



Exploration & Production

GENERAL SPECIFICATION

Drilling & Wells

GS EP FP 332

Specification for Surface Wellhead & Christmas Tree Manufacturing
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1. Scope

This document defines the requirements for Quality Assurance and Quality Control with respect to design, material, manufacturing, testing and final supply of Wellhead & Xmas Tree equipment for the use within TOTAL.

The minimum applied standard for design, manufacture, inspection and testing shall be [API SPEC 6A](#) PSL 3 unless otherwise specified within this General Specification or the TOTAL Purchase Order or Contract.

This General Specification applies to the following but not limited list of equipment:

Wellhead equipment:

- casing head housings;
- casing head spools;
- tubing head spools;
- cross-over spools;
- Multi-stage head housings and spools.

Connectors and fittings:

- cross-over connectors;
- Tubing head adapters;
- Top connectors;
- Tees and crosses;
- Fluid-sampling devices;
- Adapter and spacer spools.

Casing and tubing hangers:

- mandrel hangers;
- Slip hangers.

Valves and chokes:

- single valves;
- multiple valves;
- actuated valves;
- valves prepared for actuators;
- check valves;
- chokes;
- surface and underwater safety valves and actuators;
- Back-pressure valves.

Loose connectors (flanged, threaded, other end connectors (OEC), and welded):

- weld neck connectors;



- blind connectors;
- threaded connectors;
- adapter and spacer connectors;
- bull plugs;
- Valve-removal plugs.

Other equipment:

- actuators;
- hubs;
- pressure boundary penetrations;
- ring gaskets;
- running and testing tools
- Wear bushings

2. Reference documents

The reference documents listed below form an integral part of this General Specification. Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published at the EFFECTIVE DATE of the CONTRACT.

Standards

Reference	Title
ISO 10423/API SPEC 6A	Petroleum and Natural Gas Industries – Drilling and Production Equipment – Wellhead and Xmas Tree Equipment Second Edition
NACE MR0175/ISO 15156	Material Requirements. Sulphide Stress Cracking. Resistant Metallic Material for Oil Field Equipment
API SPEC 6A718	Specification of Nickel Base Alloy 718 (UNS N07718) for Oil & Gas Drilling and Production equipment
API SPEC 16A	Specification for Drill-Through Equipment
ASNT-SNT-TC-1A	Outlines for Qualification of Nondestructive Testing Personnel
ISO 14001	Environmental management systems
ISO TS 29001	Quality management system requirements for product and service supply
ISO 13678	Petroleum and natural gas industries - Evaluation and testing of thread compounds for use with casing, tubing and line pipe
ISO 11960	Petroleum and natural gas industries - Steel pipes for use as casing or tubing for wells
ISO 10005	Quality management systems - Guidelines for quality plans
ASME	Boiler and Pressure Vessel Code

**Professional Documents**

Reference	Title
Not applicable	

Regulations

Reference	Title
Not Applicable	

Codes

Reference	Title
Not applicable	

Other documents

Reference	Title
Not applicable	

Total General Specifications

Reference	Title
GS EP COR 350	External protection of offshore and coastal structures and equipment by painting

3. Quality Management requirements**3.1 Quality Assurance**

The selected contractor/supplier/manufacture shall be able to demonstrate conformity and be auditable to [ISO TS 29001](#) / Q1, and [ISO 14001](#).

The selected contractor/supplier/manufacture and/or its Subcontractor(s)/Supplier(s) shall be able to demonstrate conformity and be auditable to ISO/API standards related to materials to be delivered.

3.2 Quality control

In all respects to manufacturing and testing the contractor/supplier/manufacture shall provide a **Quality Control Plan** (QCP) to TOTAL for approval. Inside this QCP will be the agreed production / testing route and the third party inspection points for TOTAL. The QCP shall conform to [ISO 10005](#) and shall be submitted for approval prior any manufacturing.



4. Contract Management

4.1 Project contract management

At the time of tendering for a contract a flow diagram should be submitted for approval as part of the overall Quality management process.

4.2 Purchase order management

In the event of Direct Purchase Order award a flow diagram should be submitted for approval as part of the overall Quality management process .

