MATERIAL AND EQUIPMENT STANDARD

FOR

GENERAL INSTRUMENTATION

FACTORY INSPECTION AND TESTING OF INSTRUMENTS

AND INSTRUMENT SYSTEMS

ORIGINAL EDITION

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1. SCOPE

This Material and Equipment Standard of IPS-M-IN-100 is intended to provide guidance to both the authorized inspector and the manufacturer/supplier for the inspection and testing of all instruments and instrument systems, to be used in Petroleum Industries of Iran.

For those instruments which are included as part of an equipment package, this procedural specification shall be applied in conjunction with IPS-E-IN-280, 'Instrumentation for Equipment Packages'.

2. THE INSPECTION AND TESTING OF INSTRUMENTS AND INSTRUMENT SYSTEMS

2.1 General

Prior to the factory inspection by or on behalf of the Company the manufacturer/supplier shall carry out all the required inspections and tests and if necessary, take corrective actions with full knowledge of the Company to ensure that instruments and instrument systems fulfill the requirements stated in the purchase order.

2.2 Classification of Instruments and Instrument Systems

Instruments and instrument systems are considered in the following categories for the purpose of factory inspection:

- **Category A** - For which factory inspection and or testing are not normally required. However, manufacturer test and calibration reports shall be provided.
- **Category B** - For which factory inspection and testing Shall be carried out.
- **Category C** - For which factory inspection and testing should be carried out.

The Categories A, B and C are listed in Appendix A.

Note:

Appendix A is extracted from IPS-E-IN-100, Part 3.

Instruments and materials for instrumentation have been grouped as shown in Appendix A for the purposes of inspection and testing:

2.2.1 In-line instruments (Table 1, Appendix B)

These are instruments which form part of, or are defined as forming part of, the process pressure piping system, such as control valves, positive displacement and turbine meters, venture and other flow tubes and elements, etc.

2.2.2 On-line instruments (Table 2, Appendix B)

These are those instruments which can be isolated from the process fluids by a valve, such as pressure gages, pressure switches and transmitters, etc.

2.2.3 Off-line instruments (Table 3, Appendix B)

These are all instruments which are not in contact with any process fluid, e.g. receiving-type instruments.

2.2.4 Pre-fabricated instruments (Table 4, Appendix B)

These includes all pre-fabricated instrument equipment, such as console desks, local panels, and system cabinets, etc.

2.2.5 Construction materials (Table 5, Appendix B)

These are materials such as instrument cables, instrument air piping, tubing and instrument impulse lines, etc.

2.3 Types of Inspection

The types of inspection are defined as follows:

- **None** - Where inspection and/or testing is not required, Normal for Category A.
- **Visual** - Each item is visually checked for compliance with the purchase order.
- **Random** - Where 10 to 15% of a batch of items, as selected by the authorized inspector, are fully checked.
- **Full** - This is a visual check, plus a full test for each item of Category B and, where specified, for Category C. In some case a complete test may have to be carried out in few stages of construction at the factory.

Warning:

If, during the random inspection, failures occur in the batch of selected items, the authorized inspector may decide to increase the level of inspection to 100%.

2.4 The Requirements for Inspection

Tables 1 to 5, which are included in Appendix B, are typical examples indicating the requirements for inspection and the parties which will witness such inspection.

Note:

These tables are subject to change based on the inspection plan.

2.5 Spare Parts

When specified in the purchase order, spare parts for the above instruments or instrument systems, comprising either part or complete systems, shall be inspected and tested by the same factory inspection and testing procedures. However, spare components for systems, such as printed circuit boards, etc. need only a 10 to 15% random inspection by the authorized inspector.

3. FACTORY INSPECTION AND TESTING

3.1 General

The purpose of ‘factory inspection and testing’ is to check that the instruments and instrument systems to be supplied comply with the requirements stated in the purchase order.

Before attempting to carry out the inspection and especially the checking of calibrations, the authorized inspector shall check that the factory test equipment, as supplied by the manufacturer/supplier, is suitable for testing the instruments included in the purchase order. The factory shall provide a Calibration Certificate with the Calibration carried out against primary test

equipment.

The manufacturer shall be able to prove that equipment used for calibration is traceable back to national standards, with certificates issued by approved independent laboratories, institutes or other bodies.

The following documents should form the basis of the manufacturer's production system in the order of priority as listed.

1) The purchase order and any subsequent variations.

2) Data/requisition sheets and drawings.

