



**HELLENIC GAS
TRANSMISSION
SYSTEM OPERATOR**

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**TECHNICAL JOB
SPECIFICATION**

970/2.2

REVISION 0

DATE 12/10/2011

LNG PLANT

SHOP INSPECTION OF EQUIPMENT AND MATERIALS FOR LNG PROJECT



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CHANGES LOG

REVISIONS LOG

0	12-10-2011	FIRST ISSUE	PQ DPT	VG
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1.0 SCOPE

1.1 This specification defines the Owner's scope of shop inspection of equipment and materials required for the subject Project.

2.0 GENERAL

2.1 The requirements of this specification do not supplant or negate the vendor's responsibilities as defined in the material requisition and applicable codes, specifications and standards, nor as required by governing statutory regulations.

2.2 Owner reserves the right to modify his inspection as he deems necessary. If any non-conformance is identified, the extent of inspection may be adjusted at the discretion of the Owner.

2.3 Owner reserves the right to authorise an Independent Inspection Authority to perform shop inspection on its behalf.

2.4 OWNER has the option of attending all tests and inspections. Vendor shall be required to give six days advance notice that the equipment will be available for test on a specified date. Additionally the test certificates and equipment dossiers, as applicable, shall be made available for OWNER'S inspection and checking at the same time.

2.5 The following inspection percentages are related to the quantity of the items of equipment and materials on this project and are not intended to indicate the degree of inspection to be performed.

2.5.1 Where 100% inspection is specified, each item will be inspected but not necessarily each component making up the item.

2.5.2 Where 10% inspection is specified, only 10% of the total quantity purchased on each order will be inspected. If these are satisfactory, no further inspection will be made. In the case of bulk orders, the percentage inspection will be carried out at intervals throughout the period of delivery, not by carrying out one inspection to inspect say 10% of the order quantity.

2.6 Any non-standard inspection considered necessary for special items with unusual manufacturing features will be called up in the particular Material Requisition. In the event of conflict between this specification, a specific job specification or a requisition, they shall govern in the following priority:

Material Requisition

Specific DESFA Job Specification

This DESFA Job Specification

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- 2.7 Whenever purchased equipment includes components of a different category to the primary category under which it is listed herein, then these components shall be inspected to the extent defined in the paragraphs of this specification relating to these components.

In particular, this applies to package units and Vendor of Assembled Units, where Vendor of a piece of major equipment is required to carry out shop assembly of other associated components.

- 2.8 In the event that equipment is found to be unsatisfactory or not in compliance with the drawing or specification (rejection notice) special rectification procedures shall not be put in hand before a corrective procedure has been submitted and approved (clearance of the rejection notice).
- 2.9 For the purpose of this specification cryogenic service refers to liquefied natural gas or natural gas vapors processed at temperatures between minus 73 degrees C and minus 199 degrees C.

3.0 DEFINITIONS

Witnessing (W)

By witnessing is meant that the inspector is physically present during the action being witnessed. For testing successfully performed and witnessed by the inspector, certificate will be issued and signed by the inspector or the manufacturer's test protocol will be endorsed by the inspector having attended the test.

Monitoring (M)

By Monitoring is meant that the inspector at least temporarily attended a test or personally satisfied himself that the correct testing procedure was followed and the particular testing equipment was in proper working condition.

All relevant technical documents will be endorsed by means of signature and stamping by the inspector.

Reviewing (R)

Technical documents issued by third parties (manufacturers, subcontractors, other organizations) are reviewed by the inspector in order to check whether their contents apply to the project under consideration and/or are adequate. Every document Reviewed by the inspector will receive the "Review" stamp.

4.0 PRE-INSPECTION MEETING

- 4.1 For all major items of equipment and for fabricated piping a pre-inspection meeting shall be convened at the vendor's works as soon as possible after:

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- i) The vendors manufacturing quality plan has been reviewed by the Owner.
- ii) The major aspects of design have been agreed between the Owner and the vendor.
- iii) Major sub-orders have been sourced by vendor.

