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ADNOC GROUP PROJECTS AND ENGINEERING

OFFSHORE STEEL STRUCTURES SPECIFICATION

Specification

AGES-SP-11-001

**GROUP PROJECTS & ENGINEERING / PT&CS DIRECTORATE**

CUSTODIAN	Group Projects & Engineering / PT&CS
ADNOC	Specification applicable to ADNOC & ADNOC Group Companies

Group Projects & Engineering is the owner of this Specification and responsible for its custody, maintenance and periodic update.

In addition, Group Projects & Engineering is responsible for communication and distribution of any changes to this Specification and its version control.

This specification will be reviewed and updated in case of any changes affecting the activities described in this document.

INTER-RELATIONSHIPS AND STAKEHOLDERS

- a) The following are inter-relationships for implementation of this Specification:
- i. ADNOC Upstream and ADNOC Downstream Directorates and
 - ii. ADNOC Onshore, ADNOC Offshore, ADNOC Sour Gas, ADNOG Gas Processing, ADNOC LNG, ADNOC Refining, ADNOC Fertilisers, Borouge, Al Dhafra Petroleum, Al Yasat
- b) The following are stakeholders for the purpose of this Specification:
- ADNOC PT&CS Directorate.
- c) This Specification has been approved by the ADNOC PT&CS is to be implemented by each ADNOC Group company included above subject to and in accordance with their Delegation of Authority and other governance-related processes in order to ensure compliance
- d) Each ADNOC Group company must establish/nominate a Technical Authority responsible for compliance with this Specification.

DEFINED TERMS / ABBREVIATIONS / REFERENCES

“**ADNOC**” means Abu Dhabi National Oil Company.

“**ADNOC Group**” means ADNOC together with each company in which ADNOC, directly or indirectly, controls fifty percent (50%) or more of the share capital.

“**Approving Authority**” means the decision-making body or employee with the required authority to approve Policies & Procedures or any changes to it.

“**Business Line Directorates**” or “**BLD**” means a directorate of ADNOC which is responsible for one or more Group Companies reporting to, or operating within the same line of business as, such directorate.

“**Business Support Directorates and Functions**” or “**Non- BLD**” means all the ADNOC functions and the remaining directorates, which are not ADNOC Business Line Directorates.

“**CEO**” means chief executive officer.

“**Group Company**” means any company within the ADNOC Group other than ADNOC.

“**Specification**” means this specification for Subsea Pipeline Systems.

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1 DEFINED TERMS / ABBREVIATIONS / REFERENCES

1.1 Defined Terms

The definitions used in this document are listed in Table 1.

Table 1 – Definitions

Term	Definition
ADNOC/COMPANY	It is the Company based in Abu Dhabi. Also referred to as the customer.
Contractor	The firm or joint venture appointed by Company for providing Work/Services to the Company or its nominated representative
Consultant	Specialist Technical Consultant appropriate to the discipline
Certifying Authority	Certifying Authority shall be, as the case may, any agency or agencies appointed or nominated by the Purchaser to certify the Project or part thereof by reference to standards given in all relevant designs, specifications and procedural documents
Manufacturer	Any and all persons, firms, partnerships, companies, bodies, entities or a combination thereof including suppliers, sub-suppliers who are responsible for designing, fabricating and constructing the equipment.
Purchaser	Organization responsible for placing the purchase order or contract for the supply of goods and/or services. The organization in this case may be the Company or Contractor or Engineer.
Quality Assurance	All those planned and systematic actions (QA) necessary to ensure quality for example to provide adequate confidence that a product or service will be fit for its intended purpose.
Quality Manual	A Document setting out the general quality policies, procedures and practices of an organization.
Quality Plan	A document prepared by the Contractor/Vendor setting out the specific quality practices, resources and activities relevant to a particular project.
Quality Management System	The structure organization, responsibilities, activities, resources and events that together provide organized procedures and methods of implementation to ensure the capability of the organization to meet quality requirements.
Technical Authority	Central Engineering Department (CED) of COMPANY
TPA	Is the company contracted to undertake the third party inspection & verification tasks (TPA) on behalf of COMPANY
Vendor / Supplier	Any and all persons, firms, partnerships, companies, bodies, entities or a combination thereof including sub-vendors and sub-suppliers, who are providing equipment and/or services of equipment covered by this document.

1.2 List of Abbreviations

The abbreviations listed in Table 2 are those used in this document.

Table 2 – List of Abbreviations

Abbreviation	Definition
ADNOC	Abu Dhabi National Oil Company
ASNT	American Society for Non-destructive Testing
CE	Carbon Equivalent
CSWIP	Certification Scheme for Welding and Inspection Personnel
DPT	Dye Penetrant Test
EEMUA	Engineering Equipment and Materials Users Association
EMI	Electro Magnetic Inspection
EN	European Norm
ERW	Electrical Resistance Welding
ESW	Electroslag welding
HFW	High Frequency Welding
HS	High Strength
HSE	Health, Safety and Environment
LQ	Living Quarters
LS	Low Strength
MPI	Magnetic Particle Inspection
MS	Medium Strength
MSF	Module Support Frame
NDE	Non-destructive Examination
PWHT	Post Weld Heat Treatment
QA	Quality Assurance
QC	Quality Control
QMS	Quality Management Systems
QP	Quality Plan
QT	Quenched and Tempered
SAW	Submerged Arc Welding
SMAW	Shield Metal Arc Welding
TMCP	Thermo-Mechanically Controlled Process
TPA	Third Party Agency
TPIA	Third Party Inspection Agencies
TSD	Technical Standard Documents
UT	Ultra-Sonic Testing
YS	Yield Strength

1.3 Use of language

Throughout this document, the words '*will*', '*may/can*', '*should*' and '*shall/must*', when used in the context of actions by COMPANY or others, have specific meanings as follows:

- (a) '*Will*' is used normally in connection with an action by COMPANY and/or nominated representative, rather than by a supplier.
- (b) '*May/Can*' is used where alternatives/action are equally acceptable.
- (c) '*Should*' is used where provision is preferred.
- (d) '*Shall/Must*' is used where a provision is mandatory/vital.