3) The Company's standards.

4) The manufacturer's quotation.

5) The manufacturer's standard specifications.

6) The manufacturer's standard quality control procedures.

Deviations from the above requirements will be allowed only with the written approval of the Company.

Factory inspection shall be witnessed by:

- The Company; for 'in-house' projects.

- The designer; for turn-key projects, either alone or (at the Company's discretion) accompanied by a representative of the Company.

- The designer/Company for other projects, as applicable.

Note:

If, for any reason, the Purchaser waives inspection, this shall not relieve the supplier from the responsibility of repairing at his own cost any defects found.

The Company's and/or the Company's third-party inspector or specialist shall have free entry and access during normal working hours, to those parts of the manufacturer's and/or submanufacturer's premises which are involved in the manufacturing and testing of instruments and instrument systems applicable to the purchase order.

3.2 The Scope of Inspection

The basic scope of inspection will be defined by written notes giving the following information:

- The inspection agency.

- The engineer co-ordinating inspection activity.

- Pre-manufacturing/inspection meeting to be held (if any).

- Type of inspection i.e. running, intermediate, final.

- Requirement for a document review.

- Requirement for an inspection report.

- Any additional information.

Where other disciplines are involved in instrument inspection, the nominated instrument inspector shall have overall responsibility for the release note.

The above instructions will be further clarified by the final inspection plan.

4. THE INSPECTION PLAN

4.1 General

The manufacturer shall provide (with the quotation) a basic document entitled inspection Plan for instrumentation this shall include all instruments and instrument systems which are subject to inspection.

Objectives of the Inspection Plan:

- Establish the inspection activities specified in the purchase order.

- Finalise and agree all inspection and testing procedures by collating the purchaser's and manufacturer's requirements.

- Allow the Purchaser to plan his inspection activities.

-Determine which inspections and tests at manufacturer's/submanufacturer's may or will be attended and by whom.

- Define the activities which will be co-ordinated by the instrument, electrical or mechanical inspectors.

- Establish a yardstick if payment is to be made in installments.

4.2 Types of Inspection Plan

Plan a - The Standard Inspection Plan - the manufacturer's standard inspection and test procedure, as approved by the Purchaser.

Plan b - The Amended Inspection Plan - the manufacturer's standard inspection plan, but with additional requirements of the Purchaser incorporated.

4.3 The Authority and Content of the Inspection Plan

The finally agreed inspection plan, whether it is the standard or the amended plan, shall be accepted as the basic inspection document and, in cases of conflict between documents of the requisition, its requirements shall rule.

The inspection plan shall be signed by both parties, i.e. manufacturer and user and the document shall not be amended without the written agreement of the user.

The inspection plan shall include all references to manufacturer's documents and/or standards.

The inspection plan shall consider the following items as applicable:

a) A clarification or pre-manufacturing meeting.
b) Preparation of a Sub-orders list.
c) Subsuppliers visits.
d) Progress.
e) Inspection-visual and general.
f) Testing (pressure, and electrical insulation).
g) Calibration of instruments.
h) Process stream analysers and/or analyser modules.
i) Programmable Logic Controller (PLC) - function and system check.
j) Safeguarding systems check.
k) Distributed Control System (DCS) check.

l) Process computer system check.

m) Function/performance tests.

n) Control valves.

o) Special procedures (see 3.2).

p) Special documents.

q) Manufacturer's documents.

r) Packing and preservation procedures: This item is also the responsibility of the Materials Department.

For all complex systems such as:

- Equipment Packages.
- DCS.
- PLC (logic systems).
- Process stream analysers/analyser modules.
- Safeguarding systems.
- Blending.
- Tank gaging (computerized).
- Oil movement system (computerized).
- Process computer systems.
- Computer input, output equipment.

The inspection plan include specific functional test procedures, as agreed with the Company.

For standard instrumentation, the manufacturers functional testing procedures should be added to the inspection plan.

4.4 Notification of Inspection

The manufacturer/supplier shall notify the authorized inspector and the user by telex, at least 30 calendar days in advance of the date when the instrument(s) or instrument system(s) will be ready for inspection.

If the user can not attend the inspection, the manufacturer/supplier shall send the results of the necessary contractual control tests to the user.

4.5 Manufacturer's Quality Control Records

On the request of the user, the manufacturer/supplier shall provide a Quality Control Record 'QCR' which shall be available during the intermediate and final phases of the inspection and testing program.