4.2 The purpose of the pre-inspection meeting shall be to:

- i) Review the requirements of the material requisition and attachments.
- ii) Review the programme for the work.
- iii) Review and discuss the extent and degree of inspection to be undertaken by the Owner.
- iv) Review the vendor's manufacturing quality plan.
- v) Agree procedures for the co-ordination of the Owner's inspection and that of any independent inspection authority.

5.0 FABRICATED EQUIPMENT GENERAL

5.1 The following requirements shall apply to pressure retaining fabricated equipment e.g. towers, drums, tanks, heat exchangers etc.

5.2 Materials for Cryogenic Service

All materials of construction in cryogenic service shall be inspected by the Owner's inspector at the plate mill, foundry or forge master:

- i) Mechanical tests shall be witnessed. Particular attention shall be paid to impact testing and Crack Opening Displacement (COD) testing when specified.
- ii) Material test reports shall be checked against specified requirements for:
 - Chemical analyses
 - Physical properties
 - Final heat treated condition
 - NOT
- iii) Ultrasonic examination of all primary component plate material shall be witnessed where specified.
- iv) No repair welding of plates or components shall be carried out without prior approval of the Owner.



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- v) All material shall be 100% visually examined for surface irregularities.

5.3 Materials for Non Cryogenic Service

The Owner's inspector shall carry out the following inspections in the vendor's works:

- i) Identify all materials of construction against the relevant mill test reports.
- ii) Check thickness.
- iii) Check the mill test reports against the specified requirements for:
 - chemical analyses, physical properties, final heat treated condition and NDT.
- iv) Check that alloy verification, when specified has been carried out to the correct procedure and that the results are within specification.

5.4 Welding for all items

Welding for all items

Before the commencement of any welding the Owner's inspector shall:

- i) Check that the Welding Procedures Specifications (WPS) and the Procedure Qualification Records (PQR) have been reviewed by the Purchaser.
- ii) Check that the welders to be employed have been qualified to the respective WPS.
- iii) Ensure the implementation of approved WPS in actual welding.
- iv) Major repairs shall be subject to the Owner's review of WPS and PQR.

5.5 Fabrication for items in Cryogenic Service

- i) The Owner's inspector shall control the following operations by monitoring:
 - Material traceability and transfer of markings.
 - Back gouging prior to the welding of the second side.
 - Welding methods and consumables.
 - Thickness of materials
 - Edge preparation and fit up of seams and the set up of nozzles and attachments.
 - Profile of dished and formed components.
 - Finished welds.

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- ii) The Owner's inspector shall witness the following operations :
- All NOT including specified ultrasonic inspection of materials and welds.
 - Ferrite testing of austenitic materials and welds.
 - Hardness checks of completed welds and heat affected zones.
 - Alloy verification of austenitic welds.
 - Impact testing or weld metal on a lot basis.
 - Testing of production test plates and verification of results.
 - Pneumatic pressure tests including reinforcing pads.
 - Hydrostatic pressure tests.
 - Proof tests if specified.

5.6 Fabrication for Non Cryogenic Service

- i) The Owner's inspector shall control the following operations by monitoring:
- Material Traceability and transfer of markings.
 - Edge preparation and fit up.
 - Back gouging prior to the welding of the second side.
 - Welding methods and consumables.
 - All NOT before PWHT and after PWHT where specified.
 - Thickness of materials
 - Profile of dished and formed components.
 - Finished welds.
- ii) The Owner's inspector shall witness the following operations :
- Testing of production test plates and verification of results.
 - Pneumatic pressure tests including reinforcing pads.
 - Hydrostatic pressure tests.
 - Proof tests if specified.
 - Alloy verification if specified.

5.7 Documentation for all Items

The Owner's inspector shall verify the following by review of the vendor's documentation/certification on a progressive basis.



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- i) Use of procedures reviewed by the Owner for: Welding, NDT, Radiography, PWHT and Alloy Verification.
- ii) Material certification.
- iii) NDT certification.
- iv) PWHT charts
- v) Pressure test certification
- vi) All radiographs

5.8 Visual and Dimensional examination for all Items

The Owner's inspector shall carry out a visual examination and a dimensional check against final certified drawings. The dimensional check shall include as a minimum:

- i) Tangent to tangent dimensions,
- i i) Circumference.
- iii) Skirt/saddle fixing locations.
- iv) Elevation and orientation of connections.
- v) Elevation and orientation of clips.
- vi) Connection details i.e. type, size, rating and flange face finish.