4.3 Subcontract

Any manufacturing subcontracted shall be the responsibility of the contractor/supplier/manufacturer who was awarded the contract / purchase order by TOTAL. All dialogue if required between the contractor/supplier/manufacturer's sub vendor and TOTAL will be via the contractor/supplier/manufacturer.

5. Design requirements

5.1 General

Unless differently quoted on the purchase agreement the design requirements shall include methods, assumptions and calculations, and shall include those criteria for size, test, working and operating pressures, materials, environment (temperature limits, chemical) and other pertinent requirements upon which the design is based. Design documentation shall be reviewed and verified by a qualified individual other than the individual who created the original design.

Equipments shall be manufactured to drawings and specifications that are substantially the same as those of the size, type and model of equipment which has passed the validation test.

The contractor/supplier/manufacturer shall establish verified internal yield pressure, collapse pressure and minimum tensile strength, temperature limits, and rated working pressure, excluding end connections. The contractor/supplier/manufacturer shall identify the critical component(s) of the product and the modes of stress. The contractor/supplier/manufacturer shall calculate the stress level in the critical component(s) based upon the maximum loads in the design input requirements to determine those component(s) which are critically stressed. Critically stressed components are those which are stressed to 90% or greater of the minimum design yield strength of calculations, which shall include consideration of temperature limit effects and thermal cycles. Metal mechanical properties de-rating shall be in accordance with [ASME](#) Boiler and Pressure Vessel, Section II, Part D.

The design shall take into account the effects of pressure containment and pressure-induced loads. Specialized conditions, such as pressure testing with temporary test plugs, shall also be considered.

Component and subassembly identification and interchange ability shall be required within each contractor/supplier/manufacturer's size, type and model, including working pressure rating of equipment. Cumulative dimension tolerances of components shall be such that proper operation of the equipment is assured. This requirement applies to supplier/manufacturer assembled equipment and to replacement components or sub-assemblies.

The Contractor/Supplier/Manufacturer shall perform a **Failure Mode, Effects and Criticality Analysis (FMECA)** on the equipment in accordance with TOTAL requirements and with the relevant international standard.

FMECA shall be initiated as an integral part of the early design process (as soon as the concept is sufficiently detailed) and shall be periodically reviewed and updated to address any changes or deviations.

The objectives of FMECA shall be to:

- Identify simple failures modes and mechanisms that may lead to a fearful event.
- Evaluate corresponding causes and potential consequences on reliability.
- Rank each failure according to a criticality category of failure effect and occurrence.
- Establish mitigation actions to suppress or control the critical risks (with appropriate measures such as design, qualification testing, additional testing, procurement, manufacturing, quality assurance, maintenance, installation ...).

All FMECA studies shall be carried out at the level of the smallest part about which information is available, such as the failure rate (e.g.: electronic components).

The contractor/supplier/manufacturer shall use probability and consequence criteria, and assess the risk through a matrix of criticality, which defines risk acceptable zones (low probabilities and/or low consequences) and risk non acceptable zones (high probabilities and/or high consequences).

At the beginning of the design phase, the contractor/supplier/manufacturer shall submit a FMECA execution plan which shall outline required level of analysis detail for each system/sub-system, work responsibilities and analysis approach (including a risk criticality classification scheme).

The contractor/supplier/manufacturer shall consolidate their inductive analysis (FMECA) by a **Fault Tree Analysis (FTA)** on identified fearful events concerning availability, in compliance to the relevant international standard.

The main objectives are to identify the critical path which contributes to the top event and its probability of occurrence.

The quantification of the different undesirable events shall be achieved through a failure tree-diagram, which enables to get a model of the undesirable events and quantify their probability of occurrence.

Note: FMECA and FTA techniques are compatible methods of risk analysis (FMECA considers only single failures, while FTA considers combination of multiple failures)

5.2 Performance rating

The Contractor/Supplier/Manufacturer shall state the pressure, temperature and axial performance ratings, as applicable for the products with a product performance envelope defined and justified. This envelope is a graph that illustrates the combined effects of differential pressure and axial loads on the given piece of equipment. The various failure modes shall be given for any piece of proposed equipment.



