

MATERIAL AND EQUIPMENT STANDARD

FOR

UNINTERRUPTIBLE POWER SYSTEM

(UPS)

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Note :

For Attachments see the end of this standard specification.

1. SCOPE

This Standard specification covers the minimum technical requirements for design manufacture, quality control and testing of uninterruptible power supply system (UPS) for indoor use which shall be installed in oil, gas and petrochemical industries in Iran, under the service conditions stated in clause 4 of this standard specification. Only the general requirements of "UPS" are given in this standard specification, the specific requirements of UPS will be given in pertinent data sheet (Appendix A) and or requisitions.

2. REFERENCES

The uninterrupted power supply system shall be designed, constructed, wired, tested and quality controlled to the requirement of the editions of the following standards that are in effect at the time of publication of this Standard. The applicability of changes in standards that occur after the date of this Standard shall be mutually agreed upon by the Company and Supplier.

IEC (INTERNATIONAL ELECTROTECHNICAL COMMISSION)

IEC 51	"Recommendation for Indicating Electrical Measuring Instruments and their Accessories."
IEC 146 (1973)	"Semiconductor Converters."
IEC 255	"Electrical Relays."
IEC 146.2 (Part 2) (1974)	"Semiconductor Self Commuted Converters."
IEC 269 (1986) (Part 4)	"Low Voltage Fuses."
IEC 364.5.54 (1980)	"Earthing Arrangements and Protective Conductors".
IEC 408 (1985)	"Low Voltage Airbreak Switches, Air Break Disconnectors, Air Break Switch Disconnectors and Fuse Combination Units."
IEC 445	"Identification of Equipment Terminals and of Terminations of Certain Designated Conductors Including General Rules of an Alphanumeric System."
IEC 446 (1973)	"Identification of Insulated and Bare Conductors by Color."
IEC 529 (1976)	"Classification Degrees of Protection Provided by Enclosure."
IEC 536 (1976)	"Classification of Electrical and Electronic Equipment with Regard to Protection Against Electric Shock."

ANSI / NEMA (AMERICAN NATIONAL STANDARDS INSTITUTE / NATIONAL ELECTRICAL

MANUFACTURERS ASSOCIATION)

ANSI / NEMA PE1 (1983)	"Uninterruptible Power System."
ANSI / NEMA PE5 (1985)	"Utility Type Battery Chargers."
ANSI / NEMA PE7 (1983)	"Communication type Battery Chargers".

BSI (BRITISH STANDARDS INSTITUTION)

BS 5486.12 "Particular Requirements for Miniature Circuit Breaker Boards".

Notes:

- 1) When standards other than IEC are specified, it is understood that the equivalent IEC standard is accepted.
- 2) The testing and certification by the following authorities are acceptable where relevant:
 - a) European Organization for Testing and Certification under CENELEC administration (EOTC).
 - b) Electrical Equipment Certifications Services (EECS)

3. UNITS

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

4. SERVICE CONDITIONS

4.1 Environmental Conditions

See Attachment No. 1

4.2 Area Classification

The UPS will be installed indoor in safe area.

5. BASIC DESIGN

5.1 General

5.1.1 Description of equipment

- a) The uninterruptible power system UPS shall be a semiconductor a.c. to a.c. converter system with a dedicated d.c. electrical energy storage capability.
- b) The UPS shall serve as a secure and reliable source of power supply for functions specified in data sheet.
- c) The UPS shall consist of but shall not be limited to the following functional units:
 - I) Static charger
 - II) Battery
 - III) Static inverter.
 - IV) Static power switches
 - V) Monitoring and control devices.
 - VI) Manual bypass switch to bypass UPS during maintenance.

- d) The UPS unit shall be capable of parallel operation with similar units to offer the specified power capacity, redundancy level or standby configuration.

5.1.2 Mechanical requirements

- a) The battery charger, inverter, and power switches which form a UPS shall be housed in one or more cabinets depending on size of equipment.
- b) The UPS cabinet (s) shall be of self supporting type.

5.1.3 Ventilation

The UPS cooling shall be by fan unless otherwise specified in data sheet (Appendix A.)

In any case failure of the fan, blocked opening or air filters shall not allow a dangerous or destructive condition to develop.

