MATERIAL AND EQUIPMENT STANDARD

FOR

ALARM AND PROTECTIVE SYSTEMS

FIRST EDITION

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1. SCOPE

This Standard covers the general specifications of alarm and protective systems used with conventional alarm systems. It is intended to be used in oil, gas, and petrochemical industries, wherever applicable.

Note: This is a revised version of the standard specification for alarm and protective systems, which is issued as revision (1). Revision (0) of the said standard specification is withdrawn.

2. REFERENCES

Throughout this Standard the following dated and undated standards/codes are referred to. These referenced documents shall, to the extent specified herein, form a part of this standard. For dated references, the edition cited applies. The applicability of changes in dated references that occur after the cited date shall be mutually agreed upon by the Company and the Vendor. For undated references, the latest edition of the referenced documents (including any supplements and amendments) applies.

ISA (INSTRUMENT SOCIETY OF AMERICA)

18.1	"Annunciator Sequences and Specifications"

IEEE (INSTITUTE OF ELECTRICAL & ELECTRONIC ENGINEERS)

472	"Surge Withstand Capability Test"
C37.90.1	"Surge Withstand Capability Test for Relays and Relay Systems Associated with Electric Power Apparatus"

IEC (INTERNATIONAL ELECTROTECHNICAL COMMISSION)

IEC 61511

IEC 61508

IPS (IRANIAN PETROLEUM STANDARDS)

IPS-E-IN-190	"Transmission Systems"
IPS-G-GN-210	"Packing and Packages"
IPS-G-IN-260	"Engineering and Installation Standard for Alarm & Protective Systems"
IPS-I-IN-100(1)	"Inspection Standard for General Instrument Systems"
IPS-M-IN-220	"Control Panels"
IPS-M-IN-290	"Programmable Logic Controller (PLC)"

3. UNITS

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

4. GENERAL

4.1 Alarm systems shall be solid state type or microprocessor based state type, of modular construction. Access to alarm circuit board shall be from the front of the equipment.

4.2 Legend window displays for critical alarms shall be readable when the alarm light is not lit.

4.3 Alarm systems shall be provided with at least 20% pre-wired or on line spare capacity.

4.4 Flasher units and relays used on annunciator cabinets shall be plug-in type.

4.5 The equipment shall be able to withstand 2 kV-100 microseconds pulse between earth and all inputs and outputs interconnected.

4.6 If a multi-point continuos alarm scanning system is considered for, e.g. bearing temperatures, etc., it shall have individual alarm settings, domed red lenses and a separate indicator with push-button read-out.

4.7 In the absence of an alarm, the relevant display window shall be dark such that no dim light can exist.

5. SOLID STATE (NON-MICROPROCESSOR BASED) ANNUNCIATOR SYSTEMS

5.1 Integral Annunciator Systems

5.1.1 General

All logics shall be contained on printed circuit plug-in cards, power supply and each input circuits shall be protected by filter networks to prevent false tripping. Inputs shall operate from either a normally open or normally closed trouble contact.

5.1.2 Power requirements

Not more than 3 watts per point.

5.1.3 Logic voltage

Shall be 24 V d.c. ±20%, each card shall has its own filter/regulator circuit.

The logic voltage modules shall be easily replaceable.

5.1.4 Signal contact input voltage

Shall be 24 V d.c. and shall meet IEEE Standard 472 surge withstand capability test, unless otherwise specified.

5.1.5 Input current

Less than 2 mA.

5.1.6 Series resistance

20 Kilo Ohm max. (maximum resistance of wiring and contact to be recognized as a closed field contact).

5.1.7 Shunt resistance

120 Kilo Ohm min. (minimum resistance in parallel to signal input to be recognized as an open field contact).

5.1.8 Response time (minimum length of time signal must be present at input to guarantee a lock-in alarm, means response time).

5 ms min., unless otherwise specified.

5.1.9 Discrimination time (minimum time difference between input signals to guarantee that only the initial input signal will cause a first out alert condition, for sequential alarm points only, means discrimination time).

5 ms typical.

15 ms max.

5.1.10 Visual lamp indication on lamp panel display from point modules, shall be two 1 watt lamps in parallel per point, replaceable from the front of the cabinet.

5.1.11 Audible tone output for remote horn, which is driven by flasher/horn module, shall have internal volume control.

5.1.12 Horn sound level

72 to 90 dB @ 3 meter, adjustable.

5.1.13 Humidity

Relative humidity: (non condensing) up to 95%.