5.3 Design verification

The Contractor/Supplier/Manufacturer shall successfully complete a detailed design verification review on the basis of design input parameters provided by TOTAL as part of the Functional / Equipment Specification. Design input parameters shall include but not be limited to:

- Well architecture or design
- Well conditions, including pressure, temperature, Co2 and H2s content and in situ Ph
- Flow or injection regimes
- Tensile, bending, burst and collapse parameters
- Minimum required flow by area

Design verification shall be performed to ensure that each piece of equipment design meets the supplier/manufacturer technical specifications and the needs of TOTAL. Design verification shall include one or more of the following:

- Design reviews
- Design calculations
- Physical tests
- Comparison with similar designs and historical records of defined operating conditions.

In the case of stress analysis and finite element analysis on critical components and assemblies, TOTAL shall review contractor/supplier/manufacturer design data and performance calculations prior to issuing Manufacturing Drawings. The review shall verify good design practice and documentation that supports performance qualification testing.

The Design Verification Review records for all critical equipment shall be subject to further verification by recognized and reputable Certifying Authority, a Design Appraisal Report shall be generated and made available to TOTAL as an output to this process.

5.4 Design changes

All design changes shall be documented and reviewed against the design verification and design validation to determine if the change is a substantive change. A design that undergoes a substantive change becomes a new design requiring design verification and design validation.

Design validation may be done by testing only the component or series of components, rather than the entire assembly. The test shall adequately simulate the loading conditions that would be present if the entire assembly were tested. The contractor/supplier/manufacturer shall document the detailed test results and analysis that demonstrate that the component test adequately simulates the required loading conditions.

Design changes identified as non-substantive shall include documented justification.

The contractor/supplier/manufacturer shall, as a minimum, consider the following:

- Stress levels of the modified or changed components;
- Material changes;
- Functional changes.



6. Documentation

6.1 Bidding Phase

The Contractor shall present:

1. a full set of drawings both for WH/Xmas trees assemblies and for each component
2. Color-coded stack up drawing(s) of the entire wellhead and tree system showing the entirety of metallic materials used in the system.
3. Color-coded stack up drawing(s) of the entire wellhead and tree system showing the entirety of non-metallic materials used in the system.
4. a full set of Installation Procedures covering all the WH and Xmas Tree installation, with particular regard to CSG and TBG hangers and Sealing pack off installation phases.
5. a comprehensive description of material and hard face specifications / metallurgies proposed
6. a comprehensive description of material specifications for sealing components (elastomers and metal to metal seals) proposed
7. Fire safe qualification test documentation. (where applicable)

NOTE: Unless otherwise agreed, in case of lack of any of the above documentation, Contractors Offer may be disqualified

6.2 Design Review Phase

The Contractor shall present information of 5.1 (including any updates or revisions)

6.2.1 General Drawing Requirements

All drawings depicting accurate pictorial representation of GOODS, including:

1. All dimensions with highlighted critical dimensions and sealing areas.
2. Detailed drawing per Section for main sub equipment
3. Identification of all flow wetted and clad surfaces.
4. Location and type of all elastomeric and non-metallic components.
5. Reference numbers of parts and materials.

6.2.2 Assembly Drawings

Assembly drawings shall be an accurate pictorial representation of the GOODS, to include pertinent references, and shall as a minimum:

1. Clearly, indicate all critical seal locations and provide a detailed description of primary and secondary sealing systems (metal-to-metal, metal to elastomer, etc.).
2. Show assembly and component part number cross-reference number to Bill of Material (BOM).
3. All bore and drift diameters shall be indicated on the assembly drawings.



If design changes are made, Contractor shall revise Assembly Drawings and provide updated copies to TOTAL as soon as practical after the design changes are made and the drawings are revised.

6.3 Delivery phase

An agreed Manufacturing book shall be presented at time of delivery – if no agreed book is presented then as minimum requirements Contractor shall provide:

- Certificate of Conformity reporting:
 - Conformity to applicable specifications, duly signed by Contractor authorized Officer (e.g. QA Manager)
 - C of C for all premium threads
- Critical dimensional inspection report
- NDE reports
- Heat treat furnace charts are required for all pressure-containing parts.
- Hardness test reports
- Hydro test reports/charts
- All Torque Turn charts
- Gas test reports/charts
- Drift test report
- Micrographs for Alloy 718 (UNS N07718) products (where applicable)
- Mill Test certificates (acceptable also on CD support in PDF format)
- Customer release note
- Prototype and performance verification test signed by Contractor authorized Officer (stack up test)
- The appropriate quantities (as per the PO) in the English language of the following :
 - Operation Manual controlled copy (also on C.D. support) including instructions concerning field assembly and maintenance.
 - Coloured laminated Wall Charts (details and cross referenced with operation manual)
 - All original documents shall be written in English should any doubt arise to the contents of the translation, the English version shall govern.

