



**HELLENIC GAS  
TRANSMISSION  
SYSTEM OPERATOR**

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**TECHNICAL JOB  
SPECIFICATION**

**510/3**

**REVISION 0**

**DATE 05/04/2011**

**HIGH PRESSURE (HP) TRANSMISSION  
SYSTEMS**

**BALL VALVES DN  $\geq$  50**

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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

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**REFERENCE DOCUMENTS**

Job Spec. No. 834/2  
[Plant Coating of Buried Valves for Pipeline]

Job Spec. No. 970/2  
[Shop Inspection of equipment and materials for NGT project]

ELOT EN 1759-1 [Flanges and their joints. Circular flanges for pipes, valves, fittings and accessories, class-designated. Steel flanges, NPS 1/2 to 24]

ELOT EN 1503-1  
[Valves - Materials for bodies, bonnets and covers - Part 1: Steels specified in European standards]

ELOT EN 10045-1  
[Charpy Impact test on metallic materials-part 1: test method]

ELOT EN 10204  
[Inspection Documents for metallic products]

ELOT EN 13445-4  
[Unfired pressure vessels - Part-4: Fabrication]

ELOT EN 13942 (ISO 14313 modified)  
[Petroleum and natural gas industries - Pipeline transportation systems - Pipeline valves]

ELOT EN 14141  
[Valves natural gas transportation in pipelines - Performance and tests]

ELOT EN ISO 4527  
[Metallic coatings - Autocatalytic (electroless) nickel-phosphorus alloy coatings - Specifications and test methods]

ELOT EN ISO 10497  
[Testing of valves – Fire type testing requirements]

ISO 1083  
[Spheroidal Graphite Cast Iron - Classification Second Edition]

ASME B16.5  
[Pipe Flanges and Flanged Fittings]

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**1.0**     **SCOPE**

**1.1**     **ITEM**

Ball valves DN  $\geq$  50.

**1.2**     **SERVICE**

Sweet, natural gas with sporadic passage of water and glycol.

**1.3**     **APPLICATION**

Shut-off

**1.4**     **ADDITIONAL INFORMATION**

Additional information may be given in the Data Sheet and Material Requisition and these documents should be read in conjunction with this job specification. Any conflict between requirements of this specification and drawings, Data Sheet and Material Requisition supplementary design data, or Standards shall be referred to Owner for clarification, before proceeding with fabrication of concerned part.

Ball valve Manufacturer shall be responsible to design valves and their components in accordance with the requirements of applicable documents.

In no event, however, are thicknesses, dimensions, etc to be less than those shown on valve drawings, unless specific written approval to the contrary is received from Owner.

**2.0**     **GENERAL REQUIREMENTS**

**2.1**     **APPLICABLE STANDARDS**

ELOT EN 14141, ELOT EN 13942 and additionally satisfying the requirements herein.

**2.2**     **UNITS**

Metric for all units.

**2.3**     **PRESSURE RATING**

Refer to Data Sheet or Material Requisition.

**2.4**     **PATTERN**

Refer to Data Sheet for full bore or reduced bore requirement.

Short pattern shall not apply, unless explicitly required on the Data Sheet.

**2.5**     **CONSTRUCTION**

**2.5.1**    **BALL**

Integrally cast or forged.

**2.5.2**    **BALL BEARING**

DN  $\geq$  100 trunnion mounted of double tightness.

DN < 100 trunnion mounted or floating.

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**2.5.3**     SEATS

Double seated.

Double block and bleed shall only be provided when supplementary requirement SR1 is specified on the Data Sheet.

**2.5.4**     SEAT SEALING

Metal to metal with resilient inserts.

**2.5.5**     ANTI-STATIC

If galvanic contact, between ball and valve body cannot be ensured, valves shall have spring loaded plungers for earthing of ball and stem.

**2.5.6**     PRESSURE RELIEF CONNECTION

Required.

Refer to Data Sheet for type, either plugged or valved.

Plugged with DN  $\geq 15$ , threaded solid hexagonal head safety plug which allows cavity pressure to escape prior to disengagement of thread.

Valved with PN 250 plug valves with metallic sealing mounted (by welding) directly to Ball Valve Body.