5.1.14 Temperature ranges

Ambient limits : 0 to + 52°C.

Storage limits : - 40 to + 70°C.

5.1.15 Mounting

Flush panel mounting, unless otherwise specified.

5.1.16 Main supply input voltages

The main power supply shall be 110 V-50 Hz, unless otherwise specified, and shall meet IEEE Standard 472 surge withstand capability test, or other equivalent standard.

5.1.17 Operational sequences

Shall be ISA Sequence A, as described in ISA 18.1 "Annunciator Sequences and Specification", unless otherwise specified. See also: IPS-G-IN-260 "Engineering and installation Standard for Alarm & Protective Systems".

5.1.18 Cabinet styles

Shall be as specified in data sheet.

5.1.19 Hazardous area classification

Shall be as specified in data sheet.

5.1.20 Window nameplates

The dimensions of back lighted nameplates shall be as specified, and shall be engraved according to the user legends. Color boots for lamps shall be as specified.

5.1.21 Combination time delay/optical isolator alarm cards

All alarm cards shall be provided with time delay & optical isolator circuits, unless otherwise specified.

5.2 Remote Annunciator Systems

This system shall be same as above, except that the back lighted nameplates and its associated logic cards shall be separated (not mounted in the same place), so cable connectors shall be provided for wiring the lamp and logic cabinets.

5.3 Mosaic Tile Graphic Display Systems

This system shall consist of polycarbonate tiles designed to snap into openings of a thermoplastic grid matrix.

The snap-in tile design allows future field modifications to be made quickly and easily without special tools or skills.

The grid matrix shall be supported in a black metallic frame for wall mounting or flush panel mounting.

The system shall provide a flexible mean of providing passive and active graphic panels or map board (passive graphic panels mean graphic panels which do not include indicating lights, or switches, push-buttons, etc., and active graphic panels mean graphic panels which include indicating lights or switches, push-buttons, etc.). Lines, symbols, maps, etc., shall be painted on back-ground tiles to provide a durable, long-lasting display.

Push-buttons, switches, lamps, meters, etc., shall be factory mounted through tiles to give a professional, finished appearance.

Lamp assemblies for back lighting translucent tiles or lens inserts may be also used.

Electrical devices shall be factory wired to marked screw type terminal blocks.

Thermoplastic grid sections shall be firmly supported at each intersection using a spacer and specially designed junction fastener. Additionally, grid-to-grid clips shall be installed to ensure permanent accurate alignment.

High quality polycarbonate background tiles shall have colors permanently molded-in to provide a stable, durable base for graphic display.

Regarding Standard colors used, reference to be made to: IPS-M-IN-220 "Control Panels".

5.4 High Density Annunciator Systems

5.4.1 General

This system shall have high-density annunciator logic package, designed to be used with remote lamp cabinets.

The lamp cabinets shall have a printed identifying legend for each alarm point. Cards shall be plugged into multi-pin connectors. The card rack shall be equipped with a custom backplane board which contains the required annunciator bus connections and a terminal block for each of the card slots. The terminal blocks shall be provided for field wiring of signal inputs, lamp outputs, and each shall has one terminal for first-out sequence grouping. Two additional multi-point blocks shall provide access to system buses for connecting 24 volts logic power, remote push-buttons and multiple rack interwiring.

5.4.2 Point/flasher card

The point/flasher card shall generate the flash rates for system use. Nominal flash rates shall be four Hertz for fast flash and one Hertz for slow flash. By jumper selection, these rates shall be changed to 2 Hertz and 0.5 Hertz, respectively.

The horn relay contacts shall be brought out to three back plane user terminals and may be used to operate a line voltage horn. Also, an output called "Horn Out" shall appear on one terminal and may be used to operate an electronic audible device, or a relay on the Aux relay card.

The reflash relay shall be used as an input to one point of a Control Room Annunciator (CRA). The CRA point sequence shall be one that will realarm after "Acknowledge" and return to normal.

5.4.3 Input signals

Input signals should be optically isolated. Cards should be suitable for 24 V d.c. unless otherwise specified.

Each input signal shall have its own NO/NC jumper to select normally-open or normally-closed condition.

5.4.4 Point card

This card shall contain logic for multi-points, such as 8 annunciator points and shall be considered "A point-expander" of the basic point/flasher card. Its front face shall have a green power-on LED and red indicator LED’s.

5.4.5 Lamp drives

Transistor lamp drives (250 mA maximum/point @ 24 V d.c.) shall be used for remote lamp operation. The drives can operate lower voltage lamps if the 250 mA rating per point is not exceeded.