7. Material

7.1 General

Material and/or service shall be stated by the Contractor/Supplier/Manufacturer and shall be suitable for the specified environment in the functional specification.



Should the Contractor/Supplier/Manufacturer propose to use another material (metallic or non-metallic), the contractor/supplier/manufacturer shall state that this material has performance characteristics suitable for all specified parameters.

Supplied material shall meet the relevant requirements of [ISO 15156](#) / [NACE MR0175](#) where service conditions dictate.

All supplied material shall come from an approved source and contractor/supplier/manufacturer approval system demonstrated in the tender.

Chrome series or CRA accessories shall be made from [ISO 13680](#) casing / coupling stock or proprietary grades conforming to Total requirements. Alternative materials shall be subject to prior Total approval.

7.2 Qualification of material properties

Non wrought products are not permitted without formal approval from Total.

All forgings shall be rough machined as far as possible to near net shape prior to heat treatment to minimize degradation of mechanical properties after final machining.

Where Qualification Test Coupons are used, they shall be processed as part of the same heat treatment lot and be representative of the design ruling section. All testing shall be conducted at the 1/4T location.

Mechanical testing shall include but not be limited to the following:

- Tensile testing including Yield, UTS, Reduction of Area and Elongation,
- Hardness testing of products and QTC
- Charpy V Notch toughness testing as per relevant standard(s)

For pressure containing parts with a design ruling section greater than 3", material shall be qualified on a prolongation. Where requested by TOTAL, additional test specimens should be taken at 1/2" T location in addition to the standard 1/4" T specimens. Where such parts are subject to weld overlay and Post Weld Heat Treatment, a simulated PWHT specimen may be requested by TOTAL. This specimen shall undergo PWHT per the contractor/supplier/manufacturer Welding Procedure Specification. Mechanical testing comprising of tensile, hardness and Charpy V notch testing shall be completed and reported on the Material Test Certificate for information purposes.

Where the product is manufactured from bar stock origin, all mechanical testing shall be carried out in the transverse direction.

In the case of pressure containing materials being deployed at operating temperatures greater than 150°C, additional tensile test shall be performed at the maximum operating temperature.

8. Alloy 718

[API SPEC 6A718](#) requirements shall apply to products manufactured from Alloy 718.

Prior to manufacture TOTAL shall formally approve all metallurgical reports generated to demonstrate freedom from deleterious phases.



9. Manufacturing

Manufacturing shall be performed by API and/or ISO licensed facilities or their approved sub vendors. Manufacturing shall work only to approved Engineering Bills of Material and specifications that meet the applicable requirements.

A pre-manufacturing meeting is to be held by the contractor/supplier/manufacturer prior to manufacturing to assure compliance to TOTAL requirements. The TOTAL representative may attend this meeting although this is not mandatory.

9.1 Traceability

Each critical component, as defined during the design phase, shall be uniquely traceable during the whole manufacturing stage. This unique serial number shall be permanently marked on the component and be specified on every report related to this component.

The assembly equipment shall be uniquely traceable. This unique serial number shall be permanently marked on the assembly and be specified on every report related to this assembly.

It is the responsibility of the manufacturer to maintain the identification of material until it is received by the TOTAL.

9.2 Welding

Any welding of components shall be in accordance with the applicable standard and is subject to inspection as noted in the QCP.

All welding shall be carried out using Welders / Welder Operators & Welding Procedure Specifications qualified in accordance with [API SPEC 6A](#), [ASME IX](#) & [ISO 15156](#) (as applicable).

All welding Plant, equipment and monitoring devices shall be calibrated on a maximum frequency of 6 calendar months.

Post Weld Heat Treatment shall be carried out in accordance with the qualified Welding Procedure Specification within a range of 10 to 15 degrees C below parent material tempering temperature.

Nickel base alloy overlays (UNS NO6625) shall exhibit a Fe content of less than 5% when analyzed 3mm from the base material fusion line unless otherwise specified on the PO or other formal Contractual document.