5.1.4 Design consideration

- a) Equipment, circuit board and components located within the UPS cabinets shall be of plug in type.
- b) All plug in circuit components shall have keys or other suitable provisions to prevent incorrect assembly.
- c) Test points shall be provided for maintenance purpose.
- d) The location and grouping of components and auxiliary equipment shall permit easy identification and access for operational maintenance and repair purposes. All components shall be labelled according to related drawing.
- e) The electronic control and protection system shall be of modular design and equipped with function fault indicators.
- f) No controls or operating devices accessible to the operator shall be higher than 1750 mm.
- g) All controls accessible to the operator shall be identified with their function and status. Clockwise rotation or linear travel to the right or up direction shall increase the quantity eg increase the output, voltage or current and any variance from this manner of operation shall be suitably marked.
- h) The rating and characteristic of transformers used shall comply with the requirement of chapter III of IEC publication 146
- i) A bare internal tinned copper earthbar sized for the full length of the panel board assembly with a terminal point at each end for connecting to the external earthing system.

5.1.5 Enclosure

5.1.5.1 The UPS enclosure shall be of sturdy steel frame (at least 2 mm thick) with removable steel panels and with double braced vertically doors for extra strength. The UPS shall be free standing vertical and floor mounting. Degree of protection of the enclosure against contact with live or moving part and against ingress of solid foreign bodies and liquid per IEC 529 in enclosed building shall not be less than IP41.

5.1.6 Safety and reliability

The UPS shall be designed to minimize any risk of short circuits and to ensure personnel and operational safety under all conditions of operation, inspection and maintenance.

5.1.7 Protective devices

a) The UPS shall be provided with protection against overload and short circuit on the a.c. mains input.

Fast acting fuses shall be used to protect power semi conductors.

b) At least one of the two d.c. output leads of the battery charger shall be protected against reverse battery connection.

c) The fuses shall comply with the requirement of IEC 269.1 part 1

d) The selection of relays shall be in compliance with the requirements of each circuits and in accordance to the requirements of pertinent section of IEC publication 255.

5.1.8 Wiring and connection

a) Wiring to equipment on doors shall be carried out in flexible cables which shall be so arranged that it is not possible for the flexible cables to be trapped in the doors, or mechanically strained.

b) Cables between two connecting devices shall have no intermediate splices or joints.

c) Terminals shall be so designed that they clamp the conductors between metal surfaces with sufficient contact pressure and without significant damage to the individual conductors.

d) All terminals shall be numbered.

e) Circuits and terminals operating at different voltages and or performing different functions to be segregated.

f) Terminal blocks shall be arranged to afford easy access.

g) Spare terminals shall be foreseen for not less than 10% of total number of terminals.

h) Provisions such as cable glands, cable plates cable lugs, cable supports, cable clamps and cable cleats shall be foreseen for all incoming and outgoing cables.

i) Glands and plates shall be so located to allow easy termination of cables.

5.1.9 Alarms and indication

a) Provisions shall be included to indicate the following abnormal conditions locally on the UPS front panel and for remote alarm indications as specified in data sheet:

Charger failure

d.c. Undervoltage alarm

d.c. Overvoltage alarm

Power or indicating lamp/lamps

d.c. earth fault

Inverter failure alarm

Synchronization failure indication and alarm (optional)

Under/over frequency indication (optional)

a.c. under/over voltage indication (optional)

b) Audible alarm shall be provided with acknowledgment and reset button when specified in data sheet.

5.1.10 Measuring instruments

a) Unless otherwise indicated in data sheet in Appendix A, the following measuring instruments shall be provided:

- d.c. Voltmeter measuring rectified output voltage.
- d.c. Ammeter with charge and discharge indication
- a.c. Voltmeter measuring output voltage.
- Frequency meter, measuring output frequency
- a.c. Ammeter measuring a.c current.

b) Instruments shall be of the flush mounted industrial grade, enclosed in dust and damp proof casing, non projecting dial with non glare, non reflecting window. Similar throughout in type and size, and in compliance with the requirements of pertinent parts of IEC publications No. 51 from requirements and dimension point of view.

The accuracy of all measuring instruments shall be to class index 2.5 of IEC publication 51.

c) The use of digital instrument may be considered as specified in data sheet.

5.1.11 UPS switches

Where electronic switches are used, they shall be able to connect, interrupt, isolate or transfer power flow within the UPS.

5.1.12 Marking

The manufacturer shall provide markings to include the following:

a) Nameplate

The following minimum information shall be provided on the nameplate of the UPS:

- Purchaser's name and order No.
- The year of manufacture
- Manufacturer's name
- Model designation
- Serial No. or Control No.
- Weight
- Dimensions
- Rated input voltage
- Rated a.c. input frequency
- Rated a.c. input current
- Rated d.c. voltage
- Rated d.c. current
- Rated a.c. output voltage
- Rated a.c. output frequency
- Rated a.c. output current
- Rated a.c. output power

b) Terminal Marking

User connections shall be permanently identified to permit proper installation.