5.4.6 Operational sequences

See : 5.1.17.

5.4.7 Annunciator pushbuttons

The annunciator system shall include the operating momentary (spring loaded) pushbuttons for the system. These shall be connected to system buses and additional remote pushbuttons can be connected to the system buses through the back-plane terminals.

The operating pushbuttons shall be:

1) AK, Acknowledge.

2) FR, Flash Reset.

3) FT, Functional Test.

5.4.8 Logic voltage

See : 5.1.3.

5.4.9 System power supply

24 V d.c. or 110 V a.c.

5.4.10 Response time

See : 5.1.8.

5.4.11 Resolution (discrimination) time

See : 5.1.9.

5.4.12 Relay contact ratings

Horn and reflash: 4A @ 250 V a.c. or 30 V d.c. resistive.

Auxiliary relays: 3A @ 250 V a.c. or 30 V d.c. resistive.

5.4.13 Relay isolation

1500 VRMS from contact to Coil (logic voltage), 750 VRMS across open contacts.

5.4.14 Transient protection

Shall be Per IEEE Standard 472 on all signal and power inputs.

5.4.15 Temperature ranges

See : 5.1.14.

5.4.16 Humidity

See : 5.1.13.

5.5 Analog Input Alarm Monitors

5.5.1 General

These monitors shall accept voltage (V), or current (mA) inputs, RTD input (3 wires version), thermocouple (T/C) input, and frequency input 30 Hz to 10 kHz in various wave shapes (sine, triangle, pulse), active voltage drive sensor ±12 V d.c. shall provide analog and relay contact outputs and shall have single and dual set point modules.

5.5.2 Input power

Shall be 24 V d.c. unless otherwise specified.

5.5.3 Isolation

Input/output/line shall be 1500 V RMS.

5.5.4 Termination

Shall be rear mounted customer terminal block, rated 5 Amp, 300 V, maximum. Each terminal shall accept one 2.5 mm2 (14 AWG) wire.

5.5.5 Temperature ranges

See : 5.1.14.

5.5.6 Humidity

See : 5.1.13.

5.5.7 Voltage and current monitor

1) Input impedance: shall be greater than 1 megohm on/off.

2) Input overload voltage: shall be 240 V a.c./d.c. maximum.

3) Zero and span: shall be Adjustable.

5.5.8 RTD & T/C - open detection

Upscale drive, unless otherwise specified.

5.5.9 Relay contact rating

See : 5.4.12.

5.5.10 Relay mode

Shall be field selectable (Normally Energized, or De-Energized).

5.5.11 Set point control

Twenty turn pot front adjustment (0-100% of span).

5.5.12 Dead band adjustment

Twenty turn pot adjustment (0.5-10% of span).

5.5.13 Set point resolution

0.1% of span.

5.5.14 Set point repeatability

0.2% of span.

5.5.15 Response time

See : 5.1.8.

5.5.16 Non-linearity

0.1% of span (not including sensor).

5.5.17 Auxiliary analog output (non-isolated)

An auxiliary analog output may be provided on the rear terminal blocks as an aid to calibration, or for use as an output to drive an external load. This output shall directly follow the input signal over the full span and shall be normalized to certain voltage level such as 0.25 to 1.25 volts for all inputs. The output shall be intended for driving high impedance loads (greater than 1 megohm), or may be used with lower impedance loads at reduced accuracy. This output shall be referenced to system common, and shall be short circuit protected.

6. MICROPROCESSOR BASED ANNUNCIATOR SYSTEMS

6.1 General

This system shall normally provide six capabilities:

1) Standard annunciation.

2) Integral or remote logic architecture.

3) Input/output functions for customer customizing.

4) Meter Set (digital read-out and point selection) analog monitoring.

5) Blind set analog monitoring.

6) Computer interface, such as : RS-422/485/232.

6.2 The Module

Each module shall house cards, terminals, and bus wiring for up to four points or as specified. The light box housing shall be mounted in the front of the module. Nameplates shall be snapped onto the light box. Single, dual, triple and quad nameplate configurations per module as specified, in a choice of colored nameplates or colored filters (behind Standard white nameplates) for color coding. Modules shall be arranged in matrix fashion in flush, wall or rack mounting configurations.

For analog monitoring, a unique two cards system shall enable each module position to be used for any input function, thus permitting field change of annunciator point requirements by simple card substitution or addition.

A sequence card (one or two points per card) shall be located in module slot.