GENERAL

1 PURPOSE

The objective of this specification is to define the minimum requirements for manufacturing, procurement and supply of steel material for construction of fixed Offshore Structures.

2 SCOPE

This specification deals with the structural steel materials such as plates, rolled sections, welded pipes, seamless pipes, and covers the materials of S235, S275 and S355 grades of carbon steel which are commonly used in fixed type structures. Higher grades (like S420/S460) of steel may be considered (subject to Company approval) for situations like weight optimisation, where felt necessary but after duly accounting fatigue life and weldability aspects.

This specification applies to the following steel structures:

- (a) Jackets and piles
- (b) Appurtenances
- (c) Decks, Hull
- (d) Helidecks
- (e) Module Support Frame (MSF)
- (f) Modules
- (g) Living Quarters (LQ)
- (h) Bridges
- (i) Flare Support Towers
- (j) Telecommunication Towers
- (k) Miscellaneous and Secondary Items.

The requirements of Company's Fabrication Specification are applicable where appropriate for rolled/welded tubulars.

SECTION A

3 NORMATIVE REFERENCES

The documents listed in Table 3 are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Table 3 – Normative References

Ref.	Document No.	Title
COMPANY Specific existing specification		
1.	CP-102	Inspection and Testing Requirements for New Equipment and Materials in Manufacture
2.	GDL-040	Concession Request
3.	GDL-070	Management of Change (MOC - Applications)
4.	A0-ENG-N-SL-001	Status List for ADNOC Offshore Technical Standard Documents
5.	SP-1002	Preservation of New Materials and Equipment
6.	SP-1009	Specification for Requirements for Projects Contractor Quality System
7.	SP-1030	Design Requirement for Fixed Offshore Steel Structure
8.	SP-1108	Specification for Fabrication of Fixed Offshore Steel Structure
9.	STD-00 Part-1	Measurement Units
10.	STD-00 Part-2	Site Condition and Data
11.	Z0-PD-S-01	Structural Design Philosophy
12.	Z0-TS-S-02010	Design Criteria for Offshore Steel Structures
13.	Z0-TS-S-03020	Specification for Fabrication of Offshore Steel Structures
American Petroleum Institute (API)		
14.	API SPEC 5L	Specification for Line Pipe
15.	API SPEC 2B	Specification for the Fabrication of Structural Steel PIPE
16.	API SPEC 2H	Specification for C-Mn Steel Plates for Offshore Platforms Tubular Joints
17.	API SPEC 2W	Specification for Steel Plates for Offshore Structures Produced by TMCP
International Organisation for Standardisation (ISO)		
18.	ISO 9001	Quality Management Systems – Requirements
British Standards Institution (BSI)		
19.	BS EN ISO 148-1	Charpy Impact Test on Metallic Materials Part 1 Test Method (V and U Notches)
20.	BS EN ISO 9934-1	Non-destructive Testing Magnetic Particle Testing Part-1
21.	BS EN 10021	General Technical Delivery Requirements for Steel Products
22.	BS EN 10025-1	Hot Rolled Products of Structural Steels Part-1: General technical Delivery Conditions.
23.	BS EN 10025-2	Hot rolled products of structural steels - Part 2 Technical delivery conditions for non-alloy structural steels
24.	BS EN 10029	Tolerance on Dimensions, Shapes and Mass for Hot Rolled Steel Plates 3m thick or above
25.	BS EN 10034	Structural Steel I and H sections

26.	BS EN 10051	Continuously Hot-Rolled Uncoated Plates, Sheets and Stripes of Non-alloy and Alloy Steels Tolerances on Dimensions and Shapes
27.	BS EN 10055	Hot Rolled Steel Equal Flange Tees with radiused Root & Toes
28.	BS EN 10056-1&2	Structural Steel Equal and Unequal angles
29.	BS EN 10067	Hot Rolled Bulb Flats
30.	BS EN 10160	Ultrasonic Testing of Steel Flat Product of thickness equal or greater than 6 mm (reflection method)
31.	BS EN 10162	Specification for Cold Rolled Steel Sections.
32.	BS EN 10163-1, 2 & 3	Delivery Requirements for Surface Conditions of Hot Rolled Steel Plates, Wide Flats and Sections.
33.	BS EN 10164	Steel product with improved deformation properties perpendicular to the surface of the product – Technical delivery conditions
34.	BS EN 10204	Metallic Products – Types of Inspection Documents
35.	BS EN 10210-1&2	Hot finished structural hollow sections of non-alloy and fine grain steels
36.	BS EN 10225	Weldable Structural Steels for Fixed Offshore Structures - Technical delivery conditions
37.	BS EN 10246/ EN ISO 10893	Non Destructive Testing of Steel Tubes
38.	BS EN 10279	Hot Rolled Steel Channels
39.	BS EN 10306	Ultrasonic testing of H beams with parallel flanges and IPE beams
40.	BS 10365 Part 1	Structural Steel Sections – Specification for Hot Rolled Sections.
American Society for Testing and Materials (ASTM)		
41.	ASTM A435	Straight-Beam Ultrasonic Examination of Steel Plates

Standard Documents equivalent to those referred to herein shall not be substituted without written approval from COMPANY.

The Contractors, Suppliers or Third Parties shall equip themselves with copies of all the referenced Technical Standard Documents referred in Table 3 of this document and shall make them readily available to all COMPANY's, or nominated representative, personnel involved in the work.

4 DOCUMENTS PRECEDENCE

The specifications and codes referred to in this specification shall, unless stated otherwise, be the latest approved issue at the time of Purchase Order placement.

It shall be the CONTRACTOR 'S responsibility to be, or to become, knowledgeable of the requirements of the referenced Codes and Standards.