The QCR shall be arranged in a logical sequence, divided into appropriate sections and contain the following:

- The manufacturer's address, telephone, telefax and telex numbers.
- An index and an introduction.
- Material certificates as appropriate.
- Acceptance test details and test report.
- Equipment manual, if applicable.
- Certificates of conformity.
- Design briefs and design approval form.
- A copy of the inspection plan.
- Calibration details of control valves, etc.
- Survey studies.

- A statement of compliance and a manufacturing inspection report, signed by the manufacturer.
- Details of special procedures, such as welding, weld repair, radiography and heat treatment, etc.
- As built drawings.
- Spare parts details.
- Subsuppliers documents, if applicable.

Note:

The above documents either in total or in part as applicable, are usually made up into a Composite Instrument Manual.

5. FACTORY INSPECTION DOCUMENTS

The basic document shall be The Instrument Inspection Report as described below.

This document shall be completed, signed and issued by the authorized inspector within 10 working days after the completion of inspection.

All sheets shall contain Company's purchase order number.

5.1 The Instrument Inspection Report

The instrument inspection report shall cover all the stages of inspection given in the final inspection plan, and the format should be as follows:

5.1.1 A cover sheet

The cover sheet shall contain:

- The type and title of the report.
- Name and address of the manufacturer/subsupplier.
- User's complete purchase order number.
- Requisition number and revision letter.
- Inspection order number.
- Manufacturer's reference.
- Date of report.
- Name and signature of the authorized inspector.
- Approval of the report by the inspectors management.
- Summary.
- Cross-references to other reports.

5.1.2 Table of contents

The following gives a typical example of the table of contents of an inspection report:

- Inspection reference data.
- Statement of Compliance.
- Scope of Inspection.
- Inspection Reference Documents.
- List of Subsuppliers.
- Test and calibration equipments used, test facilities, manufacturer personnel involved.
- Inspection activities/results, (all deficiencies and deviations even if rectified during

inspection should be listed).

- Review of manufacturer's documentation.
- NONA/NCR (Notes of None Acceptance/None Conformance Report).
- Attachments.

5.1.3 Inspection reference data

This shall contain

- Purchase order number.
- Manufacturer's reference number.
- Commodity.
- Instrument tag numbers/identification.
- Quantity.
- Data and number of delegation telex.
- Scope of work indicated in delegation telex.
- Commodity shipment date.
- Original delivery date as stated on purchase order.
- Inspection agency.

5.1.4 Statement of compliance

Stating that the inspected goods meet all the requirements of the purchase order (and agreed deviations) as could be verified by the inspection agency.

5.1.5 Scope of inspection

Summarize inspection activities giving dates of inspection with reference to the inspection plan.

5.1.6 Inspection reference documents

This section shall make reference to all engineering standards drawings, etc. including revision numbers on which final inspection was based.

5.1.7 List of sub-suppliers

This section shall list all subsuppliers and their scope of supply, date of release, report number (if any).

5.1.8 List of calibration equipment

List all calibration equipment used, with serial numbers, personnel involved, etc.

5.1.9 Inspection results

This section shall report in detail all the results of the inspection activities.

5.1.10 Review of manufacturer's documentation

This section shall state that the documentation presented by the manufacturer complies with the purchase order.

5.1.11 Notes of non acceptance (NONA) and non conformance report (NCR)

List all NONA and NCR's issued during the contract together with the resolution and clear reference to the telex or letter.

5.1.12 Attachments to the inspection report

At the final Acceptance Release Inspection the following documents shall be attached to the report.

- The inspection plan.
- Certificate of conformity (design/construction testing).
- Certificate of performance.
- Calibration/test notes.
- Inspection sheets if applicable.
- Certificate of conformance (electrical area classification).
- Letters and/or telexes approving deviations or granting concessions from specifications and or requisitions.
- Minutes of meetings held before and/or during inspection stages.
- Release notes, NONA, NCR's.

5.2 Completion of the Report

If so requested in the order for inspection, a factory Instrument Inspection Report shall be completed by the authorized inspector.

A report may also be issued on final acceptance of sub-orders to the main purchase order. However, this report shall be considered as intermediate and it shall be re-issued as part of the final report. This is particularly applicable in the context of packaged units.

The Instrument Inspection Report shall be completed in five original sets and presented to the Company.