Plug valve lines shall be a minimum DN 15 for ball valve up to DN 400 and a minimum of DN 25 for ball valves DN 450 and above.

Plug valves shall be welded to valve line, but threaded at free end and fitted with a hexagonal head plug, alternatively screwed joints are acceptable providing they are fully engaged and seal welded.

For ball valves installed below ground (Refer to Data Sheet) the pressure relief line shall be valved as above and extended to a level close to the valve operator following closely the stem extension and terminating with an additional PN 250 plug valve fitted with a hexagonal head plug, all as specified above.

**2.5.7**     DRAIN CONNECTION

Refer to Data Sheet for type, either plugged or valved.

Construction requirements shall be as pressure relief connection above.

**2.5.8**     SEALANT INJECTION SYSTEM

Only required when supplementary requirement SR2 is specified on the Data Sheet.

**2.5.9**     BODY DESIGN

Valves installed below ground (Refer to Data Sheet) shall be of a fully welded design.

**2.5.10**    FLANGES

Raised Face or Ring joint as per **ELOT EN 1759-1**. For flanges with DN $>$ 600 not covered by this standard, dimensions given in **ASME B16.5** applies. Refer to Data Sheet for type. Bore to be derived from abutting pipe dimensions, see Data Sheet.

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**2.5.11**    WELDING ENDS

Beveling as per **ELOT EN 14141**.

The minimum acceptable wall thickness of welding ends shall be determined by the formula

$$WT_{min} = \frac{P \times D_e}{2 \times \text{Specified minYield Strength} \times F}$$

where, P is the Design Pressure,  $D_e$  is the actual outside diameter of the welding end and Yield Strength is the yield strength of the welding end material.

If  $WT_{min}$  exceeds the wall thickness of the abutting pipe by more than 50%, the valve shall be furnished with transition pipes welded to the valve. Reference is made to Data Sheet for abutting pipe dimensions and materials.

Transition pipe length shall be at least 150 mm. End-to-end dimension of the valve assembly may exceed **ELOT EN 14141** dimensional requirements by up to 2 x transition pipes length.

**2.5.12**    DIMENSIONAL TOLERANCES

The inside diameter of valves with welding ends shall match the abutting pipe inside diameter within a tolerance of  $\pm 1.6$  mm.

For valves  $DN \geq 300$  with welding ends the maximum allowed out-of- roundness shall be 0.5%. The out- of-roundness shall be defined by

$$200 \times \frac{D_{e,max} - D_{e,min}}{D_{e,max} + D_{e,min}}$$

where  $D_{e,max}$ ,  $D_{e,min}$  are the maximum and minimum outside diameters measured at the welding ends.

**2.5.13**    STEM SEALS

Dual "O" rings or special design of equivalent or better quality.

**2.5.14**    STEM STOPS

Required.

**2.5.15**    STEM EXTENSION HOUSING

Housing shall be rigidly mounted to valve body by flanges (or similar joint). Housing design and its connections to valve and gear operator shall prevent any ingress of water, humid air or other substances which may affect valve operation, particularly during cold periods. Where air tightness cannot be ensured, filling of the housing with a suitable lubricant can be considered acceptable.

**2.5.16**    LIFTING EYES

Required for valves  $DN \geq 150$ .

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2.5.17 SUPPORT RIBS OR LEGS

Refer to Data Sheet for requirement. Where a support is required the size of the area actually transferring the load to a base below shall be at least 20 mm<sup>2</sup> per kilogram of valve weight.

2.5.18 POSITION INDICATORS

Required.

2.5.19 PASSAGE OF SCRAPERS OR OTHER INSTRUMENTS

Required with full bore valves.

Bore diameter shall be > 96% of abutting pipe nominal inside diameter.

2.5.20 VALVE OPERATION

Refer to Data Sheet for method.

2.6 **MATERIALS**

2.6.1 GENERAL

Only fully killed fine grain carbon steel (with exceptions to trim and ball) and conforming to European Standards **ELOT EN 14141** and **ELOT EN 1503-1** shall be used. When normalized and tempered materials are specified, the tempering shall be performed prior to any welding unless specifically otherwise authorized in writing by Owner.