The CONTRACTOR shall notify the COMPANY of any apparent conflict between this specification, the related data sheets, the Codes and Standards and any other specifications noted herein.

Resolution and/or interpretation precedence shall be obtained from the COMPANY in writing before proceeding with the design/manufacture.

In case of conflict, the order of document precedence shall be:

- (1) UAE Statutory requirements
- (2) ADNOC Codes of Practice
- (3) Equipment datasheets and drawings
- (4) Project Specifications and standard drawings
- (5) Company Specifications
- (6) National/International Standards

5 SPECIFICATION DEVIATION/CONCESSION CONTROL

Deviations from this specification are only acceptable where the SUPPLIER has listed in his quotation the requirements he cannot, or does not wish to comply with, and the COMPANY/CONTRACTOR has accepted in writing the deviations before the order is placed.

In the absence of a list of deviations, it will be assumed that the SUPPLIER complies fully with this specification.

Approval of equivalent Standard Documents shall not, in any way, remove responsibility from the Contractor or third parties to meet the best practices and/or requirements of the Technical Standard Documents referred to herein, in the event of conflict.

Any technical deviations to this document and referenced COMPANY TSDs, International codes and standards and project documents, including, but not limited to, the Data Sheets and Job Specifications, shall be sought by the Vendor/Contractor for COMPANY's review and approval, prior to the proposed technical changes being implemented. Any deviation based on non-technical basis, including cost and schedule, shall be rejected. Technical changes implemented prior to COMPANY's approval are subject to rejection.

6 DOCUMENTATION

The Contractor shall comply with the documentation requirements specified in the contract.

7 INSPECTION AND CERTIFICATION REQUIREMENTS

Inspection and certification requirements for material shall be in accordance with COMPANY CP-102 and BS EN 10204.

SECTION B

8 STRUCTURAL COMPONENTS

The structural steel used is classified in four categories, with regard to the consequences of their failure during the platform life.

8.1 Special Category (S)

Structural parts or members which are in critical load transfer areas and are subjected to complex stress conditions, direct pulling or tensile load perpendicular to the surface that may lead to lamellar tearing and/or brittle fracture. Failure of these category members will have severe consequences to platform integrity (leading to platform collapse) and functioning.

8.2 Primary Category (I)

Structural parts or members whose failure will have substantial consequences to platform integrity (leading to platform collapse) and functioning.

8.3 Secondary Category (II)

Structural parts or members whose failure will lead to local failure without significant consequences to the platform global integrity and functioning.

8.4 Tertiary/Ancillary Category (A)

Structural members which do not fall in the above categories and will not contribute to the global platform integrity and which can be easily repaired/replaced without any impact on the functioning of the platform.

8.5 Categorisation of structural members

Table 4 below provides general guidance for classifying structural members. However, the classification of structural members shall be worked out in detail specific to the project/structure and shall be submitted to COMPANY for review and approval.

Table 4 – Category Classification of Structural Members

SPECIAL (S)	PRIMARY (I)	SECONDARY (II) (Notes-1 &2)	TERTIARY (A)
SUB-STRUCTURE – JACKET PILES AND APPURTENANCES			
<ul style="list-style-type: none"> - Cans of Jacket legs and Brace members - Primary members, plates subject to direct pulling / tension or heavily stressed perpendicular to surface - Primary members/plates containing high concentration of welding which are subjected to out of plane stresses that may lead to lamination. - Jacket padeye main plate, Trunnions 	<ul style="list-style-type: none"> - Piles - Jacket legs - Horizontal and Vertical bracings - Riser & J-tube support Members - Welded stub connections of B/L and riser/conductor protector with the jacket 	<ul style="list-style-type: none"> - Boat landings (B/L), Barge bumpers/Posts - Conductor and Riser protectors - Conductor guides - Mudmats - Clamps (Riser, J-Tube, Anode) - J-Tube, Caissons - Walkways, Stairs - Padeyes of appurtenances - Rigging platforms 	<ul style="list-style-type: none"> - Ladders - Gratings - Handrails - Grouting lines

TOPSIDES–DECK, MSF, MODULE, BRIDGE AND TOWERS

<ul style="list-style-type: none"> - Cans of Deck legs, columns and chord members - Deck, Module Padeye main Plate, Trunnions - Primary members, Plates subjected to direct pulling/ tension or heavily stressed perpendicular to the surface - Primary members, plates containing high concentration of welding which are subjected to out of plane stresses that may lead to lamellar tearing. - Cans of Bridge/Flare - Deck Nodes 	<ul style="list-style-type: none"> - Deck legs - Main Frames or trusses of Decks, Bridges and Flares - Braces in the vertical planes of lifting - Main girders/beams - Major equipment supports - Gantry crane, Crane pedestal and their supports - Flare, Bridge, Tower, Module supports - Stiffeners of main beams, legs, braces 	<ul style="list-style-type: none"> - Secondary braces not in the vertical plane of deck legs or lifting members - Lifeboat supports - Other Equip. supports - Monorail beams - Pipe/Cable tray supports - Stringers, Stabbing guides - Access/service platforms. - Helideck Plating - Padeye, Doubler plate and Lugs - Telecom towers, small Modules/Containers /Porta cabins - Walkways, Stairs 	<ul style="list-style-type: none"> - Floor plates - gratings - Gutters - Ladders - Handrails -
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Notes

1. Items like padeyes, Main framing of containers/porta cabins (for repeated use), elements in highly impacted areas, monorail beams, doubler plates, cans, lifeboat support plates/members, elements of higher thickness (above 19 mm) under secondary steel can be considered as critical items and shall be provided with material of minimum J2 grade corresponding to BS EN 10025.
2. Material of critical items which are subjected to tension perpendicular to the surface shall have low levels of Sulphur and Phosphorus in chemical composition. Furthermore, these items with thickness of 25 mm and above shall be tested with Z35 as per BS EN 10225 and EN 10164.

