DESFA
Hellenic Gas Transmission System Operator

HELLENIC GAS TRANSMISSION SYSTEM OPERATOR

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TECHNICAL JOB SPECIFICATION
840/1
REVISION 0
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HIGH PRESSURE (HP) TRANSMISSION SYSTEMS

FIRE PROOFING

QUALITY ASSURANCE PAGE

CHANGES LOG

REVISIONS LOG

0	05-04-2011	FIRST ISSUE	PQ DPT	V.G.
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CONTENTS

REFERENCE DOCUMENTS

ELOT EN 60079
[Explosive atmospheres]

«Κανονισμός Πυροπροστασίας Κτιρίων», Π.Δ. 71/88 (ΦΕΚ 32 Α')
[Fire Protection Greek Regulation]

- ΕΚΤΣ ΦΕΚ 315Β 1997
«Ελληνικός Κανονισμός Τεχνολογίας Σκυροδέματος»
[Hellenic Concrete Technology Regulation]

1.0 SCOPE

This job specification shall be the basis for designating equipment and structural steel which is to be fire proofed and extent of fire proofing of supporting elements of equipment and piping by means of fire resistant coverings.

In case of conflict between this specification and mandatory local codes, the latter and the most stringent shall govern.

2.0 GENERAL

For the purpose of this specification, "Fireproofed" will be considered synonymous with "Fire Resistive" as adopted by the National Legislation for Fire Protection (**Π.Δ. 71/88 (ΦΕΚ 32 Α')**).

Hazardous area is defined as the area inside a battery limit or an area within 9 m horizontally of a potential source of fire.

Hazardous equipment is defined as that containing flammable material, other combustible liquids or liquids with atmospheric boiling points below - 29°C. Equipment such as vessels, exchangers, tanks, drums and air heaters which fulfill the above requirements is considered hazardous. Piping shall not be considered combustible containing equipment.
Classification of flammable and combustible liquids shall be in accordance with **ELOT EN 60079** series.

Fireproofing shall be used to protect containers of combustible materials, fire fighting operations, and fire fighting personnel from the effects of support failure during a fire of approximately 1 1/2 hours duration.

Protection shall be achieved by fireproofing only the supporting elements of equipment and structures in fire hazardous areas that might directly extent a fire of hinder fire fighting operations as follows:

a. Cause container rupture and consequent dumping of combustible contents through collapse of the container supports or through collapse of an adjacent tall slender structure on the container or the container supports.

b. Cause a hazard to fire fighting operations of fire fighting personnel through collapse of a tall slender structure or a structure supporting heavy equipment.

3.0 DESIGNATION OF STEEL TO BE FIRE PROOFED

All structural steel supporting hazardous equipment or supporting process equipment in a hazardous area shall be fire proofed.

Structural steel supporting other equipment shall not be fire proofed unless its collapse would endanger fire proofed equipment.

Steel piperacks in hazardous areas shall be fireproofed from grade up to an elevation where the highest load is applied (i.e. first level).

4.0 EXTENT OF APPLICATION OF FIRE PROOFING

4.1 STRUCTURAL STEEL (ALL EQUIPMENT)

Columns, beams and horizontal strut bracing of structural steel shall be fire proofed from grade to an elevation where the highest important equipment load is applied to the structure. All bracing, with the exception of wind bracing, shall be considered as structural steel requiring fire proofing.

4.2 VESSEL SUPPORTS

All lugs, brackets and legs supporting process equipment located in hazardous areas shall be completely fire proofed.

On horizontal or vertical vessels which have slots in the base supports to accommodate differential thermal expansion, the application of fire proofing shall not interfere with the motion.

Saddles, supporting process equipment in hazardous areas and measuring more than 30 cm in height at their lowest points shall be fire proofed.

4.3 VERTICAL EQUIPMENT SKIRTS

Steel skirts for vertical equipment (drums, e.t.c.) shall be fire proofed from the equipment insulation to the foundation, including the base ring and bolt boxes.

Skirts with a diameter less than 1,2 m normally shall be fire proofed on the outside only; if there have non-welded connections at the interior area of the skirts then fire proof shall be applied on the inside surfaces of the skirt
Skirts with diameters greater than 1,2 m shall have fire proofing on the outside and inside surfaces.

Bottom heads of non-insulated vessels having skirt diameter greater than 1,2 m shall be fire proofed.

On vessels with a diameter less or equal than 1.2m, inside of skirts, and the bottom heads if they are not insulated, they shall be fire proofed only if the skirt access opening diameter is greater than 50 cm or if there are more than one access openings.