5.3 The Non-Conformance Report

The non-conformance report is a quality assurance related document, for reporting all serious deficiencies in a manufacturer/ supplier's capabilities to supply manufactured items of the required quality, for whatever reason, e.g. quality of work factory organization, test equipment and assistance rendered, etc.

5.4 The Release Note/Note of Non-Acceptance

When the authorized inspector or inspection agency are satisfied that the instruments and or instrument systems comply with the technical requirements and conditions of the purchase order, a release note shall be issued.

The release note is an official contractual document and shall be completed carefully and accurately. The purchase order number shall be clearly readable and the release note shall apply to one purchase order only.

The release note shall be given to the manufacturer/supplier with copies to the user as indicated on the form itself.

APPENDICES

APPENDIX A
EQUIPMENT CATEGORIES

CATEGORY A

Comprising individual items of equipment and separately mounted instruments.

Typical items in this category are:

- transmitters
- recorders
- controllers (including indicating controllers)
- pressure draught/receiving/temperature gages
- installation materials (except for impulse lines containing valves)
- solenoid valves
- plant mounted terminal junction boxes
- switches (manual/receiver and process)
- push buttons
- cables (except system cabling)
- variable-area meters (except for process applications)
- indicators (including receiving indicators)
- diaphragm seals
- manual loading stations
- howlers (HORNS)
- integrators
- pulse counters
- alarm light units
-computing/selecting/limiting/boosting/time relays, CCTV systems
- air filter-reducers
- thermocouple assemblies
- resistance thermometer elements/RTD’s
- detectors
- tank gages
- signal converters
- volume boosters
- load cells
- lock-up/quick exhaust devices
- control drives for dampers
- valve actuators/positioners

(to be continued)

APPENDIX A (continued)

CATEGORY B

Comprising instruments and equipment of a more complex nature, custom built systems or equipment packages.

Typical items in this category are:

B.1 - Field equipment such as:
- local panels
- metering stations
- meter provers

B.2 - Analytical equipment such as:
- sampling systems for process stream analyzer systems
- process stream analysers.

B.3 - System racks for:
- receiver switches
- signal converters
- signal amplifiers
- miscellaneous/auxiliary components.

B.4 - Control room equipment such as:
- control panel and consoles
- alarm systems/alarm service units
- safeguarding systems
- sequential control systems
- relay systems and cabinets
- binary logic systems (all types)
- tank gaging systems
- monitoring systems
- fire, smoke and gas detection systems
- weighing systems
- dosing systems
- blending systems
- sequential event recorder
- multi-point temperature systems
- batch control units or counters
- distributed control systems (DCS)
- programmable logic control systems (PLC)
- multiplexers
- operator consoles
- graphic panels
- prefabricated (system) cables
- interface systems
- computer systems

(to be continued)

APPENDIX A (continued)

CATEGORY C

Comprising in-line mounted instruments and items for instrument impulse lines.

Typical items in this category are:

C.1 - In-line mounted instruments such as:

- orifice plates/restriction orifices
- variable area meters
- special meter runs (e.g for custody transfer)
- turbine/PD meters (including all accessories)
- venture/dall/pitot tubes/flow nozzles
- electromagnetic/vortex/impact/ultrasonic-flow meters
- flow straighteners
- displacer level instruments
- probe-type level instruments
- control valves/safety valves
- pressure/self-acting temperature regulators.

C.2 - Installation materials (for impulse lines) such as:

- manifold blocks.