STEEL GRADE DESIGNATIONS

- (a) Structural steel shall be designated in terms of member category, group (as applicable) and grade.
- (b) Steel Corresponding to BS EN 10225 grades are based on groups 1, 2 and 3 as below:
 - (i) Group 1 grades with few changes from BS EN 10025 Parts 1, 3 and 4 and EN 10210-1: Minor changes to chemical analysis, CEV and impact requirements only.
 - (ii) Group 2 and 3 grades substantially modified from BS EN 10025 Parts 1, 3 and 4 and EN 10210-1 including qualities with enhanced through thickness ductility.

Structural steel shall be specified in accordance with Table 5.

For any material substitutions the supplier shall establish the equivalency of the proposed material with the specified material covering all physical and chemical properties and submit the proposal (the format presented in Appendix B may be used) to Company for review and approval.

Table 5 - Steel Designation (to be read along with Notes)

Category	Steel Group BS EN10225	Thickness (t) mm/ Item	Steel Grade		
			Plates and Rolled Tubulars	Rolled Sections	Seamless Hollow Sections
S	2	$t \leq 20$	S355G7+N	S355G11+N	S355G14+N
	3	$20 < t \leq 63$	S355G8+N (Z35)	S355G12+N (Z35)	S355G15+N (Z35)
	3	$63 < t \leq 100$	S355G10+N (Z35)	-	-
I	1	$t \leq 20$	S355G2+N	S355G1+N	S355G1+N
	2	$20 < t \leq 40$	S355G7+N	S355G11+N	S355G14+N
	2	$40 < t \leq 63$	S355G7+N	S355G11+N	-
	2	$63 < t \leq 100$	S355G7+N (see note1)	-	-
II (See Note 8)	-	Critical Items (see note 7)	S355J2+N	S355J2	S355J2H
	-	Other Items	S355J0 or S275J0	S355J0 or S275J0	S355J0H or S275J0H
A	-	$t < 25$	S275JR or S235JR	S275JR	S275JRH or S235JRH

Notes:

- (1) For Plate of group 2 with grade S355G7+N the thickness is up to 150 mm as per BS EN10225.
- (2) Plates, rolled sections and rolled tubulars for Category I & S shall be as per BS EN 10225.
- (3) Plates, rolled sections and rolled tubulars for Category II & A shall be as per BS EN 10025/BS EN 10225.
- (4) Seamless tubulars for Category I and S shall be as per BS EN 10225.
- (5) Seamless tubulars for Category II and A shall be as per BS EN 10210.
- (6) Impact tests (for thickness above 6 mm) shall conform to the relevant base code (BS EN 10025/ BS EN 10225/BS EN 10210) to which the material grade corresponds including supplementary requirements wherever applicable unless the requirements of this specification are more stringent. For I and S steel category of plates with groups of 2 and 3, the impact test pieces shall be machined transverse to the principal direction of rolling as per BS EN 10225. For welded tubulars which are rolled/formed in the principal rolling direction, impact test specimen to be parallel to the tubular axis.
- (7) For Secondary steel Critical item requirements (like minimum grade, Z35) see the Note-1 in Table 4. Grades of Z35 tested items shall be designated additionally with (Z).
- (8) Special Category Steels (S) shall be supplied in Normalised (+N) condition only, TMCP is not permitted.
- (9) Category II: Plates, Tubulars of thickness 12.7 mm and above, Sections of thickness above 25 mm shall be supplied in Normalised (+N) condition.

9 SPECIAL REQUIREMENTS

- (a) The steel manufacturing process shall be either basic oxygen process or electric arc furnace process.
 - (i) Rimming Steel is not permitted.
- (b) The steels of I and S category shall be fully killed and fine grained as per BS 10225.
 - (i) Steels with through thickness properties shall be vacuum degassed.
 - (ii) Steels of II and A category shall meet the requirements of BS EN 10025/10210 as per the grade.
- (c) The Supplier shall supply welded tubulars cold formed from plate to the sizes and lengths given in the material requisition. The parent materials for welded tubulars shall conform to the plate material defined in this specification. Rolled/welded tubulars are used for tube diameters in excess of 457mm.
- (d) Tubulars of diameter up to and including 457mm shall be seamless. Tubulars of diameter above 457mm to be straight seam welded tubulars rolled from plates. Manufacturing and welding of such tubulars shall be as per API 2B/API 5L and COMPANY Fabrication Specification.
- (e) Spiral welded tubulars are not acceptable. Electrical Resistance Welding (ERW) or High Frequency Welding (HFW) process shall not be accepted for Special, Primary and Secondary steel categories.

For tertiary/ancillary category steel items like handrails, ERW steel is considered acceptable.

- (f) For rolled cans, girth seam to be avoided.
- (g) For tubulars, irrespective of whether they are formed parallel or perpendicular to the main rolling direction of plates, the longitudinal axis of tensile test specimens shall be parallel to the longitudinal axis of the tubular member.
- (h) Strain ageing testing shall be as per Option 12 of BS EN 10225 for plates and rolled tubulars above 12.5mm in steels of group 2&3 corresponding to I and S categories.
- (i) Through thickness testing for category S steel above or equal to 25mm shall be as per Option 13 of BS EN 10225.
 - (i) For tubulars made from Z35 steel, the plates should be tested before forming by tensile tests in the through thickness direction, per patent plate, under the conditions specified in BS EN 10225. Alternatively, those tests may be performed on tubulars instead of plates.
- (j) Where the requirement of stress relieving Post Weld Heat Treatment (PWHT) after welding is specified in applicable approved design and drawings due to complexity or high level of stresses of the weld assemblies or where the nominal thickness exceeds 40 mm the steel manufacturer shall test the material in simulated PWHT condition as per Option-10 of BS EN 10225 and also without heat treatment. The mechanical test specimens shall be tested in as delivered condition. Unless otherwise recommended by the steel manufacturer and approved by Company. The PWHT temperature and time shall be as per BS EN 10225.