4.4 PIPE SUPPORTS

In hazardous areas, pipe rack bents supporting piping shall be fire proofed to the first level, including horizontal members at the first level. Pipe rack bents supporting (hazardous equipment except piping) shall be fire proofed up to the point of support of the equipment.

4.5 THE FOLLOWING WILL NOT BE FIRE PROOFED

Structures which support auxiliary equipment, such as storage hoppers, elevators, etc.

Diagonal bracing provided only for wind loading.

Stairways and platforms not designated for fire- fighting.

Maintenance structures, such as for tube bundle removal.

Top flanges of support beams for air heaters and piping.

Equipment handling or storing flammable gaseous or vaporous fluids which would rise rather than settle upon release; e.g. natural gas, hydrogen e.t.c.

Equipment storing liquids which would flash if released to the atmosphere.

5.0 PREPARATION

Steel work to be fire proofed should be free from scale, rust, grease, dirt and any foreign matter which would impair the band between the surface to be fire proofed and the proofing material.

6.0 MATERIALS AND APPLICATION

Concrete which shall be used for fireproofing shall have a minimum cube strength of 225 kp/cm^2 at 28 days and the size of aggregate shall not be greater than 8mm. Cement shall be Portland Cement.

Reinforcement shall be welded steel wire mesh 50x50mm with steel bar diameter 2-3mm or similar.

Fire proofing concrete shall be gun applied, poured or trowelled to give a minimum cover of 50 mm.
Reinforcement shall be wrapped around the structural steel members and lapped and wired where the member is fully fire proofed, and U-bent and wired to rods shall be provided where the top flange is exposed. For details see attached standards.

Reinforcement and spacers shall be binded in place with a 1.5mm diameter annealed iron wire, before concrete is placed.

Welded studs or blank square nuts, welded edge-on or steel rod spacers shall be used to provide a cover of 20mm between steel reinforcement and the face of the vessel skirt.

Gunite shall be used as an alternative fire proofing material. Gunite is pneumatically premixed sand and cement thrown on the steel surface by compressed air ejector which forms a very dense, high strength concrete. Water is added to the dry materials mixture as it passes through the nozzle of the ejector.

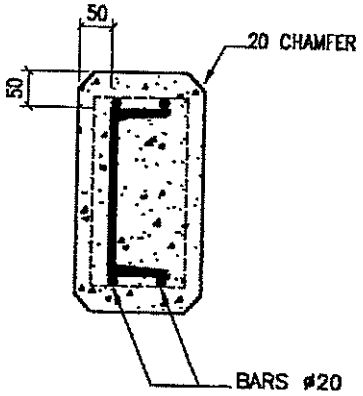
6.1 GUNITE INGREDIENTS

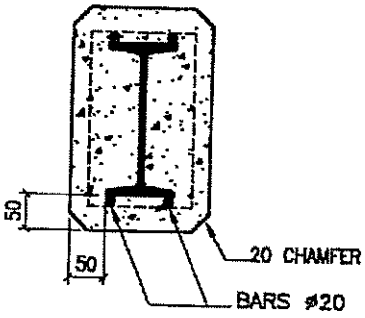
Cement shall be Portland cement.
Sand shall be high silica sand with clean, sharp, hard, durable particles conforming to **"Hellenic Concrete Technology Regulation"** (ΕΚΤΣ ΦΕΚ 315Β 1997).
The sand shall be neither excessively dry nor wet; moisture shall be about 4% by weight.
Water shall be potable water in quality and free from injurious amount of oil, acid, alkali or organic matter.

6.2 GUNITE MIXTURE

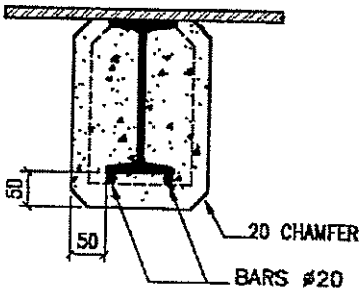
The proportions of cement to sand mix shall be approximately 1 part of cement to 3.5 parts sand (dry and loose volumes).
Cement and sand shall be passed thru a 6 mm mesh sieve to remove any lumps and then shall be thoroughly premixed before added to the hopper of the ejector.
Water content shall be maintained to insure proper consistency of the mix.
Reinforcement shall be as per above **para 6.1 to 6.2.**