5.9 Miscellaneous for all items

The "Owner's" inspector "shall witness" and check trial assemblies of internals and accessories. He shall also examine and witness thickness and continuity checks on non metallic linings.

5.10 Painting for all items

The Owner's inspector shall witness surface preparation, verify that the specified painting procedures have been complied with and check finished paint thicknesses.

5.11 Shipment for all items

The Owner's inspector shall check that the equipment has been correctly prepared for shipment.

5.12 Data Books for all items

The Owner's inspector content and completeness shall check the data books for and sign for his acceptance.

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6.0 SEAWATER VAPORIZERS (OPEN RACK TYPE)

The requirements of section 5.0, "Fabricated Equipment General" shall apply, particularly as it relates to items in cryogenic service.

These requirements are supplemented by the following:

SUBJECT	EXTENT/REMARKS	ACTION
<u>Materials</u>		
Visual inspection	100% examination of the outer tubes and of the turbulators	M
NDT	All	W
<u>Welding</u>		
Qualification of weld procedures	Special attention must be given to the simulation of any close nesting of tube welds to manifolds	R

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SUBJECT	EXTENT/REMARKS	ACTION
<u>Fabrication</u>		
Steel structures	Construction and sub-assembly	W
Fabricated pipework	As per appropriate section of this specification	
Visual and dimensional check Note (1)	Any trial sub assembly / erection of components	W
Pressure Test		W
Documentation / Certification		R

Note: (1) Dimensional check shall include:

- Overall dimensions
- Fixing locations
- Elevation and orientation of field connections
- Elevation and orientation of clips for field fixing
- Connection details i.e. type, size rating and flange face finish.

ABBREVIATIONS:

W = Witness
M = Monitor
R = Review

7.0 SUBMERGED COMBUSTION VAPORIZERS

The requirements of section 5.0 "Fabricated Equipment General" shall apply, particularly as it relates to items in cryogenic service.

These requirements are supplemented by the following:

The following shall receive final inspection:

- Burner assembly
- Control panels
- Electric motors > 110 KW
- Blowers
- Pumps
- Exhaust Gas Coolers

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SUBJECT	EXTENT/REMARKS	ACTION
Materials / Welding / Fabrication	In accordance with section 6.0	
Pressure test		W
Functional test		W
Visual and dimensional check (Note 1)		W
Final assembly		W
Documentation / certification		R

Note: (1) Dimensional check shall include:

- Overall dimensions.
- Fixing locations.
- Elevation and orientation of field connections.
- Elevation and orientation of clips for field fixing.
- Connection details i.e. type, size, rating and flange face finish.
- Type, size and location of field electrical connections.
- Type, size and location of field instrumentation connections.

(2) Other sub ordered items shall be visually inspected by the inspector at the main vendor's works against certification prior to their assembly into the main package.

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8.0 PRESSURE VESSELS – DRUMS

The requirements of section 5.0 "Fabricated Equipment General" shall apply.

9.0 FUEL GAS HEATER

The requirements of section 5.0 "Fabricated Equipment General" shall apply as it relates to the fabrication of the pressure shell. The following requirements shall also apply to the Fuel Gas Heater:

SUBJECT	EXTENT/REMARKS	ACTION
Visual inspection	Electrical element prior to its inspection with the shell	W
Inspection of the element into the shell		W
Hydrostatic test	The element to tube sheet joints	W
Gas leak test	The element to tube sheet joints	W
Wiring continuity check		W
Megger check		W
Control panel	Visual inspection against certified drawings	W
Dimensional inspection (Note 1)		W
Data books		R

Note: (1) Dimensional check shall include:

- Size, type and location of field electrical and instrumentation connections.

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10.0 TANKS (OTHER THAN LNG STORAGE TANKS)

This section applies to shop fabricated bottomed cylindrical fixed roof tanks.