- (k) Weldability tests shall be performed for steels Category S & I by means of tests described in Annex E of BS EN 10225 as preproduction qualification test for all products exceeding 40 mm in thickness. One test shall be carried out on thickest material of purchase order for each thickness range specified below. Company approved third party shall witness such tests.
- (i) $40 < t \leq 63$ mm
 - (ii) $63 < t < 100$ mm
- (l) All Structural steels shall be applied new and free from any manufacturing defects with the associated mill/test certificates.
- (m) In addition to the requirements of this section, TMCP (Thermo-Mechanically Controlled Processed) shall comply with the additional requirements as specified in Section 13 of this document.

10 CHEMICAL COMPOSITION AND MECHANICAL PROPERTIES

Chemical composition, physical and mechanical properties shall conform to relevant base code BS EN 10225/BS EN 10025/BS EN 10210 including supplementary requirements wherever applicable unless the requirements of this specification are more stringent. As a rule, the more stringent requirement will be applicable. Mechanical Properties are presented in Appendix A for general reference only and the actual shall be as per the base code the material corresponds to.

SECTION C

11 QUALITY ASSURANCE AND QUALITY CONTROL

The Contractor shall have in effect at all times, a QNQC program which clearly establishes the authority and responsibility of those responsible for the quality system. Persons performing quality functions shall have sufficient and well defined authority to enforce quality requirements that initiate, identify, recommend and provide solutions to quality problems and verify the effectiveness of the corrective action.

Contractor's Quality Management Systems shall comply with all the requirements of ISO 9001 Quality Management Systems Requirements and ISO 9004 Managing for the sustained success of an organisation - A quality management approach.

A copy of the Contractor's QNQC program shall be submitted to the COMPANY with its quotation for review and concurrence prior to award. If Contractor QNQC program is ISO 9001 certified, then only a copy of the ISO 9001 certificate is required. In addition, if Contractor's facility is ISO certified, QA audit requirements will be waived in favour of ISO 9001 registrar audits, unless the COMPANY's trend analysis program indicates areas of concern.

The Contractor shall identify in documents to its manufacturers, suppliers, Contractors and sub-Contractors all applicable QNQC requirements imposed by the COMPANY, and shall ensure compliance. Contractor shall provide objective evidence of its QNQC surveillance for all levels of its activity.

The Contractor/Supplier shall make regular QA audits on all their Sub-Contractors/Suppliers for compliance with ISO-9001. Details of these audits shall be made available to COMPANY when requested.

Using Sub-Contractors is not allowed for services/functions carried out by a Supplier without ADNOC Offshore approval.

The Contractor's Quality Manual shall provide details for the preparation of a Quality Plan, which shall include provisions for the QA/QC of services activities. The Quality Plan shall be submitted to COMPANY for approval. Moreover, in case of any revision in the Quality Plan due to change in Quality Management System, then the revised QP shall be submitted for COMPANY's approval before initiating any service activities.

All Conflicts among Contractor, Supplier and TPA shall be reported in writing to COMPANY for resolution.

12 MECHANICAL TESTING

- (a) Mechanical testing (Tensile, Impact,) of all the material shall comply with the requirements of respective base codes BS EN 10225/BS EN 10025/BS EN 10210 including supplementary requirements wherever applicable unless the requirements of this specification are more stringent.
- (b) Tests shall be carried out on steel in the supplied conditions. The verification of mechanical properties shall be carried out by cast. The test unit shall contain products of the same form and grades. BS EN 10021 shall apply in respect of all retests and resubmission for testing.
- (c) No retesting shall be allowed for through-thickness tests without approval of the Company.

13 TMCP MATERIAL

- (a) TMCP (Thermo-Mechanically Controlled Process) designated +M material as per Base codes BS EN 10025/BS EN 10225/BS EN 10210 can be considered acceptable instead of Normalised designated +N provided the project specific welding procedures qualifications are carried by the manufacturer as per applicable codes. In addition steel mill, delivery condition, steel grade, steel group and PWHT, notch toughness test shall be considered as essential variables for TMCP material for I category steel. TMCP is not permitted for S category steel.
- (b) In addition to the requirements of this section for TMCP material, inspection test requirement specified elsewhere in this specification including Section 10 shall also be complied with.
- (c) For TMCP steel the requirements of CE and PCM as mentioned below shall be complied with.

Table 6 - Carbon Equivalent Maximum Values

Thickness	CE (Maximum)	Pcm (Maximum)
Up to 40 mm incl.	0.39	0.22
Over 40 mm to 90 mm incl.	0.41	0.23
Over 90 mm to 150 mm incl.	0.43	0.24

The steel of Primary (I) shall be fully killed, fine grained and vacuum degassed.

- (a) For TMCP steel, PWHT cycle shall be defined by the steel manufacturer and same shall be submitted to COMPANY. For materials with thickness over 20 mm the manufacturer shall provide supporting data illustrating the effect of simulated PWHT on the tensile and impact properties of this type of products.
- (b) When PWHT is specified or nominal thickness is over 40 mm the mechanical test samples of each heat/lot of steel products shall be tested in simulated condition as per Option-10 of BS EN 10225 and also without heat treatment. Test Results shall comply with the requirements stated in the applicable code.
- (c) The Weldability test shall be performed for steels Category I for all products of TMCP (exceeding 20 mm in thickness) as per clause 10.11 of this specification.
- (d) Only low heat input welding processes and multilayer welding techniques shall be used for welding of TMCP steel. Unless otherwise approved by COMPANY, high heat input welding processes such as ESW processes shall not be used for welding of TMCP steel.