Where weld overlays are used for repair purposes they shall be considered as part of the design criteria and as such shall be appropriately qualified. Particular attention should be paid to the use of corrosion resistant overlays during repair or remanufacture, the application of such processes may provide deposited material with lower mechanical properties than the base material so Engineering analysis and verification is required prior to the application of such overlays.

No repair welding is permitted on materials without prior written permission from TOTAL.

Repair excavation techniques shall be limited to grinding or machining, no flame or arc gouging is permitted.

9.3 Non-Destructive Examination (NDE)

NDE procedures shall be approved by a Level III Examiner.



NDE techniques shall be in accordance with the ASTM and ASNT reference standard requirements, as applicable.

NDE technicians shall be qualified and certified to [ASNT](#) recommended practice [SNT-TC-1A](#), for the particular NDE method being utilized.

Interpretation of the results shall be performed by individuals qualified to [ASNT](#), [SNT-TC-1A](#), Level II minimum.

Acceptance criteria shall be in accordance with the materials relevant standard.

In the case of weld repairs 100% of the weld repair area and remaining original weld shall be subject to the NDE as detailed within the specification or drawing.

9.3.1 Ultrasonic Inspection

All Ultrasonic Flaw detectors shall be subject to daily calibration checks prior to commencement of testing consisting of linearity and resolution, probe index and calibration against the applicable reference standard.

9.3.2 Magnetic Particle Inspection

All Pressure containing and pressure controlling parts shall be examined using ultrasonic straight beam and angle beam techniques prior to finish machining and Wet Fluorescent MPI or Penetrant (corrosion resistant materials) post final machining.

Magnetic Particle apparatus shall be checked a minimum weekly for magnetic field strength, particle strength and Fluorescence, UV Lights shall be periodically checked for intensity.

9.3.3 Hardness testing

Hardness tester shall be calibrated with appropriate reference block prior to hardness measurement.

9.4 Assembly

9.4.1 General

Assembly of the equipment shall be performed as per:

- Approved product assembly drawing as specified in paragraph 6.2.2 of this General Specification;
- Contractor/supplier/manufacturer's detailed assembly drawing(s)
- Contractor/supplier/manufacturer's detailed assembly procedure(s)
- Bill of materials

All bolting shall be tightened using Torque wrenches calibrated on a maximum frequency of 6 calendar months. Applied torque shall be according to API or in the case of special bolting per the manufacturer's specified torque, due consideration shall be given to the presence of coating or plating on bolting when establishing the correct torque.

Traceability of critical components shall be ensured during the whole assembly stage and recorded on a specific contractor/supplier/manufacturer's report.

At the end of the assembly, the equipment shall be marked as minimum with:



- Part Number,
- Unique Serial Number

9.4.2 Connections make up

TOTAL shall approve the type of mill end thread compound used for Thread and Coupled (T&C) connections. The mill end of the proprietary T&C connections shall be assembled with a torque / turn monitoring graph. The assembly shall be fully traceable by using test charts / electronic records, pipe numbers, coupling lot number etc.

The mill end make up torque shall be in conformance with the proprietary T&C connections procedures and will be aimed towards the optimum torque unless otherwise agreed with TOTAL. All connections after make up shall be arms length drifted with the appropriate drift size and length.

The applied thread compound on the mill end to the T&C connection shall conform with the proprietary T&C connections procedures and to [ISO 13678](#) unless otherwise specified on the purchase agreement or from the following list.

For environmentally classified thread compounds; (CEFAS Class E or OSPAR Class Yellow)

- **SEAL Guard ECF** – applicable to metal to metal sealing premium connections
 - Not to be used on materials where the chrome content is 22% or above
 - Not to be used where the down-hole well temperature is above 150°C
- **Best-o-life 3010 NM Special** - applicable to metal to metal sealing premium connections
 - Not to be used on super 13% Chromium or where the chrome content is higher than 13%.
 - Not to be used where the down-hole well temperature is above 120°C

Where an unapproved CEFAS Class E or OSPAR Class Yellow thread compound will be used, Manufacturer shall demonstrate through tests that the thread compound will be suitable for the given application before use.

The use of “Dope-free” or “Dope-less” products shall be qualified by TOTAL HQ before use.