The tempering temperature shall be 10°C higher than that required for post weld heat treatment, unless otherwise specified.

Attention is drawn to section 4 detailing certifications requirements.

All parts containing pressure and butt welding ends shall have impact tests for each type of material used as per **ELOT EN 14141** and **ELOT EN 10045-1**. The test temperature shall be -20°C, unless a lower temperature is specified in the Data Sheet with an acceptance criterion of:

Mean value from the 3 tests 31 joules with the lowest single value 24 joules.

2.6.2 BUTT WELDING ENDS

Only fine grained steel suitable for field welding and with the specified minimum yield strength and chemical analysis as specified below are allowed

<u>DN</u>	<u>Yield Strength not to exceed</u>
up to 300	290 N/mm <sup>2</sup>
350 to 450	360 N/mm <sup>2</sup>
500 to 900	420 N/mm <sup>2</sup>
1050	490 N/mm <sup>2</sup>

Carbon content C shall be ≤ 0.21% on heat analysis.

Carbon equivalent (CEV)

≤0.45% for grades with SMYS ≤ 360 N/mm<sup>2</sup> and

≤0.48% for grades with SMYS > 360 N/mm<sup>2</sup>.



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Sulfur content will be  $\leq 0.030\%$  on heat analysis.

**2.6.3** BODY AND COVER

Carbon steel e.g.

Castings to ELOT EN 1503-1 grade GP240GH/1.0619 or G20Mn5/1.6220 or equivalent.

Forgings to ELOT EN 1503-1 grade P280GH/1.0426 or P285NH/1.0477 or equivalent.

Plates to ELOT EN 1503-1 grade P275NH/1.0487 or P355NH/1.0565 or equivalent.

**2.6.4** TRIM AND BALL

Stainless steels, e.g. ELOT EN 1503-1 grade X2CrNiMo 17-12-2/1.4404 or X5CrNiMo 17-12-2/1.4401 or equivalent.

Carbon steel or nodular cast iron as ISO 1083 may be used if-coated with a minimum of 30 microns electroless nickel plate or equivalent, providing, adhesion (bend) test and porosity (ferroxyl) test as ELOT EN ISO 4527 or equivalent are carried out to sample plates coated with the same material as the balls and are without failure.

Mating seating surfaces shall have a hardness differential of at least 50 HB.

**2.6.5** SEAT INSERTS STEM SEALS

Suitable elastomer.

**2.7** **FABRICATION**

**2.7.1** FORMING OF PLATE

As per ELOT EN 13445-4.

Subsequent heat treatment, if required, shall be by normalizing.

**2.7.2** WELDING

As per ELOT EN 13942 (ISO 14313 modified).

Hardness of the weld seam and heat affected zone shall nowhere exceed 260 HV 10.

**2.7.3** REPAIR BY WELDING

Only permitted in welds and casting.

**2.7.4** POSTWELD HEAT TREATMENT

As per ELOT EN 13445-4.

Valve bodies of welded construction shall be stress relieved if welded wall thickness is  $> 30$  mm, with exceptions for closure welds.

Any heat treatment operations performed by valve fabricator and intended to enhance mechanical properties, shall obtain approval by Owner.

**2.8** **NON DESTRUCTIVE EXAMINATION**

**2.8.1** CASTING

All items shall examined as per ELOT EN 14141.

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All castings shall be 100% visual inspected.

All valves shall be subject to 100% surface examination on all accessible internal and external areas by magnetic particle examination or penetrant testing.

All valves with  $DN \geq 200$  shall be examined radiographically.

**2.8.2** PLATES AND WELDED PIPE

All items shall be radiographically or ultrasonically examined according to **ELOT EN 14141**.

**2.8.3** WELDS

All joints shall be examined in accordance with **ELOT EN 14141** as follows:

All welds shall be 100% visual inspected.

- For  $DN < 200$  penetrant testing or magnetic particle testing.
- For  $DN \geq 200$  ultrasonic or radiographic testing.

Where radiography or ultrasonic examination is unfit for detection then magnetic particle examination may be used.