An analog card shall be positioned in another module slot. The analog card shall receive the transducer signal and compares it to predetermined setpoints.

The analog card shall be designed to provide complete input/output and line isolation enabling use of grounded or ungrounded sensors. Internal crossover communication links in the main bus plane shall be provided between adjacent card slots for connection of the sequence and analog card interface. No customer wiring shall be required for the sequence/ analog card set interface. All calibration shall be achieved via front access multi-turn pot adjustments and plugin jack reference read and calibration points.

6.3 The Sequences

Standard single point cards shall utilize custom microchip per card to provide sequence logic and initiate auxiliary functions. Twinpoint cards shall be furnished with two independent circuits per card to eliminate the risk of multiple point loss.

6.4 Input/Output Functions

Several terminals per card position shall be provided for user input/output functions. Integrally mounted input options for dry contacts, transducers, or special signal devices and voltages shall permit user customizing to satisfy practically any input requirement. The capability to accept a variety of input types shall allow the system to directly monitor those variables which previously required an interposing device or were not independently monitored.

Integrally mounted output options (as specified) shall allow the same flexibility in the form of dry contacts, optical couplers, electronic signals and transistor switches for interface to other instrumentation.

Analog input signals from thermocouples, RTDs, load cells (strain gage), thermistors, voltage or current transducers shall be received directly in any combination. The signal shall be monitored by the analog input card which then shall communicate setpoint information to the annunciator sequence card.

6.5 Communication Link System

When specified, the system shall be furnished with communication link systems which allowing full duplex RS- 232/422/485 communication with computer. With this option, computer can show cabinet window displays, event printouts, analog point trending graphs, selective logs, activity lists (status transmission on request), critical lists (priority interrupt transmission), complete analog input point data, etc.

6.6 Remote Logic/Split Architecture

Remote logic chassis, racks and lamp cabinets shall be used for larger systems and limited space applications. Rack mounting in 19" chassis shall house the specified No. of cards. Twinpoint cards, may be specified to permit more points of annunciation in a compact area. Each module in the lamp cabinet shall be divided into as many as eight individual indications for panel space savings and console mounting applications.

6.7 Hazardous Area Classification

Shall be general purpose application, unless otherwise specified.

6.8 Temperature Ranges & Humidity

See Clauses 5.1.13 & 5.1.14.

6.9 Power Supply

See Clause 5.4.9.

6.10 System Logic Voltage

See Clause 5.1.3.

6.11 Indication Light

Nominal 28 V, 40 mA per light/LED.

6.12 Surge Withstand Capability

Signal contact voltages of 24 or higher shall be tested and approved per ANSI/IEEE C37.90 (SWC) or latest revision.

6.13 Radio Frequency Interference Susceptibility

All external wiring shall be shielded, and designed to meet SAMA PMC 33.1- latest revision, class 2, Bands b & c (10 volts per meter from 50 Hz to 1000 Hz).

6.14 Optical Isolation

Optical coupler inputs, shall be used.

6.15 Response Time

See Clause 5.1.8.

6.16 Resolution (Discrimination) Time

See Clause 5.1.9.

6.17 Optional Time Delays (for Input Response)

As specified in data sheet.

6.18 Push-Button Interlock

Operating a push-button out of its proper sequence shall not affect sequence card function.

6.19 Test

Shall be full functional, or lamp test only, as specified, in data sheet.

6.20 Indicating Analog Cards

1) Voltage

1 to 5, V d.c. unless otherwise specified.

2) Current

4 to 20 mA, unless otherwise specified.

3) RTD

100 ohm Pt @ 0°C;10 ohm Cu @ 25°C; 120 ohm Ni @ 0°C; and 100 ohm Ni @ 0°C 2, 3, or 4 wire. (DIN Standard or as specified).

4) Thermocouples

Types J, K, T, E, N, R, B, and S. Cold junction compensation and linearization of output shall be implemented.

5) Thermistor Inputs

Thermistors with linear resistance-temperature curves and repeatability.

6) Response Time

400 ms, except for RTD inputs (2 sec., maximum). Expanded time delays as specified.

7) Sensor Lead Resistance

Voltage monitoring up to 900 ohms. Current monitoring up to 10 ohms (5 ohms for copper RTD).

8) Input Impedance

1 megohm.

9) "Channel" Isolation

Input, output and line isolation provided by on-board power supply and optical couplers.

10) Common Mode Rejection

Analog input to system common, 90 db (0 to 20 kHz).

11) Setpoint Accuracy

± 0.1% of span, or better.

