DESFA
Hellenic Gas Transmission System Operator

HELLENIC GAS TRANSMISSION SYSTEM OPERATOR

357-359, MESSOGION AVE.,
15231 ATHENS, GREECE
Tel.: 210 6501258
Fax : 210 6501551

TECHNICAL JOB SPECIFICATION

499/17

REVISION 0

DATE 05/04/2011

HIGH PRESSURE (HP) TRANSMISSION SYSTEMS

STRUCTURAL STEEL FABRICATION

QUALITY ASSURANCE PAGE

CHANGES LOG

REVISIONS LOG

0	05-04-2011	FIRST ISSUE	PQ DPT.	V.G.
Rev. No	Rev. Date	REASON FOR CHANGE	Made By	Approved By

CONTENTS

REFERENCE DOCUMENTS

ELOT EN 719
[Welding Coordination - Tasks and Responsibilities]

ELOT EN 1011-2
[Welding - Recommendations for Welding of Metallic Materials - Part 2: Arc Welding of Ferritic Steels Together]

ELOT ENV 1090-1
[Execution of steel structures - Part 1: General rules and rules for buildings]

ELOT EN 1991
[Eurocode 1: Actions on structures]

ELOT EN 1993
[Eurocode 3: Design of steel structures]

ELOT EN 10025
[Hot rolled unalloyed structural steel products; technical delivery conditions]

ELOT EN 10034
[Structural steel I and H sections; tolerances on shape and dimensions]

ELOT EN 10055
[Hot rolled Steel Equal Flange Tees with Radiused Root and Toes - Dimensions and Tolerances on Shape and Dimensions]

ELOT EN 10056-1
[Structural Steel Equal and Unequal Leg Angles]

ELOT EN 10058
[Hot rolled flat steel bars for general purposes - Dimensions and tolerances on shape and dimensions]

ELOT EN 10279
[Hot rolled steel channels - Tolerances on shape, dimensions and mass]

ELOT EN 13479
[Welding consumables - General product standard for filler metals and fluxes for fusion welding of metallic materials]

ELOT EN 14399
[High-strength structural bolting assemblies for preloading]

ELOT EN 15048
[Non-preloaded structural bolting assemblies]

ELOT EN 20898-2
[Mechanical Properties of Fasteners Part 2: Nuts with specified Proof Load Values - Coarse Thread]

ELOT EN ISO 898-1
[Mechanical properties of fasteners made of carbon steel and alloy steel - Part 1: Bolts, screws and studs]

EN 729
[Quality Requirements for Welding Fusion Welding of Metallic Materials Part 1: Guidelines for Selection and Use]

ISO 888
[Bolts, screws and studs; Nominal lengths, and thread lengths for general purpose bolts]

BS 5950
[Structural use of steelwork in building - Code of practice for design - Rolled and welded sections]

ΕΑΚ-2003 ΦΕΚ 781Β/18.06.2003
«Τροποποίηση και συμπλήρωση Ελληνικού Αντισεισμικού Κανονισμού ΕΑΚ 2000»
[Hellenic Seismic Code]

1.0 SCOPE

This specification covers the minimum requirements for the designs where required, shop detailing, fabrication, inspection, supply and erection of structural steel.

2.0 APPLICABLE CODES

ELOT EN 719
ELOT EN 1011-2
ELOT EVN 1090-1
ELOT EN 1991 (Eurocode 1)
ELOT EN 1993 (Eurocode 3)
ELOT EN 10025
ELOT EN 10034
ELOT EN 10055
ELOT EN 10056-1
ELOT EN 10058
ELOT EN 10279
ELOT EN 13479
ELOT EN 14399
ELOT EN 20898-2
ELOT EN ISO 898-1
EN 729
ISO 888
BS 5950
ΕΑΚ-2003 ΦΕΚ 781Β/18.06.2003

3.0 MATERIALS

Materials shall conform to the latest revision of the following:
Structural steel shall be Fe 360 as per **ELOT EN 10025.**
Grating shall be galvanized steel welded, non-skid grating. Bearing bars shall be 30 x 3 mesh 30 x 50. Min design load 500 kg/m^2.
High strength bolts 10.9 (**ELOT EN ISO 898-1**).
Unfinished hexagonal head bolts 4.6 (**ELOT EN ISO 898-1**).

4.0 DESIGN DEFINITION AND DETAILING RESPONSIBILITIES

The Fabricator shall be responsible for the design of all connections not specifically detailed on the arrangement drawings. Loads to be used for the design shall include any reinforcement and/or stiffeners required to carry the forces

through the connection and the connected elements.
Fabricator shall prepare and take full responsibility for the accuracy of all shop detail drawings. Shop details shall be strictly in accordance with the arrangement drawings and the this specification. The practices outlined in this specification shall be incorporated in the shop details.