SUBJECT	EXTENT/REMARKS	ACTION
Materials and construction		R
Weld procedures and qualifications		R
NDT procedures and results		R
Pneumatic test		W
Hydrostatic test		W
Visual and dimensional check	Against certified drawings	W
Painting	Paint thickness Procedures	W
Shipment		W
Data books		R

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11.0 LNG STORAGE TANKS

The requirements of section 5.0 "Fabricated Equipment General" shall apply, particularly as it relates to items in cryogenic service. These requirements are supplemented by the following:

SUBJECT	ACTION
Inspection Coordination Meeting	-
WPS & PQR check	R
Inspection of materials for use (plates, pipes, etc.) on mill	W
Inspection of materials at Contractor's shop, including Materials not mill inspected	M
Inspection of materials during field fabrication (plate edge preparation, thickness measurement etc.)	W
Check of NDT	W
Check of Weld Hardness examination	W
Check of C.O.D. examination	W
Check of repairing procedure records	R
Dimensional check of tanks (including Tank pad levelness, flatness of bottoms / roofs, joint offsets, etc.)	W
Inspection of suspended deck roof components	M
Inspection during Hydrostatic Test phase	W
Inspection of Tank clean-up as well as, nitrogen purging and drying	M
Inspection of painting application	W
Check of proposed quality control and testing procedures of Contractor for insulation application	R

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SUBJECT	ACTION
Inspection during production of manufacturer's shop of:	M
- Compression blanket	
- Perlite	
- Foam glass	
- Polyurethane Foam	
- Perlite Concrete Blocks	
- Etc.	
Inspection of above materials during and / or prior to installation in the field	M
Data Books	R

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12.0 SHOP FABRICATED PIPING

The requirements of section 5.0 "Fabricated Equipment General" shall apply. These requirements are supplemented by the following:

SUBJECT	EXTENT/REMARKS	ACTION
<u>Materials</u>	In accordance with para. 5.3 for materials in cryogenic service	
<u>Fabrication</u>		
Limitation of weld bead penetration		M
Visual and dimensional check	On a random selection of completed spool pieces	W

ABBREVIATIONS:

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13.0 ROTATING MACHINERY

The following shall be inspected by the inspector at sub-vendor's works:

- Lube Oil and Seal Oil Consoles
- Pulsation dampeners
- Control Panels
- Console pumps and drivers
- Fabricated pipework
- Electric motors 110 KW and larger
- Drivers (Diesel engines, gas turbines etc.)

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Inspection shall be carried out in accordance with the relevant sections of this specification. Other sub-ordered items shall be visually inspected by the inspector at the main vendor's works against certification prior to their assembly to the main equipment.

The following "requirements" shall apply to rotating machinery e.g. pumps, compressors, turbines etc.

SUBJECT	EXTENT/REMARKS	ACTION
<u>Materials</u>	Castings and forgings in cryogenic service shall be inspected at the foundry or forgemaster	
Mechanical tests		W
WPS and PQR		R
NDT		W
Material test reports	Chemical analyses, physical properties, final heat treated condition, NDT	
Visual and dimensional examination		M
<u>Materials</u>	Other materials of construction	
Materials against test reports		W
Check thickness		W
Materials test reports		R
<u>Welding</u>		
WPS & PQR	For Major weld repairs of castings. Welding in Cryogenic Service	R

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SUBJECT	EXTENT/REMARKS	ACTION
<u>Manufacturing</u>		
Machining and finish of main components		M
Welding methods and consumables		M
NDT and PWHT		M
Bearings and clearances		W
Cleaning and drying our		W
Pressure and / or gas testing	For pressure retaining castings and forgings after final machining	W
Static and dynamic balancing of rotors		W
Installation of rotor (compressors and turbines only)		W
Mechanical test		W
Functional test and NPSH tests		W
Strip examination		W
Noise control tests		W
Visual and dimensional inspection (Note 1)		W
Data books (Note 2)		R
Painting	Surface preparation, procedures, finished paint thicknesses	W
Shipment		W

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Note: (1) The dimensional check shall include:

- Overall dimensions.
- Base plate fixing details and locations.
- Elevation and orientation if structural field connections.
- Nozzle connection details i.e. type, size, rating and flange face finish.
- Type, size and location of field electrical connection.
- Type, size and locations of field instrumentation connections.
- Lining up of the equipment.