- Personnel shall be warned against hazard where applicable by use of adequate precautionary labelling.

- The information shall be readily visible and may be on label, tag or other printed form and permanently affixed to the equipment.

5.2 Battery Charger

For description of details of battery charger see standard IPS-M-EL-174.

5.3 Batteries

For description of details of batteries see standard IPS-M-EL-172.

5.4 Inverters

For general requirement of inverters, reference shall be made to IEC publication 146.2.

The inverter shall convert the d.c. power from rectifier or battery to a sinusoidal a.c. voltage with the frequency of 50 Hz.

The output voltage shall be constant independent of normal variation in load or battery voltage.

5.5 Static Switch

Static switch with thyristors (SCR) shall be included for connection of the load to the inverter.

In case of failure of inverter, the load shall automatically be transferred to the a.c. supply without interruption.

5.6 Voltage Regulator

An a.c. voltage regulator may be connected between the a.c. supply and the static switch to provide regulated power to the load in the event the inverter is taken out of service.

6. INSPECTION, QUALITY CONTROL AND QUALITY RECORD

See Attachment 2.

7. TEST AND CERTIFICATION

7.1 General Requirements for Test

See Attachment 3.

7.2 Specific Requirements for Test

7.2.1 Charger tests

Charger tests shall be performed in accordance with the requirements of IPS-M-EL-174

7.2.2 Inverter tests

Inverter tests shall be performed in accordance to clause 5 of IEC publication 146.2, See Table 1 which follows

TABLE 1

Test	Type test	Routine test	Optional test	Specification (Sub-clause)
Insulation	×	×		492.1 (IEC Publication 146 [2nd edition])
Preliminary Light-load	×	×		492.2 (IEC Publication 146 [2nd edition])
Checking of auxiliary devices	×	×		5.3
Temperature rise	×			5.4
Temperature dependent frequency variation	× ¹⁾			5.5
Output voltage tolerance	× ¹⁾	× ¹⁾		5.5.1
Frequency tolerance	× ¹⁾			5.6.1
Relative harmonic content	× ¹⁾	× ¹⁾		5.6.2
Harmonic components	× ¹⁾			5.6.3
Conversion factor			×	5.6.4
Power efficiency	×			5.6.5
Current division	×			5.6.6
Voltage division	×	×		5.6.7
Radio frequency			×	5.6.8
Audible noise			×	22 E (Secretariat) 4
Supply over-voltage and energy test			×	5.7
Short-time current			×	5.8
Short-circuit current capability			×	5.9
Restart			×	5.10
Output voltage unbalance test			×	5.11
Frequency modulation			×	5.12
Periodic output voltage modulation			×	5.13
Voltage rise			×	5.14
Voltage dip			×	5.15
Hold-off interval	×			5.16
				5.17

¹⁾Applicable only if a maximum value is specified.

7.2.3 Testing of UPS switches

a) Operational test of static switches shall be performed in accordance with IEC 146 (1973) Semiconductor converters second edition, and IEC 146-2 (1974) part 2 semiconductor self commutated converters where applicable.

The following testing procedure may be employed:

- 1) Dielectric/insulation. IEC 146 Sub-clause 492.1
- 2) Checking of auxiliary devices. IEC 146. sub-clause 5.4
- 3) Checking of protective devices. IEC 146 sub clause 492.9
- 4) Checking of supervisory and remote signaling circuits.

- 5) Checking of measuring devices.
- 6) Light load transfer tests.

b) Type testing of UPS switches shall require a functional test with a complete UPS. In addition to tests mentioned above the type test program shall include:

- 1) Complete functional test eg switching of load.
- 2) Transfer time test.
- 3) Load test, temperature rise to IEC 146.2 sub-clause 5.5
- 4) Short-time overload to IEC 146.2 sub-clasue 5.9.
- 5) Short circuit capability to IEC 146-2 sub-clause 5.10.

7.2.4 Test of monitoring and control equipment unit tests shall refer to

- 1) Dielectric/insulation tests.
- 2) Check of electrical circuits.
- 3) Check of operation controls.

7.2.5 Check and test for batteries

See IPS-M-EL-172.

8. FINISH

The treatment and protection of metal works may be in accordance with the manufacturer standard, but shall include cleaning, degreasing, rust resisting primers and paint finishes, that provide effective protection against corrosion under the functional and climatic conditions described.

9. INFORMATION FOR MANUFACTURER/SUPPLIER

For relevant information see data sheet in Appendix A.