5.0 DESIGN & DETAILING REQUIREMENTS FOR STRUCTURAL STEEL

Reference spec, shall be **Job Specification No. 499/16.**

5.1 ADDITIONAL REQUIREMENTS

For welded truss-work, working lines not more than 15 mm greater than the offset to the gravity axis of the member shall be used.

On welded trusses, splices to ship the largest possible section as shop assembled units shall be detailed. Splices for bolted joints shall be detailed also. Field welding shall not be used for splices unless shown and noted specifically on the arrangement drawing.

Grating shall be banded at all ends and cut outs. All banding bars shall be of the same size as the bearings bars. Grating shall be fastened to supporting members by bolts and clip assemblies designed not to protrude above the deck elevation. At least two grating hold down clips shall be installed at each end of a grating section.

Grating penetrations for pipes, electrical, etc, shall be as follows:

Field cut, but do not band, all holes smaller than 200 mm in diameter.

Shop cut and band all holes 200 mm in diameter and larger.

For holes greater than 400 mm in diameter, split grating and band.

All platforms, including circular platforms, ladders and cages shall be shop assembled including posts, handrail, mid-rail and toe plate, to the maximum extent permitted by shipping limitations.

Where shipping limitations prevent the shop attachment of handrail assemblies to platforms, both straight and bent sections of top rail, mid-rail, toe plate and posts shall be supplied in shop fabricated assemblies for field bolting to platform steel resulting in minimum field work.

6.0 SHOP CONNECTIONS

Generally shop connections shall be welded. For galvanized steel, welding shall be done prior to galvanizing.

All welds shall be in accordance with latest revision of the relevant European Standards. In particular **ELOT EN 13479, EN 729, ELOT EN 719** shall be complied.

7.0 FIELD CONNECTIONS

Field connections shall be made with high strength steel bolts, except for the following minor connections where unfinished bolts shall be used or where field welding is indicated on the arrangement drawings:

Removable handrail and ladder cage assemblies and attachments to structures.

Removable floor plate or structural members.

Purling and girds.

The minimum size of bolts shall be 16 mm diameter.

Field connections using high strength bolts shall be bearing type connection.

No friction type connection shall be used unless approved by the Owner.

Where field welding is required, the Fabricator shall provide erection clips as required.

All field welding shall be indicated on the erection drawings.

Overages on field bolts shall be 5% on both high strength steel and unfinished bolts, Hardened washers, including bevel washers, shall be provided where required.

8.0 PROTECTIVE COATINGS

Galvanizing, painting and other coatings shall be used as protective coatings.

9.0 FIREPROOFING

Fireproofing shall be noted F.P. on the arrangement drawings and on erection drawings.
The fireproofing design shall be performed as per **ELOT EN 1993 (Eurocode 3)** Design of steel structures - Part 1-2: Supplementary rules for structural fire design.
The thermal and mechanical actions shall be obtained from **ELOT EN 1991 (Eurocode 1)**: Basis of design and actions on structures, Part 2-2: Actions on structures exposed to fire.
In addition the fireproofing of steel structures shall follow the principles shown in **Job Specification 840/1** for "Fireproofing" where the thickness of fireproofing material shown in this specification shall be regarded as the minimum necessary.

10.0 FABRICATOR'S DRAWINGS

Erection plans shall be drawn by the Fabricator with erection marks shown thereon in letters at least 3 mm high. Reproductions of Owner Arrangement drawings shall not be used as erection plans. Any deviation from the above shall be made only with the written consent of Owner.
Each structure shall have an index sheet to the steel details. On small jobs, the index may be added into the erection plan, where convenient.

An Erector's bolt list specifying the number, size, type of connector, grip and ordered length of connector for each connection shall be furnished be the Fabricator. This listing shall be broken down by categories and tiers, as outlined below.
Beam to column connections. Beam to beam connections. Column splices. Bracing to column connections. Bracing to beam connections e.t.c.
A summary of all field connectors by size and length shall also be included.
Where a standard bill of material form is not an integral part of the detail drawing, separate bills of material listing all main material and fittings with space for convenient "weighing up" of the structure shall be furnished by the Fabricator.
Profiles tolerances shall comply with **ELOT EN 10056-1, ELOT EN 10055.**

11.0 ERECTION MARKING SYSTEM

The first letter of the mark shall be the prefix letter assigned to a particular structure and noted as such on the arrangement drawing.