Formed Concrete Details



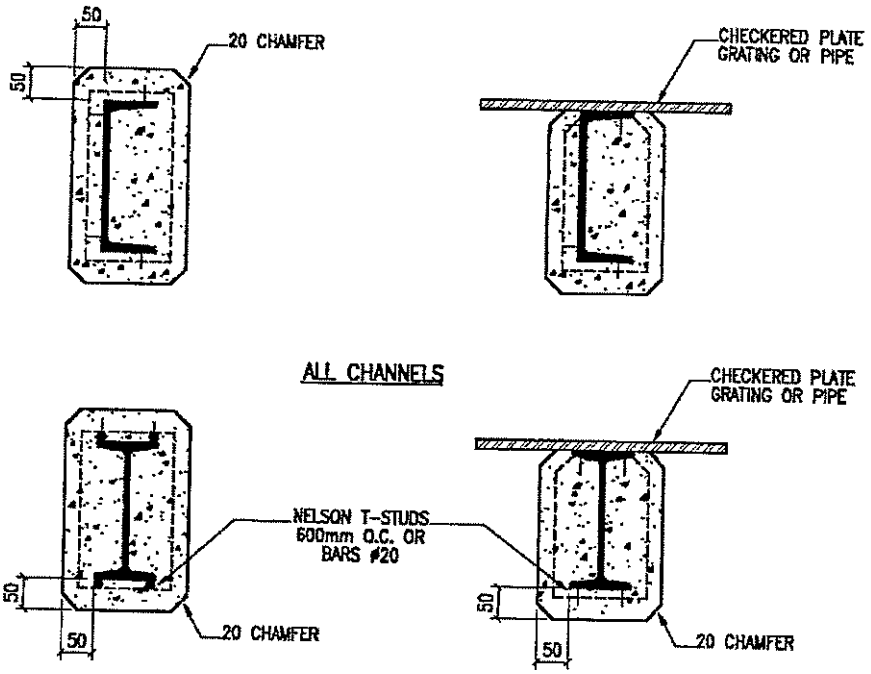


FOR PIPE OR CHECKERED PLATE SUPPORTS

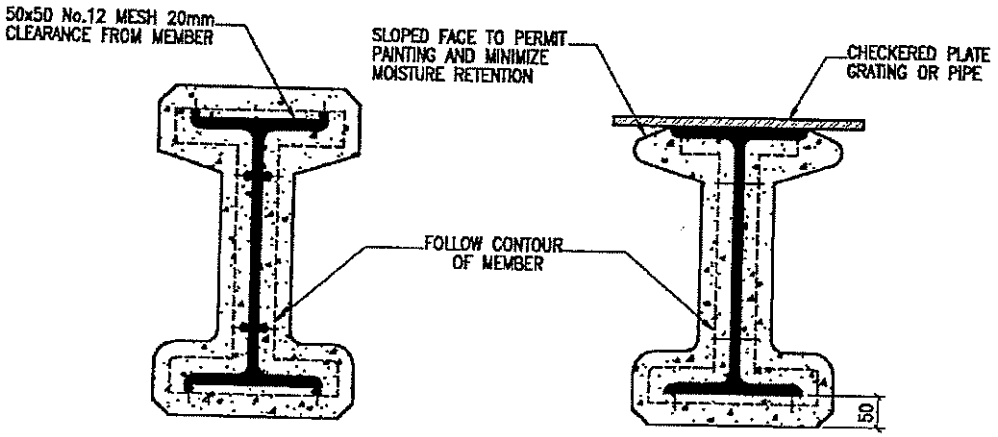


FOR ALL BEAMS AND COLUMNS

Gunite Details

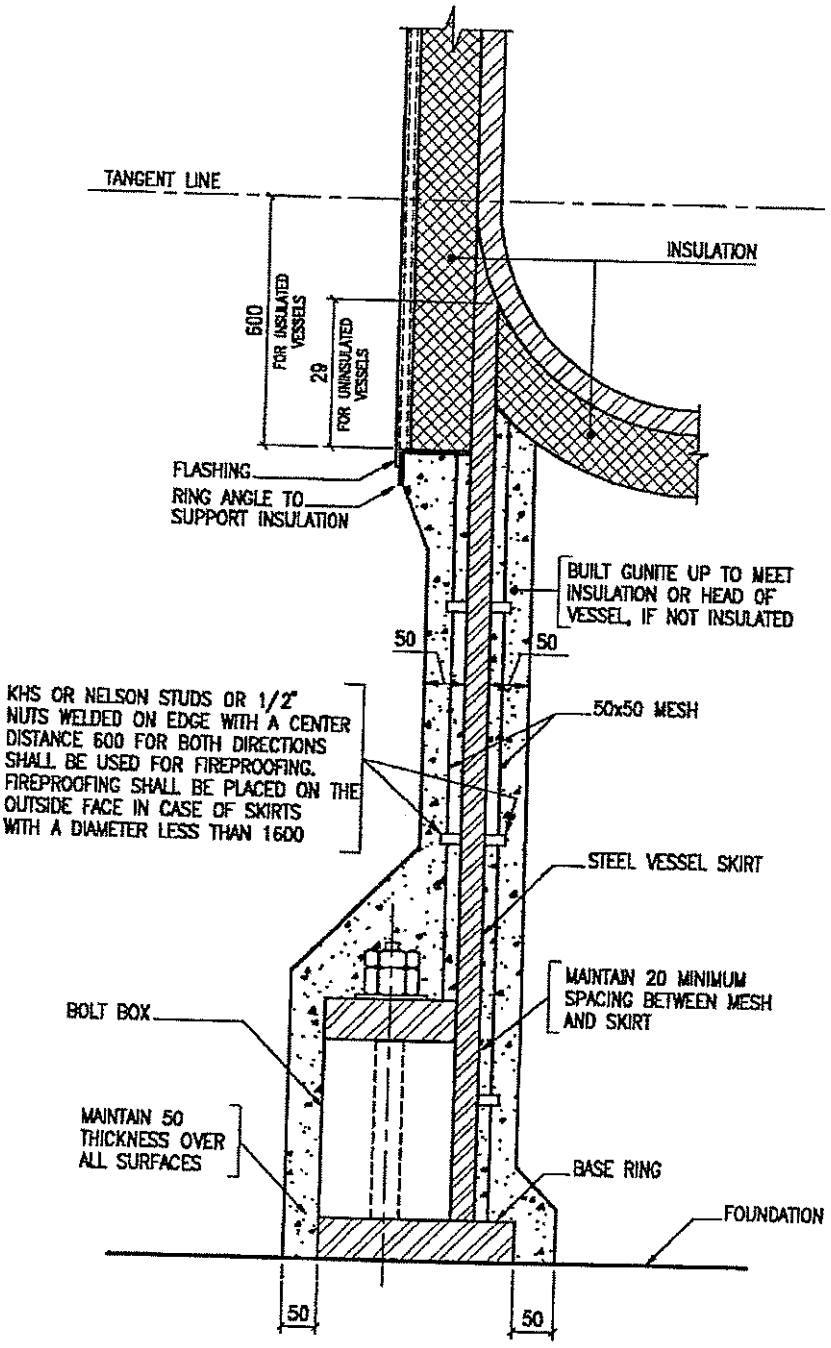


I BEAMS AND COLUMNS LESS THAN 300