**2.8.4** WELDING ENDS

All welding ends made from plate, tubulars or forgings shall be ultrasonically examined to a minimum distance of 50 mm from, and including the bevel according to **ELOT EN 14141**.

Any discontinuity with a width exceeding 6 mm shall be cause for rejection.

**2.8.5** SEALING AND SEAT RING SURFACES

All sealing and seat ring surfaces shall be magnetic particle examined as per **ELOT EN 14141**.

However laminar defects are not acceptable.

Surfaces which are to be electroless nickel plated shall be examined prior to plating.

**2.8.6** ELECTROLESS NICKEL PLATED BALLS

Thickness test shall be carried out in accordance with **ELOT EN ISO 4527** or equivalent.

**2.9** FIRE TEST

If so specified on the data sheet valve design shall have been qualified According to **ELOT EN ISO 10497**.

"Fire safe" certification shall include "fire-safe" tests representing all sizes and pressure ratings for each valve model. "Fire-safe" tests shall be witnessed by the Inspector. Previous acceptance of certification by the Owner's Engineer is acceptable in lieu of requalification for identification for identical valves.

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**2.10 FACTORY TESTING**

**2.10.1 STRENGTH AND TIGHTNESS TEST**

Air seat tests plus hydrostatic shell tests as per **ELOT EN 14141** are required.

**2.10.2 OPERATIONAL TORQUE TEST**

Required, after mounting of operating equipment and inclusive of operator functions.

**2.11 SURFACE TREATMENT**

As per Data Sheet. Valves to be installed below ground shall be coated externally by Manufacturer. External coating for buried valves shall be in accordance with Job SPEC. 834/2. Valves to be installed above ground shall be primed and painted as per Data Sheet.

**2.12 MARKING**

Valves to be installed below ground shall be marked on a welding end with valve serial number, Client contract number and material grade of welding end, and all marking shall be as per **ELOT EN 13942** (ISO 14313 modified) on the nameplate which shall be fixed at a point close to the actuator /operator.

Valves to be installed above ground shall be marked on their bodies with serial number and Client contract number. Welding ends shall be marked with material grade, and all marking shall be as per **ELOT EN 13942** (ISO 14313 modified) on the nameplate.

The nameplate shall additionally bear the Inspection Body stamp as per **ELOT EN 10204** and Job Specification **970/2**.

**2.13 TAGGING**

All valves shall be tagged with the valve number (commodity code) as stated on the data sheet and be prefixed by the valve nominal size. This shall be clearly stamped on a noncorrodible metal tag which is to be securely attached to the valve with a noncorrodible metal wire.

**2.14 DELIVERY**

When wrench is specified on the Data Sheet, one piece shall be supplied with each valve.

Handle extension is required if valve is to be installed below ground.

Handwheels and wrenches may be shipped in accordance with the Manufacturer's standard procedure, otherwise the valve shall be delivered in fully assembled condition with all openings, pipe ends, nipples, etc. capped for protection.

**3.0 SUPPLEMENTARY REQUIREMENTS**

**3.1 GENERAL**

The following Supplementary Requirements shall not apply unless specifically requested on the applicable Data Sheet.

Further requirements, if specifically mentioned in the Material Requisition or on the

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Data Sheet, shall be valid. In case of conflict between such requirements and the requirements contained herein, the former shall prevail.

**3.1.1**     SUPPLEMENTARY REQUIREMENT SR1

Valve seats shall provide for double block and bleed (double tightness) which shall function under the lowest pressure differential.

**3.1.2**     SUPPLEMENTARY REQUIREMENT SR2

Seat design shall incorporate a sealant injection system that shall allow for injection with valve under full line pressure. The system shall provide a tight shut-off even if seat sealing surfaces should become damaged.

With earth-covered valves (refer to Data Sheet) injection lines shall be extended to near valve operator. A check valve shall be where the injection line is fixed to the body.

Screwed joints are only acceptable if fully engaged and seal welded.

**4.0**     TECHNICAL DOCUMENTATION. INSPECTION AND CERTIFICATION

**4.1**     **QUANTITY**

Four copies of each, inclusive of original for all Documents and Certificates.

Four copies of each, inclusive of one reproducible for all Drawings.