9.5 Corrosion Protection

Each product shall be suitably protected against corrosion during transit and storage for a period of one (1) year under the specific storage conditions. – if the proposed storage time is less than 1 year it shall be highlighted to TOTAL

The coating material shall be readily removable with environmentally friendly products.

The contractor/supplier/manufacturer shall advise for any precaution during handling and removal of coating material, in particular regarding the disposal procedure.

9.5.1 Protection during manufacture of equipment

Corrosion protection shall be ensured throughout the manufacturing process, including temporary periods where components or sub-assemblies are stocked.

9.5.2 Painting

All painting shall be carried out in accordance with the applicable coating system defined within TOTAL General Specification [GS EP COR 350](#).



The Contractor/Supplier/Manufacturer procedure shall be submitted to TOTAL and indicate the trade names and the following characteristics:

- Surface preparation method for primer;
- Physical characteristics of the primer;
- Surface preparation method for the painting;
- Physical characteristics of the paint;

9.5.3 Painting checks during production

Throughout the duration of the work, the Suppliers Quality Control department shall check the following points in accordance with the chosen system. The results of these checks shall be recorded (quality control report).

- Construction quality
 - Suitability for the coating:
 - . Corners, sharp edges
 - . Form, quality and continuity of welds.
 - Surface preparation quality:
 - . Grade of cleanliness
 - Cleanliness (dust level, etc.)
 - Roughness, Ra.
 - Salts contamination or others
 - Climatic conditions for application
 - Substrate temperature
 - Drying and polymerization state of primer and of each coat
 - Interval between coats
 - Number of coats
 - Thickness of the various coats and of the final system
 - Appearance and colors
 - Pull-off test
 - . The tests shall be carried out in accordance with the standard. The minimum level of performance shall be 3 MPa. The measuring instrument shall be fitted with a storage pressure gauge recording pulling force.

9.5.4 Protection of threads

Storage grease shall be applied to all exposed threads after inspection by the TOTAL representative.

The thread protector's design should conform to [ISO 11960](#) annex I. and documented proof of conformity should be submitted to TOTAL before use.



Where closed end protectors have been specified in the purchase agreement a 5 mm weep hole shall be present in each closed-end type protector to allow venting of the pipe bores.

A light oil may be applied prior to the TOTAL inspection to prevent rust.

The approved storage compounds are as follows:

- TOTAL Jet Marine Imperator modified 2571 – for all zones
- Rust-Veto AS:
 - for all zones except sub Sahara or tropical zones
 - for sub Sahara or tropical zones when equipment is intended to be used less than 80 days after storage compound have been applied.
- Kendex OCTG Orange corrosion inhibitor:
 - for all zones except sub Sahara or tropical zones
 - for sub Sahara or tropical zones when equipment is intended to be used less than 80 days after storage compound have been applied.

Unless otherwise specified on the purchase agreement the above storage compounds shall only be used.

Where an unapproved CEFAS Class E or OSPAR Class Yellow storage compound will be used, Manufacturer shall demonstrate that the storage compound will properly protect the thread for one and half year in the specific storage conditions before use.

Thread protector used shall be closed end and comply with all specified thread standard.

9.6 Sub-contracted items

Care shall be taken by contractor/supplier/manufacturer to comply with the above when ordering sub-assemblies or components from sub-contractor/supplier/manufacturer.

TOTAL QA/QC reserved the right to audit any sub-contractor/supplier/manufacturer facility and/or inspect any equipment at any sub-contractor/supplier/manufacturer facility.

9.7 Identification and Marking

9.7.1 General

All equipment supplied against this General Specification shall carry the API Monogram where the Contractor/Supplier/Manufacturer is licensed to undertake this requirement. Any legitimate factors affecting the application of the Monogram i.e. non standard rating etc shall be highlighted by the contractor/supplier/manufacturer at Tender stage for TOTAL evaluation.

All critical components shall be permanently marked per bill of material requirements.

Markings shall meet the requirements of this specification, ISO reference standard and contractor/supplier/manufacturer Engineering Procedures. Marking of items should be legible after surface treatment or coating. All assembly and single end item stamping shall be done with low stress dies where part configuration allows.

Marking should be done in an area where it will not affect the product function and be unaffected by potential grip marks during make-up.

Marking of OD and ID shall be in fractions (i.e. 3"1/2, 5"3/4).



