANT, MATERIALS, AND LABOUR

Except where otherwise specified the Contractor shall at his own expense and risk, supply and provide all the Constructional Plant, Temporary Works, materials, both for temporary and for permanent work, labour (including the supervision thereof), transport to and from the Site, and other things of every kind required for the purpose of or in connection with the Contract.

PA.23. CUSTOMS CLEARANCE AND BONDED STORAGE AREA AT SITE

- (1) The Contractor shall execute all required customs clearance of plant components and equipment imported into Pakistan under the Contract, and the Owner and Engineer will assist the Contractor in the above clearances.
- (2) The Contractor shall keep equipment and materials which required customs clearance in satisfactory condition, and shall prepare an exclusive bonded storage area(s).
- (3) It is desirable that the Contractor make possible customs clearance at the Site.

PA.24. RETURN OF LEFT OVER/SURPLUS MATERIAL

The Contractor shall keep record of the quantities of all materials imported into Pakistan under the Contract, quantities of material

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received in the storage yard at the Site and quantities issued for erection and balanced in stock.

On completion of the Works, the Contractor shall return to the Owner all the material imported under Category "A" on the basis of relevant shipping documents less the material installed on the Works.

PA.25. HOUSEHOLD EQUIPMENT

- a) Air conditioners, refrigerators, and other household equipment will be arranged by the Contractor at his own cost.
- b) The Owner shall not be responsible for payment of Custom duty and Sales tax, etc.: on the import of air conditioners, refrigerators, and other household equipment as well as cars imported by the Contractor for his use on the project.
The cars imported by the Contractor should not be more than 1600 CC size.

PA.26. NOT APPLICABLE

PA.27. NOTICES TO OWNER, ENGINEER, AND CONTRACTOR

Notices shall be sent to the Owner, the Engineer and the Contractor by registered mail or by delivering personally to the following addresses:

(1) Contractor

Notices shall be sent to Contractors

Address designated in the Form of Agreement

(2) Engineer
Tokyo Electric Power Services Co., Ltd. Name and
Attention: Project General Manager address
1-4 Uchisaiwai-cho 2-chome, Chiyoda-ku, of
Tokyo 100, Japan The Engineer

PA.28. USE OF ENGLISH LANGUAGE

In addition to the requirements of Section CC all meetings and discussions with the Owner/Engineer shall be in English and the Contractor shall, if necessary, arrange an interpreter or English-speaking spokesman.

Representatives, based permanently on Site and conversant with English, shall be provided by the Contractor for the duration of the Contract or as directed by the Owner.

PA.29. TRAINING FACILITIES FOR OWNER'S PERSONNEL

(1) Foreign Training

The Contractor shall train a suitable number of the members of personnel of the Owner in the operation and maintenance of the equipment to be supplied. The total man months for training will be limited to one hundred and fifty (150). All living, that is boarding, lodging, return air ticket and transport expenses of the trainees during the period of training including daily allowance incidental expenses, medical expenses, or medical insurance from time to time will be covered by the Contractor.

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The Contractor will provide all maintenance and operation manual, drawings relating to all the equipment to each trainee at the Contractor's Works.

(2) Jobsite Training

The Owner shall make available, charge, to the Contractor a suitable number of staff members for the purpose of on-the-job training. They shall be made available for a period to be specified later. It shall be the responsibility of the Contractor to train them adequately and properly in a planned manner so that these members of the Owner's staff could take over the responsibility of operation and maintenance of the plant and equipment at the time of handing over of such plant and equipment.

The Contractor shall provide video aids, slides, and technical films for training purposes to the Owner's personnel. Such materials shall become the property of the Owner without any charge.

PA.30. ERECTION

- (1) Prior to erection work, the Contractor shall conduct thorough research and investigation on preliminary work methods, safety, and schedule so that the erection work can be smoothly conducted and the erected plant can exhibit the expected performance.
- (2) The Contractor shall assign the Contractor's representative at the job site from the beginning through to the completion of

the Works. The Contractor's representative shall be given the authority effective during the period of work which allows him to take all the necessary emergency measures so as to execute the said work. However, the Contractor's representative shall be approved by the Owner.

(3) The Contractor's representative shall supervise quality control, safety control and maintenance of the facilities with a strong sense of responsibility. He shall also be responsible for retaining order and preventing trouble at the job site.

(4) In case the Owner and/or the Engineer determines that the Contractor's representative is unsuitable for the position, the person shall be replaced at his own cost. When the Contractor's representative is absent from the job site for two (2) weeks or more for a business trip or other reasons, an approval of such shall be obtained from the Owner and a proxy shall be assigned during this period.