10. DOCUMENTATION/LITERATURE TO BE SUBMITTED BY MANUFACTURER/SUPPLIER

10.1 At Quotation Stage

10.1.1 Supplier shall submit the following:

- a) Report of experience, background, major clients and annual sale for similar equipment.
- b) Reference list showing the successful operation of equipment for at least two years and the locations of equipment offered in major oil industries.
- c) Typical type tests certificate of similar equipment.
- d) Declaration of confirmation with the set standards and or clear indication of deviation from the standards and the specifications.

10.1.2 Drawings and documents relating to:

- a) Dimensioned outlines and foundation details including weights and cable entries (size and clearance).
- b) Mounting details.

10.1.3 Electrical schematic diagram

10.1.4 Electrical reference documents relating to:

- a) General Description.
- b) Equipment Specification.
- c) performance Data.
- d) Characteristic Curves.

10.1.5 Spare parts and special tools requirements as follows:

- a) List of recommended commissioning spares with price.
- b) List of recommended spares for three years of operation
- c) List of special tools, testing devices and instruments.

10.1.6 Guarantee policies

10.1.7 Complaint and compensation policies

Note:

The quotation will be considered as incomplete and rejected if the above mentioned information are not included.

10.2 At Ordering Stage

10.2.1 Final general arrangement drawings, showing floor plan, elevation and end view of assembly.

10.2.2 Mass and dimensions of the assembly and of individual shipping sections, where applicable.

10.2.3 Electrical wiring documents concerning:

- a) Schematic diagrams of all circuits.
- b) Wiring diagrams.
- c) Alarms, indications and acknowledgment schemes.
- d) Circuits description indicating test points and pertinent wave forms and voltages.

10.2.4 Final electrical reference documents relating to:

- a) General Description.
- b) Equipment Specification.
- c) Performance Data.
- d) Characteristic Curves.
- e) Drawings/Parts and material lists.

10.2.5 Instruction manuals relating to:

- a) Transport and Storage.
- b) Installation.
- c) Commissioning.
- d) Operation.
- e) Inspection / Test.
- f) Maintenance incorporating trouble shooting guide.

10.2.6 Illustrated Spare Parts Lists Including Special Tools.

10.2.7 Certificates Concerning:

- a) Applicable type Tests.
- b) Applicable routine Tests.
- c) Quality assurance.

Notes:

- 1) For number of drawings, documents, manuals and certificates to be submitted by manufacturer see Appendix 'C'.
- 2) The above mentioned documents shall include identifications of all proprietary items including order number and purchaser's name.
- 3) For instructions of purchaser about drawings, see Attachment 12.

11. PACKING

For general requirements, see Attachment 4.

12. SHIPMENT

For general requirements, see Attachment 5.

13. GUARANTEE

See Attachment 6.

14. SPARE PARTS

See Attachment 7.

15. LANGUAGE

See Attachment 8.

16. COORDINATION RESPONSIBILITY WITH OTHERS

See Attachment 9.

APPENDICES

APPENDIX A

TYPICAL UNINTERRUPTIBLE POWER SYSTEM DATA SHEET

1) Purchasing company:

2) Project name:

3) Standard specification number:

4) UPS output (inverter a.c. output)

a) Rated output power and power factor:

b) Nominal output voltage, steady-state and transient tolerance bands:

c) Nominal output frequency and tolerance band:

d) Number of phases:

e) Special requirements regarding, e.g. synchronization, relative harmonic content and modulation:

f) Voltage and adjustability range:

5) Type of loads to be operated from UPS:.....

6) UPS input (a.c. input to the battery charger):

a) Nominal input voltage and tolerance band:

b) Nominal input frequency and tolerance band:

c) Number of phases:

d) Special conditions regarding, e.g. superimposed harmonics, transients voltages, supply impedance, etc.:

e) Limitations regarding e.g. inrush current, harmonic currents, etc.:

f) Noise limit:

g) Standby power generator rating (if used):.....

7) Battery

a) Battery type e.g. lead acid, nickel-cadmium or other type:

b) Nominal d.c. voltage, number of cells:

c) Battery capacity-----Amperehours at load of-----Amperes, down to a minimum of -----Volts/cell (end of discharge voltage).

d) Battery accommodation:

8) Battery charger

a) Floating voltage range, nominal and tolerance band:

b) Equalizing voltage range, nominal and tolerance band:

c) Direct current rating:

d) Duty cycle:

9) UPS Type and configuration

a) Description of type and configuration with the aid of block diagram:

b) Number of battery chargers:

c) Number of battery sets:

- d) Number of inverters:
- e) Number and type of power switches:

10) Physical requirements

- a) Description of UPS functional units housing, i.e. different units housed together or separately:
- b) Mounting; rack, wall or floor:
- c) Dimensions: height, width and depth: :

11) Finish: See clause 8 of this standard:.....