I BEAMS AND COLUMNS – 300 AND LARGER

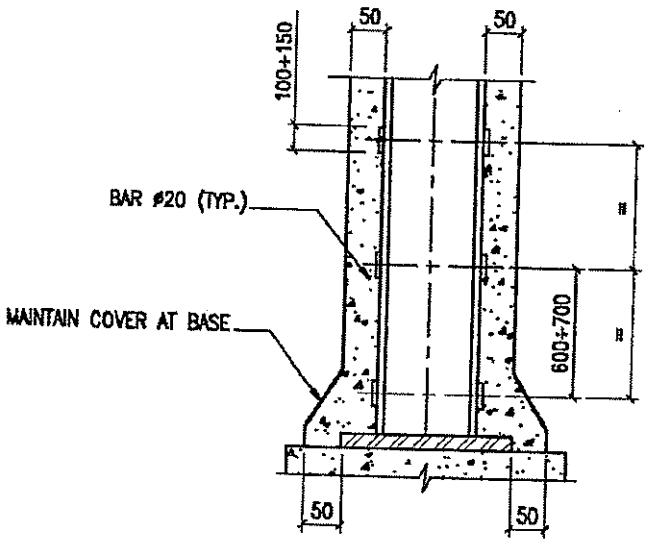
Tower Skirts



NOTE:

1. IF OPENINGS, SUCH AS MANHOLES, ARE ENCOUNTERED, USE 4 STUDS OR NUTS AROUND OPENING. WHEN NUTS ARE USED ON EDGES WIRE MESH WITH 116 GALVANIZED WIRE SHALL BE USED.

Gunite Details



DETAIL AT COLUMN BASE