The second letters of the mark shall indicate the type of structural framing in accordance with the table below. There shall be a dash between the first and second letters of the mark. The Fabricator shall use:

"B" - for rolled beams and channels.
"C" - for column, post, or strut not designated by a coordinate system on the arrangement drawing. Where a column is given with a coordinate the coordinate must be used as the mark.
"D" - for vertical bracing of skewed bracing.
"F" - for frames shipped in one piece.
"G" - for girts.
"H" - for hangers.
"K" - loose gussets.
"L" - ladders safety cages, or lintels.
"M" - for bolsters, shims, and miscellaneous material.
"P" - for floor plates, plain or checkered.
"R" - for hand failing and rail posts.
"S" - for sag rods.
"T" - for trusses.
"X" - for horizontal bracing.
"BK" - for brackets.
"BP" - for loose base plates or bearing plates.
"CS" - for casing plates.
"HB" - for header box on heaters.
"PG" - for plate girders.
"SS" - for stair stringers.
"TB" - for trolley beams.
"TS" - for tube sheets on heaters.

Beam marks shall be painted on beams at the same and as they are shown on this plan view of the Fabricator's framing plan. The numerical portion of the beam mark shall identify the floor or tier thus: beam 1 to 199 on first or lowest tier, beams 200 to 299 on 2nd tier, 300 to 399 on third tier, e.t.c.

On a structure having one or both dimensions over 30 m. in plan view, all erection marks shall be suffixed with the derrick suffix letter shown on the arrangement drawing.
All unsymmetrical beams, girders, or trusses, shall have a direction painted on one end, preferably north or east.
All members to be marked "top", where possibility of erecting the member inverted exists.
All columns to have the mark painted on the outside face of the flange and marked "North" or "East".
Column marks shall carry a tier suffix for spliced columns. On vertical bracing the mark shall be painted on the lower end.
Where a member is shipped in two or more pieces, each piece shall have a different mark.
The use of R or L suffixes for opposite hand marks will not be permitted.
Examples of typical marks for a structure prefixed "A" is given below :

A-B402, Beam 402 in 4th tier.
A-D-6(0-2) Column at coordinate D-6, from grade to 2nd tier.
A-D6, Vertical brace (note no hyphen between C & 6).

A-C1-NW, Column 1 (not coordinated since no hyphen between C & 1), with derrick suffix NW (northwest) for a large square structure.
A-G17, B, Girt 17 in a long structure with derrick suffix B.

All marks shall be painted on the steel in legible fashion, with letters and numerals a minimum of 37 mm high.
All rods, turnbuckles, clevises, etc, are to tagged and marked with the tag wired firmly to the member.
All bolts, washers, etc shall be shipped in kegs or crates and tagged or clearly marked as to size, diameter, and length.
On duplicate units, color coding shall be used where called for on the arrangement drawing. Where color coding is required, the Fabricator shall paint a one inch wide bend all around each member at one end, including kegs, or crates, etc., in the color designated by the arrangement drawing.
Galvanized members shall be tagged with a metal plate having raised letters so that the mark shall be visible after galvanizing. This metal plate shall be tack-welded to the member prior to galvanized. The Fabricator may submit alternate proposal for marking galvanized members, subject to the Owner's Engineer written approval.

12.0 INSPECTION

The material and workmanship covered in this Specification shall be subject to inspection in the field or shop by a qualified Inspector. However, such inspection shall not relieve the Contractor of his responsibility to furnish materials and workmanship in accordance with the contract requirements.

The Inspector shall have the option to make, but shall not be limited to, the following types of tests and inspections, at Fabricator expenses and in accordance with DIN Specifications.

Determine chemical composition of steel.
Determine mechanical properties of steel.

Inspect shop-fabricated structural steel members and assemblies for conformance with the requirements specified.

Inspection of shop assembled.

Make inspection of shop welds as follows:

-Visual inspection of all shop welds.

-Liquid penetrant inspection.

-Magnetic particle inspection.

-Radiographic testing.

-Ultrasonic testing.

13.0 SHIPMENT

All shipments, including partial shipments, shall be accompanied by sufficient bolt or connectors of the proper size and length to suit the material shipped with each shipment.

Prior to shipment, the Fabricator shall transmit the necessary detail drawings.

Ladders with ladder cages, handrails, platforms and trusses shall be shop assembled as permitted by shipping limitations and with assurance of no damage.

14.0 ERECTION REQUIREMENTS

All steel erection shall be carried out without delay in a first class workmanlike manner, in accordance with the **ELOT ENV 1090-1** and **BS 5950** as specified elsewhere in this Specification. The Construction Contractor shall plumb level, thoroughly fasten, brace and guy the structure before welding or bolting starts so as to keep it plumb and true during erection.