12) Setpoint Adjust

Multi-turn pot with setpoint reading on digital display.

13) Repeatability

± 0.1% of span.

14) Deadband

Standard 1%; optional 0.5, 2, 5, or 10% of span as specified.

15) Digital Indicator

a) Ambient Temperature Stability

½ digit from 0° to 50°C ambient, of the digital indication.

b) Input Line Effect

Less than 0.05% of span for ± 10% change in line voltage.

c) Resolution

± ½ digit.

16) Analog Output Features

Digital meter read-out, annunciator visual and audible alarms and auxiliary outputs (contact, optical coupler or electronic), isolated analog output (1-5 V and/or 4-20 mA linearized), digital output.

a) Actuation Modes

Single High or Low;dual High-High, High-Low, or Low-Low. Up to four setpoints may be used for one input.

b) Meter Read-out

Digital display; °C, °F, or 0 to 100% linear or square root. Engineering units and special ranges shall be as specified.

c) Additional Display Data

Point value, setpoints,display check, point transducer type, point alarm status, point High or Low setpoint, cold junction temperature for thermocouples and lead resistance for RTD_s.

d) Digital Display Accuracy

± 1°C. Microprocessor based with Auto Zero circuit for self-calibration check.

e) Analog Output Accuracy (% of Span)

i) Temperature Stability

± 0.5% of span from 0° to 50°C.

ii) Linearity

± 0.2% of span.

iii) Repeatability

0.2% of span.

iv) Output Impedance

Less than 1 ohm (1 to 5 V).

6.21 Blind Set Analog Cards

Blind set cards (without digital indicator) may be used, if specified. The required specifications shall be same as for indicating cards, with the exception that this card does not have the digital indication.

6.22 System Common Outputs

Annunciator visual and audible alarms and auxiliary outputs (contact, optical coupler, electronic).

1) Flasher/Audible Output Card

Load shall be less than 3 watt.

Flash Rates: Fast flash 4 Hz ± 15%, slow flash 1 Hz ± 15%.

Capacity: 300 points, unless otherwise specified.

2) Remote Auxiliary Relay

Load (Coil): shall be less than 3 watt.

Contact Rating: 4 A @ 250 V a.c. or 30 V d.c. (resistive).

6.23 RS-422/485/232/ Communication Link System

Shall be as specified in data sheet.

7. PROTECTIVE SYSTEMS

7.1 Protective system configuration, sensors, actuators, logic solver, hardware and software shall meet the required SIL class. For material of protective systems selection refer to the following standards:

a) Field Components

Pressure : IPS-M-IN-110

Level : IPS-M-IN-140

Flow : IPS-M-IN-130

Temperature : IPS-M-IN-120

Control Valves : IPS-M-IN-160

b) Logic Systems

PLC : IPS-M-IN-290

Relays : This Standard Para. 7.3.

Solid State : This Standard Para. 5 & 6.

c) Seal Classification & Reliability Analysis: IEC 61508

IEC 61511

7.2 Solenoid Valves

7.2.1 Solenoid operated valves shall be suitable for 110 V A.C /24 V D.C.

7.2.2 All electrical solenoid valve coils shall be encapsulated to protect coils from ambient conditions, per ANSI/- NEMA MG 1-2003 rating is the minimum requirement, or other equivalent standard.

7.2.3 Electrical solenoid operators shall be per ICS 6-1993 (R-2001), or other equivalent standard.

7.2.4 Solenoid coils shall be A.C/D.C. operated with windings insulated to BSEN 60085-2004 Class A, or other equivalent standard.

7.2.5 Instead of flameproof execution, consideration shall be given to intrinsically safe constructions with potted (Hermetically sealed) coils and increased safety terminals, assented for use in division 2 areas.

7.2.6 Manual reset shall be provided for all solenoid valves in safeguarding systems, except for applications where after restoration of the normal situation, no difficulties are encountered, in cases where valves may return automatically to their original position.

In those cases where a manual reset is required this feature shall be incorporated in the electric system by means of an electric push button mounted in a convenient location close to the solenoid valve.

Where mechanical manual reset is required and when special control philosophies are applied, the manual reset device shall preferably be of the push button type in the valve body. External lever arrangements with mechanical latching devices shall not be applied.

7.3 Relay and Relay Boxes

7.3.1 "LED" indicator type relays shall be used. This indicator shall indicate the status of the relay if it is being energized or de-energized.