12) Ventilation: Natural or fan cooled:.....

13) Protection (other than normally provided by manufacturer); Description:

- a) Input:
- b) Output:
- c) d.c. link:.....
- d) Surge protection:

14) Metering (other than normally provided by manufacturer) Specify:

Case size, scale length, accuracy, range, type, etc.

- a) Voltmeter:
- b) Ammeter:
- c) Frequency meter:
- d) Other:

15) Indicating lights (other than normally provided by manufacturer): Specify:

- a) Function:
- b) Color:
- c) Other:

16) Audible alarm, specify:

- a) Function:
- b) Level:
- c) Acknowledgment reset control:

17) Other requirements

- a) Exposure to shock and vibration:
- b) Dripproof construction:
- c) Fungus proofing:
- d) Insect proofing:
- e) Remote alarms:
- f) Cabinet door lock:
- g) Electrical danger labels:
- h) Maintenance bypass circuits and other installation requirements:
- i) Future extension of the UPS:
- j) Optional tests required:

APPENDIX B

1. CHARACTERISTICS RELATED TO INVERTERS

1.1 Output voltage

The r.m.s. voltage (unless otherwise specified for a particular load) between the output terminals.

1.2 Output current

The r.m.s. current from the output terminals.

1.3 Output power

The active power (the sum of the power of the fundamental frequency components of voltage and current and power of the harmonic components) from the output terminals.

1.4 Load power factor

Characteristic of an a.c. load in terms expressed by the ratio of active power to apparent power assuming an ideal sinusoidal voltage.

1.5 Rated output current

The output current specified by the manufacturer as a basis of declaring the duty cycles and over-current capability.

1.6 Rated continuous output current

The maximum output current which can be carried continuously without exceeding established limitations under prescribed conditions of operation.

1.7 Rated short-time output current

The maximum output current which can be carried for a specified time without exceeding the established limitations under prescribed conditions of operation.

1.8 Rated output voltage

The output voltage specified by the manufacturer as a basis for rating.

1.9 Rated output

The apparent power output for specified load conditions

1.10 Rated frequency (frequency range)

The rated value of the fundamental frequency of the output voltage or the range over which the fundamental frequency may be adjusted.

1.11 Voltage/frequency function

The ratio of output voltage to the frequency of the output fundamental as a function of the frequency.

1.12 d.c. supply voltage

The mean value of the direct voltage between the input terminals taken over one period of any ripple voltage appearing between the input terminals.

1.13 Rated supply voltage

The supply voltage specified by the manufacturer as a basis for rating.

1.14 Supply transient overvoltage

The peak instantaneous voltage that may appear between the input lines to the inverter with the inverter disconnected.

1.15 Supply inductance

The inductance appearing in the input lines to the inverter with the inverter disconnected.

1.16 Supply transient energy

The energy which the d.c. supply system, due to a transient, is capable to deliver at the terminals to which the inverter is to be connected.

1.17 Dynamic short-circuit output current

The transient current which flows from the inverter into a short-circuit across the output terminals.

1.18 Output impedance

The impedance presented by the convertor to the load for specified frequencies.

1.19 Periodic output voltage modulation

The periodic variation of output voltage amplitude at frequencies less than the fundamental output frequency.

1.20 Periodic frequency modulation

The periodic variation of the output frequency from its rated value.

1.21 Voltage deviation

The instantaneous difference between the actual instantaneous voltage and the corresponding value of the previously undisturbed waveform

Note:

Voltage deviation amplitude is expressed in per cent or per unit referred to the peak value of the previously undisturbed voltage.

1.22 Voltage dip

The transient voltage deviation amplitude, the direction of which is towards diminishing the absolute voltage.

1.23 Voltage rise

The transient voltage deviation amplitude, the direction of which is towards increasing absolute voltage.

1.24 Unbalanced three-phase system

A three-phase system in which the r.m.s value of at least one phase voltage (or current) or line-to-line voltage is significantly different from the others.

Note:

In an unbalanced three-phase system, negative or zero-sequence components are existing.

1.25 Unbalance ratio

The difference between the highest and the lowest fundamental r.m.s values in a three phase system, referred to the average of the three fundamental r.m.s values of current or voltages respectively.

1.26 Unbalance factor

The ratio of the negative sequence component to the positive sequence component.