Minimum marking shall specify:

- Assembly Part Number,
- Serial Number,
- Short item description,
- Material
- TOTAL PO number

9.7.2 Thread marking

Thread identification shall be low stress dies in all cases and comply with the following requirements:

- All threaded end connections are to be stamped with the thread size, weight, grade and thread type during the manufacturing process.
- Thread identification is to be circumferential and as close to the end of the part as possible. If all the information will not fit in one single circumferential line, two lines are allowed.

10. Quality control

10.1 Manufacturing Quality Control

All connections make up, dimensional inspections and/or NDE controls as stated in paragraph 9.3 of this General Specification shall be recorded on specific Contractor/Supplier/Manufacturer report(s).

10.2 Pre Delivery testing

All equipment shall be subjected to a verification and acceptance testing programme that has been approved by TOTAL to demonstrate that the equipment,

- Will satisfy all specified requirements,
- Will perform satisfactorily in service
- All Units and Systems have been completed in accordance with the specifications prior to delivery.

A comprehensive test program, covering the complete range from component and equipment integrity testing through functional and performance verification of all equipments shall be agreed and implemented.

The programme shall as a minimum include the following types of tests:

- Factory acceptance tests (FAT)
- Functional testing



10.2.1 Factory Acceptance Test (FAT)

A Factory Acceptance Test (FAT) of equipment is the set of tests required to prove that the components of equipment and the equipment itself, satisfy all specified functional and performance requirements.

All Factory Acceptance Tests for equipments shall be performed as defined in the relevant TOTAL approved FAT procedure and with the relevant international standard.

FAT testing shall be in accordance to [API SPEC 6A / ISO 10423](#).

For PSL 3G & 4 products gas seat tests shall be performed in addition to the hydro seat tests. The gas seat test shall be performed after the hydro seat tests. The acceptance criteria for low pressure gas tests shall in accordance with [API SPEC 6A](#) with the additional requirement that the pressure drop shall not exceed 30 psi (10%) during the hold period.

The following additional testing shall be carried out;

- For actuated valves determine the minimum opening pressure at full differential working pressure and the closure time at normal supply pressure, TOTAL to review
- Verify total closure of the valve under full differential working pressure when the actuator pressure is reduced to zero
- All valves shall be subject to a low pressure air seat test 100 psi for 5 minutes minimum duration and determination of breakout torque for comparison against approved performance standards
- Clamps shall be tested according to API SPEC 16A
- VR plugs shall be tested at the working pressure for a minimum of 3 minutes
- Following installation of pup joints to Casing & Tubing Hangers a full API drift shall be carried out followed by a pressure test at the assembly rated working pressure.

Note: Due consideration should be given to Hanger, pup and connection capacities when determining the test pressure

10.2.2 Functional testing

In addition to the Factory Acceptance Testing required by [API SPEC 6A / ISO 10423](#) for individual components, a system stack up and functional test is required, Functional Testing on the first set of equipment being produced. The purpose of the stack up test is:

- To confirm that all the critical parts go together as per the design
- To verify the field operating procedures using all the proper tools in sequence,
- To verify proper balance of the running configuration
- Functional Test procedure shall be accepted by TOTAL prior to performing the Test.
- Functional test shall include setting seals (if applicable), functioning tools and pressure testing.



11. Packaging

All materials and equipment shall be properly packaged in order to:

- Prevent damage from handling, shipping and land transport.
- Ease lifting and movement by crane and/or fork-lift.
- Lifting points to be duly dimensioned for weight and balance and clearly marked.

Shipping package documentation shall include as minimum the following:

- Contractor's name
- Equipment description
- Assembly part number
- Size Range
- Connection type (size, weight and steel grade)
- Pressure and tensile rating (including connection).
- Purchase order number
- Material
- Assembly Drawings
- TOTAL Call Off Order/Contract No/ Material No
- Material Safety Data Sheets

Drilling bodies shall be delivered with plastic covers on each flanged outlet.

Xmas tree shall be delivered assembled without wing block assembly and with blind flanges on the tree body production and vent outlets unless otherwise specified on the PO.

The wing assembly shall be delivered as separate part assembled with actuated valves.

All outlets and connections shall be fitted with either proprietary protectors or appropriately designed and secured blanking boards.