(2) Inspector shall verify the following by review of the vendor's documentation / certification.

- Use of procedures reviewed by the purchaser for Welding, NDT, Radiography, PWHT, Alloy verification, Mechanical testing, Functional testing and Strip Examination.
- Material certification
- NDT certification
- PWHT charts
- Pressure test certification
- All radiographs
- Electric motor certification

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13.1 SUBMERGED LNG PUMPS

The following shall also apply:

SUBJECT	EXTENT/REMARKS	ACTION
NDT	After final machining of pump components	W
Balancing of rotating components	All rotating components shall be balanced dynamically prior to the assembly of the rotor	W
Inspection of the pumps columns	In accordance with section 5.0	
All testing to demonstrate correct operation of foot valves		W
Cryogenic cables		W
Full functional testing at operating temperature	On the first pump of each type	W
"Dummy pump" testing		W
Fault level tests of cryogenic cable		W

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14.0 FLARE STACKS

The requirements of section 5.0 shall apply. These requirements are supplemented by the following:

The following items shall receive final inspection at the sub-vendor's works.

- Flare tips
- Molecular seal
- Flame Front Generators

SUBJECT	EXTENT/REMARKS	ACTION
Pressure Test		W
Functional test		W
Visual and dimensional examination	During visual inspection, inspector shall check that the base ring is flat and square as aligned to the transition	W
Shipment	Where the stack is to be shipped in several sections the inspector shall witness the shop fit up and watch marking of adjacent sections	W

ABBREVIATIONS:

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15.0 SPECIAL EQUIPMENT

15.1 Loading Arms

The requirements of section 5.0 shall apply. These requirements are supplemented by the following:

SUBJECT	EXTENT/REMARKS	ACTION
Functional Test	For the complete equipment together with its control systems	W

15.2 Nitrogen Storage / Vaporizing Package

The requirements of section 5.0 shall apply. These requirements shall be supplemented as follows:

SUBJECT	EXTENT/REMARKS	ACTION
Trial fitting of plates and match marking		W
L.P. and H.P. Nitrogen pumps	In accordance with section 13.0	
Functional test of control systems		W
Trial erection of ladders, stairways and platforms		W

15.3 Seawater Filters – Instrument Air Dryer – Air Receiver

The requirements of section 5.0 "Fabricated Equipment General" shall apply.

15.4 Other special equipment

Following equipment will receive final inspection:

- Seawater Intake Screens
- Seawater Chlorination Package
- Cooling Water Conditioning Package
- Chemical Injection Package(s) Final inspection shall include:

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SUBJECT	EXTENT/REMARKS	ACTION
Material identification	Against specified requirements and mill test reports	W
Radiographs		R
Pressure test		W
Functional test		W
Dimensional test		W
Painting and preparation for shipment		W
Data books	NDT, Radiography, PWHT	R

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16.0 ELECTRICAL EQUIPMENT

The following equipment shall receive final inspection.

- Motors
- Electric generators
- Switchgears
- Circuit breakers
- Motor control centers
- Transformers
- Cables
- Instrument and emergency power supplies and battery systems
- Communications, Aut. Controls, Fire Alarm and Electroacoustical Systems

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16.1 Motors – Electric generators

Motors 110 KW and larger, inspection will be 100%.

Motors below 110 KW will be inspected only if it is specified in the material requisition.

All submerged motors, inspection will be 100%.

All Electric generators, inspection will be 100%.

Final inspection shall include:

SUBJECT	EXTENT/REMARKS	ACTION
Tests	Specified on the requisition data sheet and/or referenced specification	W
Visual and dimensional examination	Against final certified drawings	W
Check of completeness	Check for completeness of vendor's works and availability of all component parts and accessories	W
Certification (Note 1)	For all components including type tests and type of protection	R

Note: (1) For motors to be installed in hazardous locations review certificates of conformity to standards for ex-proof equipment. The certificates must be an international or national recognized testing organization.