(5) With regard to equipment, instruments and materials, special care shall be exerted when transporting, handling and storing the said items in order to prevent loss and damage.

(6) The Contractor shall closely consult with the Owner and the Engineer about such matters as erection, installation, adjustment and inspection of equipment and materials. The Contractor's representative shall keep in close contact with and fully cooperate with the Owner and the Engineer, and

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shall exert his utmost efforts to conduct the said work in a proper and satisfactory manner.

- (7) In case inconvenience or trouble occurs in relation to other facilities or work in progress during the installation work, the Contractor shall report to the Owner and the Engineer and shall then, under the coordination of the Owner and the Engineer, conclude an agreement with the other contractor(s) of the work(s) in a manner that all work(s) can be conducted without trouble.
- (8) The Contractor shall exert every effort to keep things in order so as to prevent accidents at the job site and to facilitate smooth progress of the Works. After the work is completed, scaffolding and related materials and machines employed for executing the work shall be removed immediately, and the job site shall be cleaned and put in proper order.
- (9) The Contractor shall exercise extreme care to prevent any fire whatsoever, particularly at the job site or at the workmen's quarters.
- (10) The Contractor shall assign a full-time electrical engineer at the job site so as to ensure the security of the power line used for the work. A monthly schedule water consumption, working power and power consumption shall be submitted to the Owner and the Engineer.
- (11) Waste oil, dust, trash and other such material which accumulate as the work progresses shall be disposed of in a

manner approved by the Owner and the Engineer.

- (12) Prior consultation shall be conducted to prevent accidents which might otherwise occur between two different working levels. Such consultation, between and/or among other contractors shall be conducted in the presence of the Owner and the Engineer.
- (13) Should human accident, facility accident, public nuisances or other emergencies develop in relation to the work, appropriate emergency measures shall be taken immediately, and the accident shall be reported to the Owner and the Engineer at once.
- (14) Should the Contractor employ a subcontractor(s), the Contractor shall submit a report describing the background and experience of the subcontractor(s) to the Owner and the Engineer for approval.
- (15) The Contractor's representative and/or related persons shall attend the periodic meetings which are to be held by the Owner and the Engineer during the progress of the work so as to discuss the work method and progress.
- (16) The Contractor shall prepare all temporary materials required for erection work.
- (17) The Contractor shall submit a work report (number of persons by job, contents of work, etc.) to the Owner and the Engineer daily.

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(18) The Contractor shall submit the installation specifications and/or procedures to the Owner and the Engineer for approval.

(19) All welders shall be qualified in the handling skills of specified materials, and the Contractor shall submit their certificate of qualifications to the Owner and the Engineer.

(20) The welding rods shall be carefully boxed and sufficiently protected from damage caused by high humidity during shipment and storage at the Site.

The Contractor shall take measures to prevent incorrect use of welding rods by welders during construction works in the field.

(21) All consumables such as chemicals, lubricants, fuses, lamps, etc., required for the work up to the point of Provisional Taking Over of the Power Plant shall be supplied by the Contractor.

(22) The Owner and the Engineer have the right to inspect and approve each stage of the work so as to ensure smooth work progress and completion.

(23) All works regarding the supply and setting of materials, equipment and related facilities as well as the necessary foundations for drum lifting, generator stator pole up/lift up; deaerator and feedwater heater lifting shall be prepared by the Contractor.

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The generator stator shall be carried into the main building by the pole-up or lift-up method through the opening of wall on the main transformer side.

(24) The Contractor shall submit the consumption amount of water and electric power to the Owner and the Engineer once a month.

(25) The Contractor shall be responsible for repair of the construction road and drainage system until the construction road and drainage system have been taken over by the Owner.

PA.31. OPERATION AND MAINTENANCE ADVISING WORKS DURING THE GUARANTEE PERIOD

(1) The Engineer will provide the following services to the Owner during the GUARANTEE period after Provisional Taking Over.

(a) Follow up and expedite rectification of any defects pointed out during the period.

(b) Provide advice and recommendations to the Owner regarding any troubles concerning the performance of the Plant and/or equipment as and when required by the Owner.

(c) Provide specialists services for investigations of any problem or trouble as and when required by the Owner.

(2) The Contractor shall provide the works specified in CC.18, Section III, Volume 1.

(3) The Contractor shall provide a necessary staff to advice and solve all matters related to defects, damages, troubles, etc., during the maintenance period.

- (4) The Contractor shall provide the necessary data, drawing and reports concerning any defects, damages, troubles, etc., to the Owner and the Engineer.
- (5) The Contractor shall exert his best efforts to assist the Engineer in all matters related to the Contractor's works.
- (6) The Contractor shall prepare all reports and explanation sheets when so instructed by the Engineer.

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