All metal seals shall be preserved and supplied in protective boxes with adequate packing to prevent damage.

Elastomeric seals shall be supplied in black plastic bags suitable to prevent UV degradation. The bag shall be tagged with cure date and shelf life. Batch/cure test certification should accompany the goods.

Seal assemblies shall be stored in water tight wooden boxes at all times especially during transit. A suitable desiccant shall be included in the box to absorb moisture and minimize the potential for corrosion.

12. Repair and remanufacture controls

Repair and remanufacture of Wellhead and Xmas Tree equipment shall be carried out in accordance with contractor/supplier/manufacture procedures and TOTAL approved Quality Control Plan.



Unless otherwise authorized by TOTAL, repair and remanufacture of Wellhead and Xmas Tree equipment shall be carried out by Original Equipment Manufacturers (OEM's) only.

Where rework or remanufacture processes result in parts falling outside the original design tolerances, appropriate Engineering analysis shall be completed and formalized to verify fitness for purpose. Where such designs were originally subject to an Independent Design Appraisal the engineering data shall be presented to the Authority responsible for the original design appraisal for further verification, a supplementary design appraisal report should be issued as an output to this process.

Replacement parts shall be manufactured to the original Specifications and applicable Quality Control Plans.

The supplementary requirements detailed within this General Specification relating to materials, welding, quality controls and testing shall apply to the repair and remanufacture process.

All remanufactured parts subject to PWHT shall undergo a post rework hardness test in the repair area. Acceptance shall be per the original material specification.

13. Third Party Inspection

13.1 Scope of Third Party Inspection

The Third Party Inspection agency allocation details shall appear within the agreed QCP (see paragraph 3.2 of this General Specification).

Adequate time should be given and a good line of communication should be established between the nominated inspection company and the contractor/supplier/manufacture.

Unless otherwise specified on the PO and/or QCP, for equipment intended to be used for non critical applications, the Third Party will:

- Monitor:
 - Welding,
 - NDE on critical components and welding
 - Critical dimensions inspection (Bodies, Bonnets, End and Outlet connections and flanges)
 - Hardness test (Bodies, Bonnets, End and Outlet connections and flanges)
- Witness:
 - Hydrostatic and gas tests,
 - Functional test of valve,
 - Stack up,
 - Drift test,
 - Torque of the pup joint to the hanger
- Perform a final visual inspection (including marking, premium thread(s), body...) on 100% of equipment to be supplied,
- Review the documentation on 100% of equipment to be supplied.



Unless otherwise specified on the PO and/or QCP, for equipment intended to be used for applications deemed to be critical by TOTAL, the Third Party will:

- Monitor:
 - Welding,
 - NDE on critical components
 - Critical dimensions inspection (Bodies, Bonnets, End and Outlet connections and flanges)
- Witness:
 - NDE on welding
 - Hardness test (Bodies, Bonnets, End and Outlet connections and flanges)
 - Hydrostatic and gas tests,
 - Functional test of valve,
 - Stack up,
 - Drift test,
 - Torque of the pup joint to the hanger
- Perform a final visual inspection (including marking, premium thread(s), body...) on 100% of equipment to be supplied,
- Review the documentation on 100% of equipment to be supplied.

TOTAL QA/QC reserved the right to attend the following "optional" operations (non-exhaustive list):

- Heat treatment,
- Chemical analysis,
- Mechanical tests

Where the results of any witness activity and/or final visual inspection and/or documentation review is found non satisfactory, TOTAL QA/QC reserves the right to receive a copy of the NCR raised by the Contractor/Supplier/Manufacturer.

Equipment manufactured under this General Specification shall not be shipped without any Release Note from the Third Party Inspection body unless otherwise agreed on PO and/or QCP.

13.2 Waiver / Derogation

Where the Manufacturer will not be able to fulfill the requirements of this General Specification, the Manufacturer shall formally request for derogation from TOTAL.

Where the equipment delivered by the Manufacturer will not fulfill the requirements of this General Specification and where the Manufacturer will not be granted derogation by TOTAL, the Third Party Inspection representative shall not accept the material



Bibliography

SI 1996/913	Design Construction etc Regulations
94/9 EC	ATEX Directive
ISO 13680	Petroleum and natural gas industries - Corrosion-resistant alloy seamless tubes for use as casing, tubing and coupling stock