7.3.2 Relays used to monitor signals for alarm trip shall be relay rack mounted. The signals shall be connected externally across a dropping resistor so that the relay may be replaced without interrupting the process signal.

With special consideration, other packaging may be considered.

7.3.3 The rating of relay contacts feeding external devices, especially inductive loads such as solenoid valves, motor starters, etc. shall be adequate for the specific service.

7.3.4 Relays with time delay action shall have well calibrated setting dials.

7.3.5 Relay boxes shall be totally enclosed, dustproof, suitable for indoor use and equipped with detachable hinged doors. All cable glands shall be suitable for the cables to the box.

7.3.6 The maximum temperature inside the boxes shall not exceed the allowable temperature of the individual components.

7.3.7 Terminal strips shall be of clip-in type.

7.3.8 Internal wiring of relay boxes shall consist of PVC insulated stranded copper wires, 250 V grade, minimum cross section 1 mm^2 (32 × 0.2 mm). Wire ends at terminals shall be provided with suitable compression type wire pins or fork lugs.

7.3.9 The wiring shall preferably be laid in PVC ducting with covering lid.

7.3.10 The color code of wires shall be in accordance with the rules existing in "Transmission Systems" Standard IPS-E-IN-190.

7.3.11 Finish of relay boxes, inside and outside shall be in silver gray.

7.3.12 Each separate sequence control or protective system shall be mounted in one relay box, and be shown on separate drawing. Very simple, small systems may be combined in one box, provided adequate physical separations are made between the systems.

7.3.13 The wiring and relays of control systems of vital equipment with the same duty (e.g. instrument air compressors) shall always be in separate relay boxes.

7.3.14 Relay boxes located in safe areas may contain intrinsically and non-intrinsically safe circuits, provided the wiring and terminals of the intrinsically safe circuits shall be separated as far as practicable and adequately protected from becoming accidentally connected to components and wiring of non-intrinsically safe circuits. See: IPS-E-IN-190 "Transmission Systems".

8. DOCUMENTATION/LITERATURE

1) At Quotation Stage

Suppliers shall provide the following in the numbers requested at the time of quotation:

a) Comprehensive Descriptive Literature.

b) List of recommended commissioning and two years spares with prices.

c) Details of any special tools required with prices.

2) At Ordering Stage

Suppliers shall provide the following in quantities and at times as detailed on the order:

a) List of recommended spares for commissioning and two years continuous operation.

b) Illustrated comprehensive spare parts manual with part numbers suitable for warehouse stocking.

c) Illustrated installation and operating instructions.

d) Maintenance manuals.

Note: The above shall include identification of all proprietary items.

All drawings and literature (must be in the English language and show all dimensions, capacities, etc., in metric units).

The order number shall be prominently shown on all documents. Drawings shall be properly protected and packed.

9. INSPECTION AND TEST

Inspection by user or appointed representative shall consist of but not necessarily be confined to:

1) Visual and dimensional checks.

2) Hydraulic and functional tests where applicable.

3) Certified test reports shall be provided for each instrument.

4) SIL compliance certificate of a testing authority shall be provided as per par. 7.1.14 to 7.1.19 of IPS-G-IN-260.

5) The user reserves the right to reject individual instrument for bad workmanship or defects.

6) For more information, see Standard of: General-Factory inspection and testing of instruments and instrument systems: IPS-I-IN-100(1).

10. PACKING AND SHIPPING

Equipment shall be carefully protected and packed to provide adequate protection during transit to destination and shall be in accordance with any special provision contained in the specification or order.

Special attention shall be given to protection against corrosion during transit.

All bright and machined parts must be painted with a rust preventative.

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 precaution taken to ensure that the items do not come loose in transit or be otherwise damaged.

Instruments having delicate movements and assembled into panels for inspection and test shall be replaced in makers special shock absorbing packages for transit, all connections being marked for remounting in IRAN. Such instruments to be packed in same case as associated panel, but protected by a bulkhead or equivalent packing arrangement.

For more details refer to : IPS-G-GN-210 "Packing and Packages".

11. GUARANTEE

Vendor shall guarantee the following when the instrument is operated in accordance with the written operating instructions.

11.1 Designed performance and quality under conditions per specification.

11.2 Instrument is free from fault in design, workmanship and material to fulfil satisfactorily the operating conditions specified.

11.3 Spare parts guarantee for minimum 10 years and performance guarantee for one year after installation or 18 months after shipment whichever is closer.

12. TRAINING

Training on alarm and protective systems shall be given to all personnel involved in field, to secure safety and optimum operation as required.