APPENDIX C
LIST OF DRAWINGS, DOCUMENTS, MANUALS AND CERTIFICATES TO BE SUBMITTED BY
MANUFACTURER, SUPPLIER IN NUMBERS
AND THE TIMES INDICATED BELOW

	DESCRIPTION	REQUIRED WITH QUATATION	CERTIFIED INFORMATION		NUMBER OF WEEKS BEFORE DELIVERY
			NO. OF COPIES		
			REPRO-DICIBLES	PRINTED MATTER	
A	DRAWING AND OTHER DOCUMENTS:				
	a) ELECTRICAL EQUIPMENT:				
	1. DIMENSIONED OUTLINES AND FOUNDATION DETAILS INCLUDING WEIGHTS, CABLE ENTRIES AND CLEARANCES				
	2. DETAILS AND CROSS-SECTIONAL ARRANGEMENT				
	3. MOUNTING DETAILS				
	4. PERFORMANCE DATA (TYPICAL)				
	5. PARTS / MATERIAL LIST				
	6. RELEVANT CATALOGUES				
	7. NAME PLATES				
	8. LIST OF FINAL LABELS				
	b) SINGLE LINE DIAGRAM				
	1. PRELIMINARY				
	2. FINAL				
	c) ELECTRICAL REFERENCE DOCUMENTS:				
	1. GENERAL DESCRIPTION				
	2. EQUIPMENT SPECIFICATION				
	3. PERFORMANCE DATA (ACTUAL)				
	4. DRAWINGS / PARTS / MATERIALS LIST				
B	INSTRUCTION MANUALS : (FOR ALL REQUIRED ITEMS)				
	1. INSTALLATION, COMMISSIONING AND INSPECTION				
	2. OPERATION AND MAINTENANCE				
C	SPARE PARTS REQUIREMENTS:				
	1. ILLUSTRATED SPARE PARTS				
	2. RECOMMENDED COMMISSIONING SPARE LIST				
	3. RECOMMENDED SPARES FOR THREE YEARS OPARATION				
D	CERTIFICATION:				
	1. PERFORMANCE TEST, MATERIALS CERTIFICATES AND CURVES				

ATTACHMENTS**ATTACHMENT 1
ENVIRONMENTAL CONDITIONS**

1.1 Site elevation : ----- meters above see level.

1.2 Maximum ambient air temperature : ----- degree centigrade.(Bare metal directly exposed to the sun can at times reach a surface temperature of ----- degree centigrade.

1.3 Minimum air temperature : ----- degree centigrade.

1.4 Relative humidity : ----- percent.

1.5 atmosphere : saliferous, dusty corrosive and subject to dust storms with concentration of 70 - 1412 mg/cubic meter, H₂S may be present.

1.6 Lightning storm isoceraunic level : ----- storm days / year.

1.7 Maximum intensity of earthquake ----- richters.

Note:

Blanks to be filled by client.

**ATTACHMENT 2
INSPECTION / QUALITY CONTROL, AND QUALITY RECORDS**

2.1 Inspection / Quality Control

2.1.1 The purchaser's inspector, or his authorized representative shall have free access to the manufacturing plant engaged in the manufacture of the equipment, to carry out necessary inspection at any stage of work.

2.1.2 Inspection may include the visit to quality control laboratories, work shops, testing bay etc.

2.1.3 The supplier shall make available technical data, test pieces and samples that the purchaser's representative may require for verification in conjunction with pertinent equipment.

If required the supplier shall forward the same to any person or location that the purchaser's representative may direct.

2.2 Quality Records

2.2.1 The supplier shall maintain appropriate inspection and test records to substantiate conformance with specified requirements.

2.2.2 Quality record shall be legible and relevant to the product involved.

2.2.3 Quality records that substantiate conformance with the specified requirements, shall be retained by manufacturer and made available on request by purchaser.

2.2.4 The supplier shall establish and maintain procedure for identification collection, indexing, filing, storage, maintenance and disposition of quality records.

2.2.5 Supplier shall submit to purchaser: reports, test schedules, and test certificates (in ----- copies) on completion of tests.

Note:

blanks to be filled by client.

**ATTACHMENT 3
TESTS AND CERTIFICATION**

3.1 General Requirements

3.1.1 Test procedure as proposed by the supplier shall be agreed upon, and approved by the purchaser before any test is carried out.

3.1.2 Purchaser may require witnessed tests to be carried out in the presence of his nominated representative who should be informed at least ----- weeks in advance of the date of the tests and confirmed ----- weeks before the tests.

3.1.3 Test certificates and test reports shall refer to the serial No. of the equipment tested and must bear the purchaser's name, order No. and manufacturer's name and seal.

The certificates shall be approved by the purchaser before shipment instruction is given.

3.1.4 Approval by the purchaser's inspector or representative shall not relieve the vendor of his commitments under the terms of this specification or any associated order.

3.1.5 The equipment may be rejected if measurement and inspection reveal any discrepancies between quoted figures resulting in purchase order and those measured actually.