APPENDIX B
INSTRUMENT INSPECTION REQUIREMENTS AND RESPONSIBILITIES
TABLE 1 - IN-LINE INSTRUMENTS

Item No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Description	Oritica plate/ Restriction oritica	Venture Tubee	Oritica Meter Run	PO Meter / Turbine Meter	Variable area meter	Pitol Tube	Efect mag c/vorsen tmp./ur/esonik TXS	Controk Valve	Emergency depressurisin Emergency Shut down valves	Sequential Control Valves		Probe type Level Instroment	Analyses Sample PROBES	Metering Station	Meter Prover	Weighting / Dosing System	Level Switches (Float Types)	Radio active Level Tex
Type of inspection plan	A	B	B	A	A	A	B	B	B	B		A	A	A	A	A	A	B
Pre – inspection meeting	no	yes	yes	no	no	no	ye	yes	yes	yes		no	no	yes	yes	yes	no	yes
Inspection	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	X
construction	W 2)	W 2)	W 2)	---	---	---	---	W 2)	W 2)	W 2)		---	---	W 2)	W 2)	---	---	---
Quantities	W	W	W	W	W	W	W	W	W	W		W	W	W	W	W	W	W
Appearance	W	W	W	W	W	W	W	W	W	W		W	W	W	W	W	W	W
Accessones	---	---	---	W	---	---	---	W	W	W		---	---	W	W	W	W	W
Dimensions	---	W	W	W	W	W	W	W	W	W		W	W	W	W	W	W	W
Material certificates	R	R	R	R	R	R	R	R	R	R		R	R	R	R	---	R	R
Pressure test	---	W	W	W	W	W	W	W	W	W		---	---	W	W	W	W	W
Calibration	---	---	---	---	---	---	W	W	W	W		---	---	W	W	W	W	W
Pertormance test	---	---	---	R	R	---	---	W	W	W		---	---	W	W	W	---	W
Remarks								1)		1) 5)								3) 4)

LEGEND:

A Inspection Plan type, see (4.2) **B Inspection Plan type, see (4.2)**

R Report review **W Witness**

X Applicable

Notes:

1) For control valves, the requisition shall indicate where vacuum and helium tests are applicable and/or the duties are cryogenic.

2) Construction shall be in accordance with an agreed design and certain constructional details shall be witnessed.

3) All indications of safety aspects shall be checked (e.g. warning plates).

4) Mounting, maintenance and operation instructions shall be checked for compliance.

5) Tight shut-off leak test required.

(to be continued)

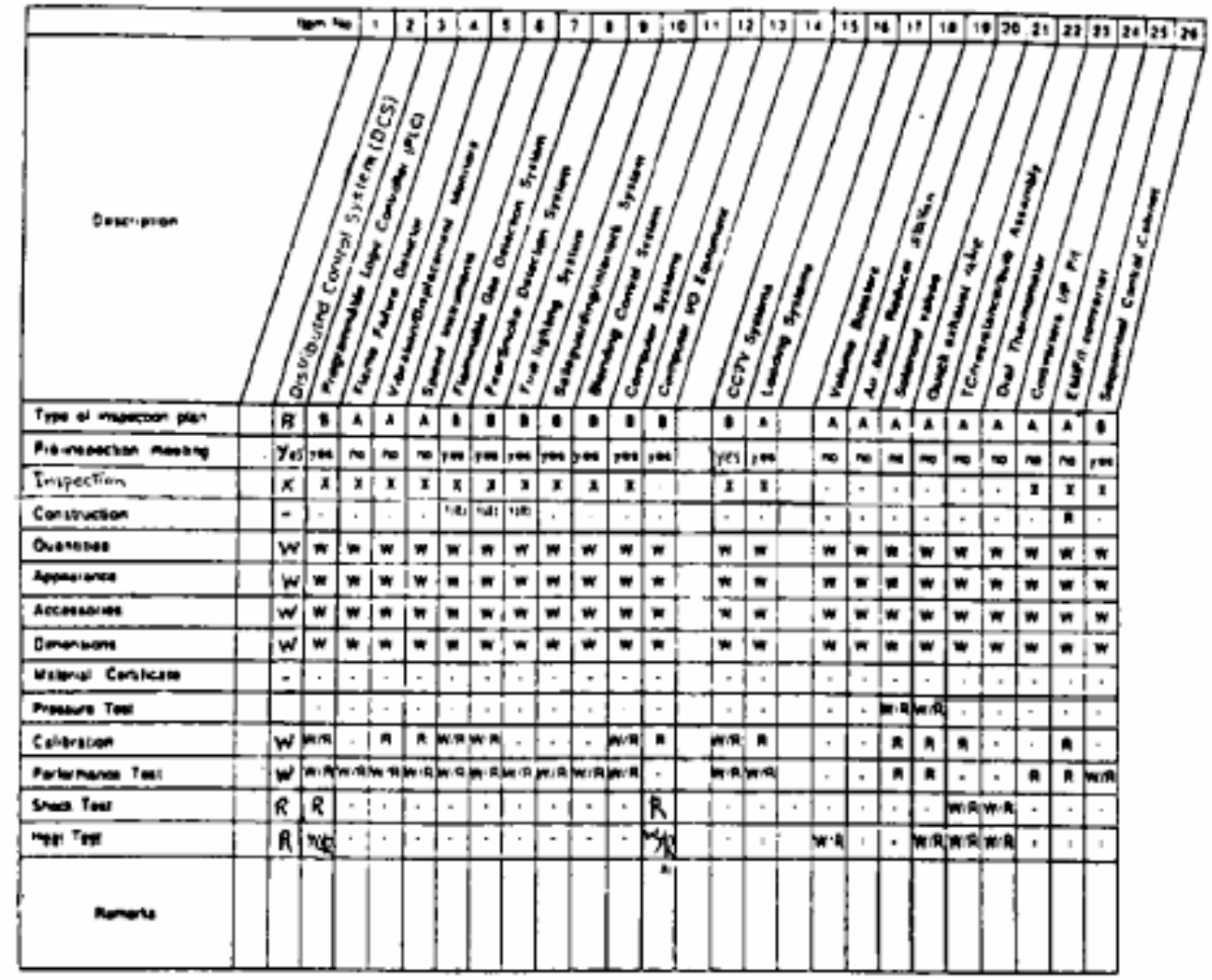
APPENDIX B (continued)
TABLE 2 - ON-LINE INSTRUMENTS