14 INSPECTION

14.1 General

- (a) Inspection of surface conditions and dimensions shall be carried out by the steel manufacturer.
- (b) The Supplier/Manufacturer shall be fully responsible for ensuring the compliance of the material with the all the requirements of this specification and the basic codes the specified material corresponds to.
- (c) For implementation of non-destructive testing procedure and evaluation, as a minimum all NDE personnel shall be trained and certified to CSWIP-Level 2 as per CSWIP-ISO-NDT-11/93-R & ISO 9712 or other equivalent international NDE personnel certification (for example ASNT, ASME Level 2) subject to COMPANY approval. All visual welding inspectors shall be trained and certified minimum to CSWIP-Welding Inspector-Level 2 or equivalent subject to Company approval.
- (d) COMPANY reserves the right to recheck the tests carried out by the supplier. For this purpose COMPANY may request the delivery of samples or specimens for analyses in an independent laboratory/agency chosen by the COMPANY.

- (e) COMPANY/Purchaser and Certifying Authority shall be permitted free access at all times to any part of the steel Supplier's works engaged upon the order.
- (f) COMPANY/Purchaser and Certifying Authority reserve the right to inspect the manufacturing and testing process at any stage and to reject steel that does not comply with this specification.

14.2 NDT Requirements for Secondary and Tertiary Steel

- (a) Visual Inspection and Surface Condition

All surfaces of all products shall be 100% visually inspected.

Plates surface condition shall comply with EN 10163-1 and EN 10163-2, class A, subclass 3, except as otherwise specified separately.

Rolled sections surface condition shall comply with EN 10163-3, class C, subclass-2.

Magnetic particle Inspection (MPI) shall be carried out in accordance with ISO 9934-1 for plates and rolled sections, and EN 10246-12 for hollow sections, to confirm the complete removal of discontinuities.

Surface condition of seamless hollow sections and welded tubular shall conform to requirements of codes BS EN 10025/BS EN 10225/API Spec 2B/API 5L as applicable.

- (b) NDT for Internal Soundness Inspection

Plates of high strength (S355) or grade J2 with thickness greater than 19 mm supplied for critical loading application shall be ultrasonically tested in accordance with EN 10160. Ultrasonic testing shall be carried out either prior to or after the final heat treatment and shall meet the requirements of EN 10160, class S0/E1.

Rolled sections of high strength (S355) or grade J2 supplied for critical loading application shall be sound and free from such internal defects as this might preclude its use for the purpose for which it is intended. Internal soundness for rolled sections with web thickness greater than 12 mm shall be subjected to ultrasonic examination of webs and flanges and shall meet the requirements of EN 10306, Class 2.1.

All Hollow sections/tubular shall be ultrasonically tested for longitudinal defects in accordance with EN 10246-7 to acceptance level U3/C and for detection of laminar imperfections when thickness exceeds 9.5 mm.

Also, the weld seam of hollow sections/tubular shall be 100% tested either in accordance with EN 10246-9 to acceptance level U3 or by radiography in accordance with EN 10246-10 with an image quality class R2.

For tubulars with thickness of 9.5 mm and below Electro Magnetic Inspection (EMI) can be used.

14.3 NDT Requirements for Primary and Special Steel

(a) Visual Inspection and Surface Condition

Requirements of 14.2.1 specified above shall apply for visual inspection and surface condition for all products. In addition, Primary and special shall meet the requirements as below:

- (i) When the wall thickness has been reduced by more than 5 % of the nominal wall thickness or 1.6 mm whichever is less during repair/rectification of surface discontinuities/imperfections, magnetic particle inspection shall be carried out in accordance with EN 10246-12 to confirm complete removal of discontinuities and shall meet acceptance level M1.
- (ii) Surface discontinuities/Imperfections which exceed the above limits shall be ground or machined to sound metal. The excavation area shall be faired, and the thickness in the ground area shall not be reduced more than tolerances specified in respective applicable standards. If the wall thickness of any of the product is reduced beyond the above limits all such products shall be rejected. Weld repair of base metal shall not be permitted.

(b) NDT for Internal Soundness Inspection

All plates shall be 100% ultrasonically tested in accordance with EN 10160 and shall meet the requirements of EN 10160, class S1/E2 for steels of group 3 and EN 10160, class S0/E1 for steels of group 1 and 2.

All rolled sections of steel group 1, 2 & 3 shall be sound and free from such internal defects as they might preclude its use for the purpose for which it is intended. Internal soundness for rolled sections with web thickness greater than 12 mm shall be subject to 100% ultrasonic examination of both webs and flanges and shall meet the requirements of EN 10306, Class 2.1.

Full peripheral body of hollow sections/tubular shall be ultrasonically tested for detection of laminar imperfections to comply with the requirements of EN 10246-14 acceptance level U3 (for seamless) or EN 10246-15 acceptance level U3 (for strip/plate used in the manufacture of welded hollow sections/tubular).

In addition, all seamless hollow sections shall be ultrasonically tested for longitudinal defects in accordance with EN 10246-7 to acceptance level U2/C.

Also, the weld seam of hollow sections/tubular shall be 100% tested either in accordance with EN 10246-9 by automatic ultrasonic examination to acceptance level U3 or by radiography in accordance with EN 10246-10 with an image quality class R2.

15 TOLERANCES

The dimensions and tolerances of the product (plates, sections/shapes, and seamless tubulars) shall be in accordance with requirements of the respective code BS EN 10225/BS EN 10025/BS EN 10210 to which the material conforms to. Inspection for dimensions and tolerances shall be carried out by the steel manufacturer.