3.1.6 Any charges incurred by the tests quoted under heading of specific requirements for tests to be quoted as a separate item and are not to be included in the cost of the equipment.

Note:

Blanks to be filled by client.

ATTACHMENT 4 PACKING

4.1 Equipment must be carefully packed to provide necessary protection during transit to destination and shall be in accordance with any special provision contained in the order.

4.2 Special attention must be given to protection against corrosion during transit, and silica gel or similar dehydrating compound shall be enclosed.

4.3 The method of cleaning preserving and the details of packing including moisture elimination, cushioning, blocking and crating shall be such as to protect the product against all damages or defects which may occur during handling, sea shipment to the port and rough road haulage, to site and extended tropical open air storage, generally as client general conditions of purchase(see Attachment 10)

4.4 All bright and machined parts must be given the protection against corrosion.

4.5 Ancillary items forming an integral part of the equipment should be packed preferably in a separate container if the equipment is normally cased or crated.

Alternatively the ancillary items should be fixed securely to the equipment and adequate precautions taken to ensure that the item do not come loose in transit or be otherwise damaged.

4.6 The supplier shall provide methods of handling to prevent damage and or deterioration during transit.

4.7 Where deemed necessary each shipping section shall be furnished with removable steel angles.

4.8 The requirements of above items shall not relieve the supplier of any of his responsibilities and his obligations for delivery of equipment in a sound undamaged and operable conditions at site.

4.9 Identification for Shipment

The marking and labels of products should be legible, durable and in accordance to specification.

Identification should remain intact from the time of initial despatch at work to the final destination.

Marking shall be adequate for identifying a particular equipment in the event that a recall or inspection becomes necessary.

**ATTACHMENT 5
SHIPMENT**

5.1 UPS package shall be provided with a permanently attached readily visible identification tag(s) bearing the equipment number of the UPS to which it belongs.

5.2 The greatest care must be taken to ensure that shipping and associated documents with exact description for customs release are accompanied with the shipment.

**ATTACHMENT 6
GUARANTEE**

6.1 Clearance of Defects

The supplier shall guarantee his equipment during commissioning and for one year operation, starting from the completion of seven days continuous service test in site at full load against the following defects:

- All operational defects
- All material defects
- All constructional and design defects

6.2 Replacement of Defective Parts

All defective parts shall be replaced by the supplier in the shortest possible time free of charge including dismanteling, reassembling at site and all transportation cost. The above mentioned period shall not however be longer than 18 months from the date of dispatch from the manufacturer's works.

6.3 Supply of Spare Parts

Further more the supplier shall guarantee the provision of spare parts to the purchaser for a minimum period of ----- years from the date of despatch.

6.4 After Sale Technical Services

6.4.1 Commissioning

6.4.1.1 The supplier shall quote if required for the services of competent engineer(s) and or technician(s) to assist in installation, commissioning and testing of the equipment at site on a per diem basis.

6.4.1.2 The quoted rates shall be irrespective of duration and frequency and the supplier shall guarantee the services of the engineer(s) and technician(s) on the specified date within a minimum of ----- weeks advance notice by the purchaser.

6.4.2 Training

6.4.2.1 The purchaser may require the supplier to arrange for training of his personnel in the manufacturing plant and or in site for the operation and maintenance of the equipment offered.

6.4.2.2 The supplier shall quote (if required) for the cost of any of above mentioned services on a per person per diem basis. The program for the training shall be prepared by mutual agreement. An advance notice of ----- weeks minimum, is required by purchaser for the commencement of training program.

Note:

Blanks to be filled by client.

**ATTACHMENT 7
SPARE PARTS**

- 7.1** All spare parts shall comply with the same standards, specification and tests of the original equipment and shall be fully inter-changeable with the original parts without any modification at site.
- 7.2** They shall be correctly marked in accordance with client reference and manufacturer part numbers, giving also the purchaser's order number.
- 7.3** Spare parts shall be preserved to prevent deterioration during shipment and storage in humid tropical climate.
- 7.4** List of recommended spare parts and interchangeability with spare parts of similar equipment shall be submitted by supplier.

**ATTACHMENT 8
LANGUAGE**

8.1 All correspondence, drawings, documents, certificates, including testing, operation and maintenance manuals and spare part lists etc. shall be in English.