Item No.	1	2	3	4	5	6	7	8	9	10	11	12	13
Description	Differential Press TX FLOM / Press /Level	Pressure TX Local Controllers	Pressure Switches Tempreture	Purge Rotameter assemblies	Tarth gauges	Tempreture TXS	Tempreture Controller	Process Stream System	Analyses Sampling System	Turbine Meter (Insection Type	Analyser Retractable sample probes	Manometers	Displacement level TX
Type of inspection plan	A	A	A	A	A	A	A	B	B	A	A	A	A
Pre – inspection meeting	no	no	no	no	yes	no	no	yes	yes	no	no	no	yes
Inspection	---	---	---	---	X	---	--	X	X	X	X	X	X
construction	---	---	---	---	---	---	---	---	W [2) 3)]	---	W [2) 3)]	---	---
ovantilies	W	W	W	W	W	W	W	W	W	W	W	C/W	W
Appearance	W	W	W	W	W	W	W	W	W	W	W	C/W	W
Accessones	---	---	---		---	---	---	W	W	W	---	---	---
Dimensions	W	W	W	W	W	W	W	W	W	W	W	---	W
Material certificates	R	R	R	R	R	---	---	---	R	R	R	---	---
Pressure test	W	W	---	W	W	---	---	---	W	---	W	X	---
Calibration	W	W	W	---	W	W	W	W	---	W	---	X	W
Pertormance test	W	W	W	W	W	W	W	W	W	W	---	---	---
Remarks	1)	1)	1)	1)	1)								

LEGEND:
A Inspection Plan type, see (4.2) **B Inspection Plan type, see (4.2)**
R Report review **W Witness**
X Applicable
Notes:
1) Certified mill test report (CMTR) for wet parts only.
2) Construction shall be in accordance with an agreed design and certain constructional details shall be witnessed.
3) All indications of safety aspects shall be checked (e.g. warning plates)

(to be continued)

APPENDIX B (continued)
TABLE 3 - OFF-LINE INSTRUMENTS



LEGEND:
A Inspection Plan Type, see (4.2) B Inspection Plan Type, see (4.2)
R Report review W Witness
X Applicable

Notes:
1) Construction shall be in accordance with an agreed design and certain constructional details shall be witnessed.
2) All indications of safety aspects shall be checked (e.g. warning plates).
3) Electromagnetic interference test required.

(to be continued)

APPENDIX B (continued)
TABLE 4 - PREFABRICATED INSTRUMENTS

Item No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Description	Control Desh	Local Panel	System Cabinet	Alarme Service Unit	Auexillery racks	Instruments Cabinets (Conventer Vib . Monitor)	Electrical / Instruments Inter laco Cabinets		Instrument Air Filter Reduce Station	Fire Fighing Detection Cabinet	Gas Detection Cabinet	Alarm Display Panel	Graphic Panel	Fwe and Gas Display panel
Type of inspection plan	B	B	B	B	B	B	B		B	B	B	B	B	B
Pre – inspection meeting	yes	yes	yes	yes	yes	yes	yes		yes	yes	yes	yes	yes	yes
Inspection	x	x	x	x	x	x	x		x	x	x	x	x	x
construction	W [1)]	W [1)]	W [1)]	---	W [1)]	W [1)]	W [1)]		W [1)]	W [1) 2)]	W [1) 2)]	W [1)]	W [1)]	W [1) 2)]
Quantities	W	W	W	W	W	W	W		W	W	W	W	W	W
Appearance	W	W	W	W	W	W	W		W	W	W	W	W	W
Accessones	W	W	W	W	W	W	W		W	W	W	W	W	W
Dimensions	W	W	W	W	W	W	W		W	W	W	W	W	W
Material certificates	---	---	---	---	---	---	---		---	---	---	---	---	---
Pressure test	---	---	---	---	---	---	---		W	---	---	---	---	---
Calibration	---	---	---	---	---	W	---		---	W/R	W/R	---	---	---
Pertormance test	B	---	---											
Remarks														