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16.2 Switchgears – Circuit breakers – Motor Control Centers

H.V. and L.V. switchgears, bus ducting, circuit breakers rated above 600 Volts, motor control centers and associated relay panels, inspection will be 100%.

Inspection shall include:

SUBJECT	EXTENT/REMARKS	ACTION
Full operational tests	For local / remote control and indications, interlocking re-acceleration, automatic transfer schemes and protective relays	W
Routine tests		W
Check of alignment and tightness	For connections and joints(on an spot basis)	W
Check of safety and operational interlocks	On a spot basis	W
Visual and dimensional examination	Against requisitions, standards, specifications and drawings	W
Check of completeness		W
Certification	For all components including type tests and type of protection	R

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16.3 Transformers

No inspection of transformers 500 KVA and below.

100% inspection of transformers above 500 KVA, of transformers with primary voltage rating above 15 KV and of transformers with on-load tap-changer.

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SUBJECT	EXTENT/REMARKS	ACTION
Routine tests		W
Check correct operation of tap-changing equipment and protective and indicating devices		W
Visual and dimensional examination	Against requisitions, standards, specifications and drawings	W
Check of completeness		W
Certification	For all components including type tests	R

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16.4 Cables

For cables inspection will be min 10%. In general cables will be subject to inspection to the extent necessary to ensure vendor conformance to the requirements of the material requisition, standards, specifications and drawings.
In addition:

SUBJECT	EXTENT/REMARKS	ACTION
Routine tests	For operation and dielectric tests and the tests described in the Mat. Requisition. Also for fire-proof and for non-propagating cables	W
Certification	Including type tests for special purpose cables	R

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16.5 Instrument and emergency power supplies and battery systems

On single items of vendor's standard equipment there will be no inspection. UPS and Rectifiers will receive 100% inspection. On custom built equipment inspection will be 100%.

Inspection will consist of the following:

SUBJECT	EXTENT/REMARKS	ACTION
Routine tests	For operational and dielectric tests	W
Visual and dimensional examination	Against requisitions, standards, specifications and drawings	W
Check of safety and operational interlocks	On a spot basis, particularly supply transfer schemes and test switching	W
Check of completeness		W
Certification	For all components including type tests	R

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16.6 Communication, Aut. Control, Fire Alarm and Electro-acoustical systems

On single non-interconnected systems there will be no inspection.
 On multiple packages inspection will consist of the following:

SUBJECT	EXTENT/REMARKS	ACTION
Check of all controls, channel frequencies and inert-system facilities		W
Dimensional check	On items supplied as loose equipment for accommodation by others	W
Certification	As called in the requisition	R

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W = Witness
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17.0 INSTRUMENTATION EQUIPMENT AND SYSTEMS

The following equipment shall receive final inspection:

- Automatic Cryogenic Tank Gauging (including level switches displacer type).
- Cryogenic Tank Level, Temperature and Density Monitoring Systems.
- LNG TANKS/Civil monitoring system
- DCS System, ESD System, Control Panels and Operator Consoles (Note 1)
- Closed circuit TV system - Analysis Instruments.

SUBJECT	EXTENT/REMARKS	ACTION
Functional and other tests	Specified in the requisition and its attachments	W
Visual and dimensional examination	Against final certified drawings	W
Shop test certificates		R

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Note: (1) Steelwork for panels and operator consoles shall be visually and dimensionally examined after painting and before assembly. Inspection by monitoring shall be undertaken during the piping and wiring phases.

ABBREVIATIONS:

W = Witness
 R = Review

18.0 FOAM SYSTEM

18.1 Storage Tank

This shall be inspected in accordance with the requirements of section 10.0.

18.2 Balance of the equipment

The balance of the equipment shall receive final inspection.

SUBJECT	EXTENT/REMARKS	ACTION
Functional test	The complete equipment with its control	W
Visual and dimensional examination (Note 1)		W
Data / certification	Against specified requirements	R

Note: (1) Dimensional check will include:

- Overall dimensions
- Fixing locations
- Elevation and orientation of field connections.
- Connection details i.e. type, size, rating and flange face finish.
- Type, size and location of field electrical connections.
- Type, size and location of field instrumentation connections.