8.2 Offers in other languages will not be considered.

**ATTACHMENT 9
COORDINATION RESPONSIBILITY WITH OTHERS**

- 9.1** In case the equipment ordered should be mounted on, aligned, connected, adjusted, or tested with the equipment of other manufacturer(s), the supplier shall contact directly the said manufacturer(s) and supply and obtain all dimensional and technical information and arrange for any interconnecting equipment and combined test that may be required.
- 9.2** The supplier shall be responsible for correct and timely communication with the said manufacturer(s) and for any delay and/or cost claims arising from such communications.
- 9.3** Copies of all correspondence should be sent to purchaser.
- 9.4** The name and address of the manufacturer(s) will be given as soon as their orders have been confirmed.

**ATTACHMENT 10
GENERAL CONDITIONS OF PURCHASE**

This document will be submitted by purchaser at the time of ordering.

**ATTACHMENT 11
SAMPLE OF PURCHASER'S DRAWING TITLE BLOCK:**

DRAWING NO.	DESCRIPTION				
REFERENCE DRAWINGS					
D					
C					
B					
A					
REV	DATE	DESCRIPTION	REF	CHK	APP
THE NAME OF RELEVANT COMPANY					
DRAWING TITLE :					
DRN. BY	SCALE	MICRO FILM CODE	PROJECT NO.	CHK. BY	APP. BY
JOB NO.	AREA CODE	DWG. NO.	SHEET	REV.	

Note:

Appropriate Nomenclature and Registered mark shall be used for quotation and order.

**ATTACHMENT 12
INSTRUCTIONS OF PURCHASER ABOUT DRAWINGS**

12.1 Purchaser's drawing title block, "the sample of which is given in Attachment 11 shall be shown in the right lower corner of the drawings.

12.2 Drawings are to be protected and packed. Negatives must be dispatched in a strong card board cylinder.

12.3 Drawings must be rolled and not folded.

12.4 All drawings, documents and literatures shall be forwarded under cover of a fully detailed letter to purchaser whose addresses are given in Attachment 14.

Note:

Blank to be filled by client.

**ATTACHMENT 13
MATERIAL, LAYOUT AND LETTERING OF LABELS**

Label material to be "Traffolite" 5 mm. Thick having two outer layers; and to be engraved into the white layer to give black lettering on a white background.

LETTER TYPE

TYPE	HEIGHT mm	WIDTH	STROKE	CASE		LETTERS / 25 mm	SAMPLE
A	5	WIDE	LIGHT	UPPER	CASE	7½ ± 1.2 mm. TOL	ABCDEFGHIJKLM
B	5	WIDE	HEAVY	"	"	7½ ± 1.2 mm. TOL	
C	5	NARROW	LIGHT	"	"	11 ± 2.5 mm. TOL	
D	5	NARROW	HEAVY	"	"	11 ± 2.5 mm. TOL	
E	3	WIDE	LIGHT	"	"	10 ± 1.2 mm. TOL	
F	3	WIDE	HEAVY	"	"	10 ± 1.2 mm. TOL	
G	3	NARROW	LIGHT	"	"	15 ± 1.2 mm. TOL	
H	10	WIDE	HEAVY	"	"	3½	
J	12	WIDE	HEAVY	"	"	2½	

Note:

Height is in millimeters.

(to be continued)

ATTACHMENT 13 (continued)

LAYOUTS

LAYOUT 1		LETTERS MAX / LINE	8 MIN		8 MIN	
LETTER TYPE	G E & F	28 19	25		4	DIA HOLES
LAYOUT 2		LETTERS MAX / LINE	8 MIN		8 MIN	
LETTER TYPE	G E & F	28 19	25		4	DIA HOLES
LAYOUT 3		LETTERS MAX / LINE	12 MIN		12 MIN	
LETTER TYPE	A & B C & D E & F G	22 23 30 45	32		4	DIA HOLES
LAYOUT 4		LETTERS MAX / LINE	12 MIN		12 MIN	
LETTER TYPE	A & B C & D E & F G	22 23 30 45	32		4	DIA HOLES
LAYOUT 5		LETTERS MAX / LINE	12 MIN		12 MIN	
LETTER TYPE	H J	15 10	32		4	DIA HOLES
LAYOUT 6		LETTERS MAX / LINE	12 MIN		12 MIN	
LETTER TYPE	A & B C & D E & F G	28 40 40 58	32		4	DIA HOLES
LAYOUT 7		LETTERS MAX / LINE	12 MIN		12 MIN	
LETTER TYPE	A & B C & D E & F G	28 40 40 58	32		4	DIA HOLES

ALL DIMENSIONS ARE GIVEN IN mm.

MIN = MINIMUM

**ATTACHMENT 14
FULL ADDRESS OF PURCHASER**

.....
.....
.....
.....

P. O. BOX	No.	CODE No.
TELEPHONE	No.	
TELEX	No.	
FACSIMILE	No.	

Note:

Blanks to be filled by client.