16 MARKING

16.1 General

- (a) For Special (S), Primary (I), Secondary (II) and Ancillary (A) category materials and products, the marking (including colour coding) shall be as per the requirements of the respective code BS EN 10225/BS EN 10025/BS EN 10210 to which steel the steel conforms to.
- (b) All marking shall be controlled and inspected by the Supplier and certified complete and correct before shipment of material.
- (c) Each product shall be identified by a colour code representative of steel grade and quality. Steel that cannot be identified shall be rejected. Based on yield strength different steel grades can be designated as below for marking purpose:

Description	Grade
High Strength Steels (HS)	S355 Grade Steel and higher
Medium Strength Steels (MS)	S275 Grade Steel
Low Strength Steels (LS)	S235 Grade Steel

16.2 Colour Coding

The colour band for different steel grades shall be as below:

- (a) S 235 (LS) : Aluminium
- (b) S 275 (MS) : White
- (c) S 355 (HS) : Blue
- (d) S 420 (HS): Yellow
- (e) S 460 (HS) : Green

The paint stencil /marking shall be made with white paint and shall include the details but not limited to the following:

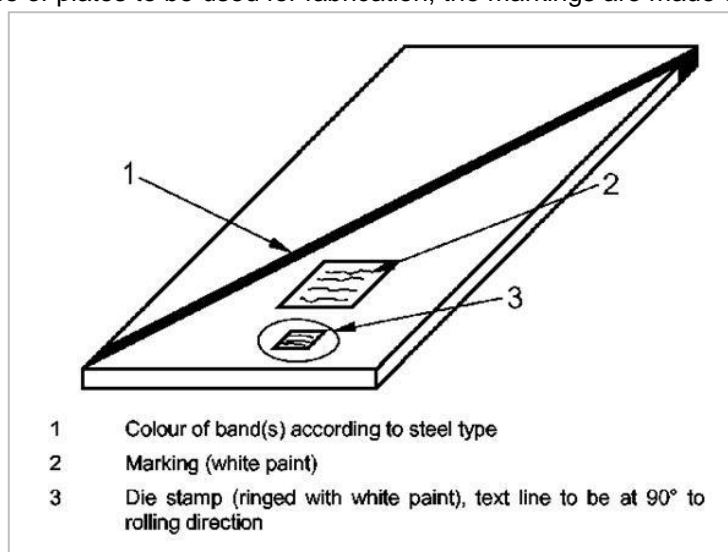
- (a) Heat/Cast no.
- (b) Steel Grade.
- (c) Steel Category (Special Steel/Z35 tested).
- (d) Dimensions.
- (e) Manufacturer's mark/logo.

The marking on plates, sections and tubulars is as below:

Plates

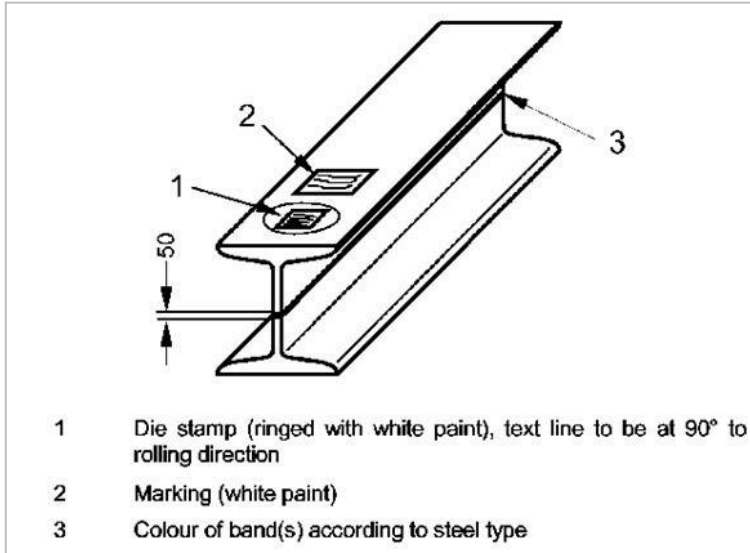
A stripe, at least 50 mm wide, running on the one hand diagonally, and on the other, lengthwise over a longitudinal section of the plate.

In the case of plates to be used for fabrication, the markings are made on the pipes only.



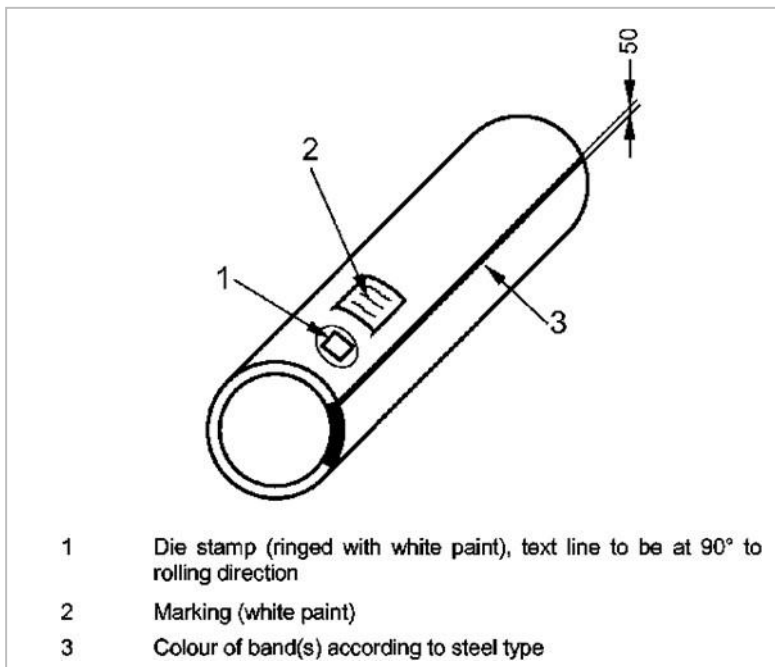
Sections

A stripe, at least 50mm wide, running over the entire length of the web.



Tubulars

A stripe, at least 50 mm wide, running over the entire pipe length.