LEGEND:
A Inspection Plan type, see (4.2) **B Inspection Plan type, see (4.2)**
R Report Review **W Witness**
X Applicable
Notes:
1) Construction shall be in accordance with an agreed design and certain constructional details shall be witnessed.
2) All indications of safety aspects shall be checked (e.g. warning plates).

(to be continued)

APPENDIX B (continued)
TABLE 5 - CONSTRUCTION MATERIALS

Item No.	1				2	3	4	5	6	7	8			9
Description		(Electrical Signal) Cables	(power System) Cables	(T/C Extention) Cables	System Cables	Wiring Materials	Instruments Air Tubing Materials	Cable Trunling	Cable Tryrs	Fjeld Junction Boxes	impise Line	Compression Fin mge	Fronge Couplings	Equalities Manifolds
Type of inspection plan		A	A	A	A	A	A	A		A	A	A	A	B
Pre – inspection meeting		no	no			no	no	no		no	no	no	no	no
Inspection		---	---	---	---	---	---	---		---	---	---	---	---
construction		---	---	---	---	---	---	---		---	---	---	---	---
Quantities		W	W	W	W	W	W	R	R	W	W	W	W	R
Appearance		W	W	W	W	W	W	R	R	W	W	W	W	R
Accessones		W	W	W	W	---	---	---	---	R	---	---	--	---
Dimensions		W	W	W	W	---	W	R	R	W	W	W	W	R
Material certificate		---	---	R	R	---	R	R	R	---	---	R	R	R
Pressure test		---	---	---	---	---	R	---	---	---	R	R	R	R
Calibration		---	---	---	---	---	---	---	---	---	---	---	---	---
Pertormance test		---	---	---	---	---	---	---	---	---	---	---	---	---
Remarks														

LEGEND:
A Inspection Plan type, see (4.2)
B Inspection Plan type, see (4.2)
R Report review
W Witness
X Applicable

APPENDIX C

TYPICAL ABBREVIATIONS FOR TAG NUMBER TITLES EQUIPMENT CODING

ABBREVIATION	FULL TEXT
ADP	Alarm display panel
ADU	Alarm display unit
ANC	Analyzer cabinet
ASU	Alarm service unit
BCC	Basic controller cabinet
BLC	Blending cabinet
CC	Converter cabinet
CIC	Computer interface cabinet
CPU	Central processing unit
CCTVC	Closed circuit television cabinet
DMA	Direct memory access
EC	Earthing cabinet
ESD	Emergency shut down
FFC	Fire fighting cabinet
FGDC	Fire & gas detection cabinet
FGDDP	Fire & gas detedtion display panel
FMC	Flow metering cabinet
GDC	Gas detection cabinet
IC	Instrument console
JE	Junction box-electric singles
JEI	Junction box-intrinsic safe signals
JP	Junction box-pneumatic signals
JPT	Junction box-plant telecommunication signals
JT	Junction box-thermocouple signals
LP	Local panel
OPS	Operator station
PIU	Process interface unit
RC	Riser cabinet
SCS	Sequency control system
SER	Sequentional event recorder
SSC	Safeguarding system cabinet
TEC	Telemetering cabinet
TGC	Tankgaging cabinet
UDP	Utility display panel
UPS	Uninterrupted power supply