ABBREVIATIONS:

W = Witness
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19.0 BULK PIPING MATERIALS

This section covers the inspection of pipe, pipe fittings (i.e. elbows, tees, reducers, O'lets etc) and flanges. It is envisaged that the majority of inspection will take place at stockist's warehouses. When inspection takes place at the tube mill, foundry or forgemaster the same requirements shall apply.

SUBJECT	EXTENT/REMARKS	ACTION
<u>Materials for cryogenic service</u>		
Visual inspection	100%	W
Dimensional examination	10%	W
<u>Materials not required cryogenic service</u>		
Visual and dimensional inspection	5% of each nominal size during each inspection visit	W
Material certificates		R

ABBREVIATIONS:

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20.0 VALVES

This section covers the inspection of:

- General valves (Gate, globe, check, ball, plug, butterfly, slide)
- Safety relief valves
- Control valves
- Valves with operators

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20.1 Valves in Cryogenic Service

All valves in cryogenic service shall receive 100% inspection.

SUBJECT	EXTENT/REMARKS	ACTION
WPS and PQR	For production welding and major repair welds to castings and forgings	R
Cryogenic testing		W
Seat and back seat testing	Hydrostatic pressure testing of bodies and covers may be accepted by review of test certification	W
Material traceability and material test reports		R
Alloy verification		W
NDT		W (spot)
Functional tests on valve operators		W
Dimensional examination		W (spot)

20.2 Valves not in Cryogenic Service

Following valves not in Cryogenic Service shall receive Inspection:

- All valves of ferritic alloy, austenitic alloy and aluminium construction
- C.S. valves above 900 rating
- All slide valves.
- All operated valves.
- Control valves DN 150 and larger.
- All pressure relief valves.
- All valves requiring "fire safe" certification.

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SUBJECT	EXTENT/REMARKS	ACTION
Seat and back seat leak tests	10% of each nominal size / type at each visit	W
Functional test (where operators are fitted)	10% of each nominal size / type at each visit	W
Dimensional check	10% of each nominal size / type at each visit	W
Visual inspection	All valves	W
Material and test certificates	Including pneumatic and hydrostatic test reports and NDT certificates	R

ABBREVIATIONS:

W = Witness
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21.0 BULK INSTRUMENTATION

Following bulk instruments shall receive inspection:

- Electronic and pneumatic panel mounted equipment.
- Local pneumatic and electronic controllers and transmitters.
- Multipoint temperature indicator and multipoint recorders.
- Variable area flow meters.
- Positive displacement meters.
- Orifice type flowmeter runs.

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SUBJECT	EXTENT/REMARKS	ACTION
WPS and PQR		R
Functional tests	When called for in the requisition	W
Calibration checks	When called for in the requisition	W
Visual and dimensional examination		W
Check of documentation / certification / calibration data sheets and compliance with electrical safety codes for marks and labels		R

ABBREVIATIONS:

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22.0 BULK ELECTRICAL AND MISCELLANEOUS ITEMS

Following bulk electrical and miscellaneous items shall receive inspection:

- Motor control stations
- Lighting and distribution boards
- Cable Glands and terminations
- Outlet sockets/plugs
- Earthing Materials
- Luminaries
- Junction boxes and associated fittings
- Switches and Meters
- Telephones, loudspeakers
- Alarms
- Racks and supports
- Conduits and fittings

In general the above will be subject to inspection to the extent necessary to ensure vendor conformance to the requirements of the requisition and attachments.



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Selected electrical bulk material shall be subject to a quality check of approximately 10 % and a full quantity check against the vendor's shipping documents.

For items to be installed in hazardous locations review certificates of conformity to standards for ex-proof equipment. The certificates must be of an international or national recognized testing organization.

23.0 INSULATION MATERIAL

Insulation materials shall be inspected by the Owner's inspector at the manufacturer's works.

Inspection shall be carried out against a sampling procedure which shall be agreed with the Owner.

Sample inspection shall include the witness of preparation of test pieces and the witness of such mechanical and chemical tests as may be specified.

The manufacturer's documentation/certification shall be checked 100 %.