17 TEST CERTIFICATES

- (1) Test certificates shall be supplied to the Inspector and Certifying Authority for approval for every supplied item. The certificates shall contain the information as per the requirements of the standard to which the material is being produced including any additional information required by this specification, to purchase for review and acceptance prior to despatch.
- (2) For Category I (Primary) and Category S (Special) steels supplied mill/ex-stock, the mill test certificates shall comply with BS EN 10204–3.2.
- (3) For Category II (secondary) steels of J2/J2H grade supplied mill/ex-stock the mill test certificates shall comply with BS EN 10204–3.2.
- (4) All other secondary steels of Category II shall comply with BS EN 10204–3.1.
- (5) For Category A (Ancillary) steels the inspection certificate shall be Type 2.2 in accordance with BS EN 10204.
- (6) All tests and reports shall be made at the Manufacturer/Supplier's expense. Certificates and data shall be in the English Language and SI units.

18 DOCUMENTATION

The documentation shall include but not be limited to the following:

- (a) Details of manufacturer, mills and vendor/supplier.
- (b) Mill certificates.
- (c) Quality control documentation.
- (d) Inspection Records.
- (e) Production test report.
- (f) Test Certificates.
- (g) Testing/simulation data for TMCP material (as per sections 11 and 13).
- (h) Additional data for PWHT condition (as per section 11).

19 MATERIAL STORAGE

Material storage shall be as per COMPANY's Fabrication Specification.

20 PACKING AND DELIVERY CONDITIONS

Packing, delivery conditions and general conditions for acceptance shall be in accordance with Company Specifications and supplemented with 'Instruction to Bidders' which shall be part of bid documents.

APPENDICES

APPENDIX A: MECHANICAL PROPERTIES

Table A.1- Plates, Rolled Tubulars and Rolled Sections – Primary and Special (as per BS EN 10225)

Group	Steel Grade	Minimum Yield Strength ReH for Thickness t (mm)					Tensile Strength Rm for Thickness t (mm)	Min. Elongation	Min. Avg. Energy Charpy Impact Test	
		≤ 16	> 16 ≤ 25	> 25 ≤ 40	> 40 ≤ 63	> 63 ≤ 100			≤ 100	Temp
		MPa	MPa	MPa	MPa	MPa	MPa	%	°C	J
Plates and Rolled Tubulars (refer to notes a & b)										
1	S355G2+N	355	345	--	--	--	470 to 630	22	-20	50
2	S355G7+N	355	355	345	335	325	470 to 630	22	-40	50
3	S355G8+N	355	355	345	335	325	470 to 630	22	-40	50
3	S355G10+N	355	355	345	335	325	470 to 630	22	-40	50
Rolled Sections (refer to notes c, d, e & f)										
1	S355G1+N ^(f)	355	345	--	--	--	470 to 630	22	-20	50
2	S355G11+N	355	345	345	335	-	460 to 620	22	-40 ^(e)	50
3	S355G12+N	355	345	345	335	-	460 to 620	22	-40 ^(e)	50 ^(d)

Notes:

- The specified tensile strength and elongation values apply to the maximum thickness for which minimum strengths are specified.
- Charpy V-notch mid thickness verifications are also required for thickness over 40 mm. In the case of piling material the mid-thickness impact shall be verified at -30oC in lieu of -40oC.
- For up to and including 25 mm thickness, test at -20o C.
- For Section Grade S355G12+N transverse Charpy V-notch impact test shall be carried out in lieu of longitudinal tests to meet 50 J minimum average at -40oC as per Option 26 of BS EN 10225.
- When agreed at the time of enquiry and order, sections/hollow sections with thicknesses greater than specified shall be supplied- see option 25 of BS EN 10225.
- As rolled condition (for sections) can be considered up to maximum flange thickness of 25 mm.

Table A.2 – Mechanical Properties for Seamless Tubulars – Primary and Special (as per BS EN 10225)

Group	Steel Grade	Minimum Yield Strength ReH for thickness t (mm)		Tensile Strength Rm	Min. Elongation	Min. Avg. Energy Charpy Impact Test	
		≤ 20	> 20 ≤ 40			Temp	Energy
		MPa	MPa	MPa	%	°C	J
1	S355G1+N	355	345	470 o 630	22	-20	50
2	S355G14+N	355	345	460 o 620	22	-40	50
3	S355G15+N	355	345	460 o 620	22	-40	50

Table A.3 - Mechanical Properties for Secondary and Ancillary steel (as per BS EN 10025/BS EN 10210)

Category	Steel Grade	Minimum Yield Strength ReH for Thickness t (mm)		Tensile Strength Rm for thickness t (mm)	Min. Elongation	Min. Avg. Energy Charpy Impact Test (see note b)	
		≤ 16	> 16 ≤ 40			Temp	Energy
		MPa	MPa	MPa	(see note 1) %	°C	J
II (Secondary)	S355J0/J2	355	345	470-630	21	0/-20	27
	S275J0	275	265	410-560	22	0	27
A (Tertiary)	S275JR	275	265	410-560	23	+20	27
	S235JR	235	225	360-510	26	+20	27

Notes:

- (a) Values presented are general. The actual values shall be as per the base code.
- (b) Impact Test (for thickness above 6mm) shall be carried out as per the stipulations of the relevant base code the material corresponds to.

APPENDIX B: MATERIAL SUBSTITUTION PROPOSAL FORMAT

<i>Material Description:</i>								
<i>Material Category:</i>	<i>Special S</i>		<i>Primary I</i>		<i>Secondary II</i>		<i>Ancillary A</i>	
TEM (↓)	Specified Material as per Company Spec			Proposed Alternate Material		Remarks		
	Description			Description				
	Grade:			Grade:				
	Code: BS EN 10225 / 10025 / 10210			Code:				
	Properties (↓)			Properties (↓)				
Chemical								
CEV								
C								
S, P								
Others:								
Mechanical								
Yield Strength								
Impact test (Trans. /Long.): Temp and Energy								
Steel Making Process								
Deoxidisation								
Special treatment								
Delivery Condition								
NDT-Inspection (UT)								
Certification Type								
DEVIATIONS								
ADDITIONAL TESTS								