Also electronic files of all Documents and Certificates must be submitted by Contractor to the Owner.

**4.2**     **INSPECTION AND CERTIFICATION**

Inspection will be performed by an Independent Accredited Inspection Body or the Manufacturer's Authorized representative independent of the manufacturing department. Inspection requirements are defined in the following documents.

- a. Material requisition
- b. Job Specification No. **970/2** "Shop inspection of equipment for NGT and material project"
- c. Relevant project specifications
- d. Inspection clauses of applicable Standards.

Inspection procedures to be followed are detailed in Owner document "Inspection and Test instructions".

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## 4.3 DOCUMENT REQUIREMENTS

### 4.3.1 WITH TENDER

Proof of design either as certificate of approval or prototype test report issued by an Accredited certifying authority.

Statement of Manufacturer's type number for each item if standard product offered. Catalogues, general arrangement drawings and parts list covering all items inclusive of operating equipment.

Statement regarding materials used for all principle component with reference to material standards herein.

Statement regarding materials for surface treatment.

Certificate confirming valve design has been qualified for Fire Test Approval (re. 2.9), if required.

### 4.3.2 AFTER AWARD OF CONTRACT (BEFORE PRODUCTION)

Dimensioned general Arrangement drawing of each item including support ribs, operating equipment etc., together with a material parts list detailing material standard and grade, item number and description as well as certification level of materials as a minimum.

Welding procedures specifications, Forming procedures, Testing procedures.

Recommended procedure for installation (welding) in pipeline to avoid excessive heat on valve.

Manufacturer's Detailed Test and Inspection plan. The plan shall additionally show the control points at which the Independent Inspectors witnessing /approval is required as per section 4.2 herein.

### 4.3.3 ON DELIVERY

Comprehensive operation, maintenance and reconditioning manuals.

List of recommended tools, spare parts, lubricants etc., necessary for two years operation.

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### 4.4 VALVE CERTIFICATION PACKAGE.

Valve drawings shall include the following information printed clearly in or adjacent to the title block:

- a. Contract No.
- b. Requisition No. and item No.
- c. Purchase Order No.
- d. Valve number (commodity code)
- e. The principle dimensions of the valve, any gear operator, the size, type, and style.  
Also the weight of the valve, per size, should be included.
- f. Materials of construction.
- g. Pressure-Temperature limitations.

Drawings shall be checked and certified by the Manufacturer as being an actual record of the valve being supplied against the Purchase Order.

Drawings shall be sent to the Owner accompanied by a transmittal note or letter, marked for attention Procurement Department.

Approval of Manufacturer's drawings shall not be considered as relieving the Manufacturer of any responsibility for detailed design, dimensions, construction of equipment or deviation from specification.

Manufacturer shall not commence final manufacture of valves until receipt of the Owner approval of his drawings.

### 5.0 SHIPMENT, PROTECTIVE COATING AND END PROTECTION

- Ball valves shall be shipped in the open position.
- Unmachined exterior surfaces of valves shall be painted per Manufacturer's standard.
- Machined or threaded surfaces subject to atmospheric corrosion during shipment or subsequent storage shall be coated with easily removable rust preventive.
- Valves with screwed or socket weld parts shall have the ends protected with metal, or plastic plugs.
- Valves with flanged ends shall have the gasket surface protected by means of a suitable disc wired on.
- Valves with butt-weld ends shall have the bevels covered with a suitable close fitting protector.

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- When lifting the valves, the slingers must be wrapped around the body only and not around the spindle lever.
- Packing is to be in wood cases.
- The valves to be transported must be firmly fixed to the case load-bearing bottom.
- For valves with a weight greater than 0.6 tons fastening is performed with wooden saddles and joists nailed to the side walls. The saddles two for each valve, must ensure an uniform distribution of the valve weight over the case bottom. For valves with a weight lighter than 0.6 tons only the joists nailed to the side walls are required. For the valve actuator units and the valve components (e.g. extensions) the fastening will depend upon their shape, weight and dimensions.
- The packing shall be mechanically protected i.e. from impact caused by falls during handling, vibration caused by transport etc.
- Manufacturer Quality Plan shall include details about lifting, support during transportation, preservation, etc.