APPENDIX D

STANDARD ABBREVIATIONS FOR SERVICE DESCRIPTIONS

ABBREVIATION	FULL TEXT	ABBREVIATION	FULL TEXT
ABS	Absorber	DCR	Demetallic catalyst regeneration
ACCU	Accumulator	DEAER	De-aerator
ALKYL	Alkylation	DEBALL	Deballasting
AROM	Aromatic	DEBUT	Debutanizer
ATM	Atomsphere	DECOK	Decoking
AUX	Auxiliary	DEETH	De-ethanizer
AVTURB	Aviation turbine	DEM	Demineralized
BCIRC	Bottom circulation	DEPENT	Depentanizer
BD	Blowdown	DEPROP	Depropanizer
BENZ	Benzene	DESALT	Desalter
BFW	Boiler feed water	DET	Detection
BL	Battery limit	DEXYL	Dexylenation
BLEND	Blender	DIFF	Differential
BOOST	Booster	DISCH	Discharge
BPA	Bottom pump-around	DISPL	Displacement
BTM	Bottom(s)	DIST	Distillate
BTX	Benzene-toluene-xylene	DISTR	Distribution
BYP	By-pass	DSH	Desuperheater
CAT	Cayalyst or catalytic	DW	Domestic water
CDU	Crude distilling unit	EJ	Ejector
CHRG	Charge	EMERG	Eemergency
CHW	Chilled water	EXCH	Exchanger
CIRC	Circulation	EXTR	Extractor
COAL	Coalescer	FAIL	Failure
COL	Column	FF	First failure group
COMB	Combustion	FG	Fuel gas
COMPR	Compressor	FLUSH	Flushing
COND	Condenser, condensate	FO	Fuel oil
CONT	Continuous	FRACT	Fractionator
CONV	Converter	FURN	Furnace
CW	Cooling water	FW	Feed water
CYCL	Cyclone	GO	Gas oil
HDA	Hydrodealkylation unit	HC	Hydrocarbons
HDM	Hydrodemetallization unit	HCR	Hydrocracker
HDS	Hydrodesulphurizer	LUB	Lubrication
HEAD	Header	MAX	Maximum
HEX	Hexane	METH	Methanizer
HGO	Heavy gas oil	MGO	Medium gas oil
HI	Hight	MIN	Minimum
HMU	Hydrogen manufacturing unit	MOL	Molecular
HP	High pressure	MOS	Maintenance override switch
HPU	Hydrogen purification unit		
HS	High sulphur	MP	Medium pressure
HT	Hydrotreater	MVAC	Mild vacuum
HTR	Heater	NAPH	Naphtha
HVU	High vacuum unit	NG	Natural gas
HYDR	Hydrolic	NNF	Normally no flow
H_2	Hydrogen	N_2	Nitrogen

(to be continued)

APPENDIX D (continued)

ABBREVIATION FULL TEXT ABBREVIATION FULL TEXT

ABBREVIATION	FULL TEXT	ABBREVIATION	FULL TEXT
INJ	Injection	OOS	Operational override switch
INL	Inlet	OUTL	Outlet
INSTR	Instrument	OVHD	Overhead
INT	Internal	O2	Oxygen
INTERF	Interface	PLATF	Platformer
INTM	Intermediate	PP	Personal protection
KERO	Kerosine	PREFL	Preflash
KO	Knock-out	PREM	Premium
LGO	Light gas oil	PRESS	Pressure
LH	Lock hopper	PRETR	Pretreater
LIQ	Liquid	PROD	Product
LO	Low	PUR	Purification
LP	Low pressure	PW	Potable water
LPG	Liquefied petroleum gas	RAFF	Raffinate
LR	Long residue	RDC	Rotating disc contactor
RECONT	Recontacting	REACT	Reactor
RECOV	Recovery	REB	Reboiler
RECY	Recycle	REC	Receiver
RED	Reducer	TWR	Tower
REF	Refinery	VAC	Vacuum
REFL	Reflux	VAP	Vapor
REFRIG	Refrigeration	VIBR	Vibration
REG	Regular	VISB	Visbreaker
REGEN	Regeneration	VGO	Vacuum gas oil
RES	Residue	VLV	Valve
RUND	Rundown	WHB	Waste heat boiler
SAMPL	Sampling	WTR	Water
SD	Shutdown	XYL	Xylene
SEP	Separator		
SEU	Sulfolane extraction unit		
SIGN	Signal		
SOL	Solution		
SOLV	Solvent		
SPLIT	Splitter		
SR	Short residue		
SRU	Sulphur recovery unit		
STAB	Stabilizer		
STM	Steam		
STOR	Storage		
STR	Stream		
STRIP	Stripper		
SUCT	Suction		
SUPERH	Superheater		
SWS	Sour water stripper		
SYST	System		
TCIRC	Top circulation		
TEMP	Temperature		
TK	Tankage		
TOL	Toluene		
TPA	Top pump-around		
TURB	Turbine		