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TECHNICAL JOB SPECIFICATION

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LIQUEFIED NATURAL GAS PLANTS

ALLOY VERIFICATION METHODS

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CHANGES LOG

REVISIONS LOG

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REFERENCE DOCUMENTS

ELOT EN 10036 Chemical analysis of ferrous materials. Determination of total carbon in steels and irons. Gravimetric method after combustion in a stream of oxygen

ELOT EN 10071 Chemical analysis of ferrous materials. Determination of manganese in steels and irons. Electrometric titration method

ELOT EN 10136 Chemical analysis of ferrous materials. Determination of nickel in steels and irons. Flame atomic absorption spectrometric method

ELOT EN 10184 Chemical analysis of ferrous materials. Determination of phosphorus in non-alloyed steels and irons. Molybdenum blue spectrophotometric method

ELOT EN 10200 Chemical analysis of ferrous materials. Determination of boron in steel. Spectrophotometric method

ELOT EN 10211 Chemical analysis of ferrous materials. Determination of titanium in steel and iron. Flame atomic absorption spectrometric method

ELOT EN 10212 Chemical analysis of ferrous materials. Determination of arsenic in steel and iron. Spectrophotometric method

ELOT EN 10276-1 Chemical analysis of ferrous materials. Determination of oxygen in steel and iron. Sampling and preparation of steel samples for oxygen determination

ELOT EN 24829-1 Steel and cast iron: spectrophotometric method for silicon contents from 0.05% (m/m) to 1.0% (m/m)

ELOT EN 24829-2 Steel and cast iron: spectrophotometric method for silicon contents from 0.01% (m/m) to 0.05% (m/m)

ELOT EN 24943 Sampling and analysis of iron, steel and other ferrous metals. Methods of analysis. Determination of copper. Steel and cast iron: flame atomic absorption spectrometric method

ELOT EN 24946 Determination of copper. Steel and cast iron: spectrophotometric method

ELOT EN ISO 10280 Steel and iron. Determination of titanium content. Diantipyrylmethane spectrophotometric method

ELOT EN ISO 10700 Steel and iron. Determination of manganese content. Flame atomic absorption spectrometric method

1.0 GENERAL

1.1 Scope

1.1.1 This standard covers the requirements for the qualification of personnel and procedures, marking and approved methods of alloy verification.

1.1.2 The extent of alloy verification, including the items which are to be alloy verified, the method to be used, sampling and acceptance criteria and the assignment of responsibilities for conduct, shall be in accordance with the Order.

1.2 European Standards

The European Standards to be complied are listed below:

ELOT EN 10036 Chemical analysis of ferrous materials. Determination of total carbon in steels and irons. Gravimetric method after combustion in a stream of oxygen

ELOT EN 10071 Chemical analysis of ferrous materials. Determination of manganese in steels and irons. Electrometric titration method

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2.0 VERIFICATION

2.1 Purpose of Verification

2.1.1 The purpose of alloy verification is to ensure that the specified material is supplied and used in accordance with the design requirements.

2.1.2 Alloy verification shall not be considered as a substitute for required material test reports. Material test reports shall not be considered as acceptable alloy verification.

2.2 General

2.2.1 Alloy verification, when specified, shall be performed at the point of application at the time which ensures that proper materials have been used in the fabrication of an identifiable assembly (such as plate welded into a vessel or a pipe length welded into a spool). The point of application may be at the Seller's shop during fabrication, or at the project site for field assembled items not previously alloy verified.

2.2.2 At the option of the purchaser, alloy verification shall be performed either by the purchaser's inspector, the Seller, or a third party contracted by the Seller.

2.2.3 If alloy verification is performed by the seller or a third party, the seller shall certify that all alloy verification tests have been performed in accordance with the approved procedure by qualified personnel and that all alloy verification has been performed at the point which will ensure the correct material has been used.

2.2.4 Alloy verification of weld material shall be performed in the same manner as for the adjacent base metal.

2.3 Qualification of Procedures and Personnel

2.3.1 The alloy verification personnel and procedures shall be subject to review by the Purchaser as follows:

a. The Seller or third party shall submit for review the alloy verification procedures, including complete descriptions of the methods and equipment to be used and personnel qualification procedures.

b. The Purchaser's inspector will review the procedures and qualifications and witness

sample alloy verification tests to the extent necessary to prove the procedures and personnel are acceptable.

c. The Purchaser's inspector will check procedures to ensure that verified material is traceable to the Order and any required material documentation.

d. All tests and stages of alloy verification shall be subject to further witness by the Purchaser's inspector.

e. If the performance of any verification is unacceptable to the Purchaser's inspector, or if any material has been incorrectly identified, all further tests shall be witnessed and approved or performed by the Purchaser's inspector until such time as the problem is corrected.

2.3.2 The stamp manufacturer's certificate for the low stress stamp shall be submitted to the Purchaser's inspector for review and acceptance before the stamp may be used.

2.3.3 The Seller shall ensure that all involved parties fully understand the alloy verification requirements, the verification method to be used, the period during fabrication that verification will be carried out and the method of marking verified material.

3.0 METHODS AND RESULTS OF TESTS

3.1 Analysis Methods

3.1.1 The following analysis methods are acceptable for required alloy verification:

a. Chemical analysis by one of the methods described in the European Standards, as applicable, or a similar method accepted in writing by the Purchaser:

ELOT EN 10036
ELOT EN 10071
ELOT EN 10136
ELOT EN 10184
ELOT EN 10200
ELOT EN 10211
ELOT EN 10212
ELOT EN 10276-1

b. Spectroscopic analysis by one of the methods described in the European Standards, as applicable, or a similar method accepted in writing by the Purchaser:

ELOT EN 24829-1
ELOT EN 24829-2
ELOT EN 24943
ELOT EN 24946
ELOT EN ISO 10280
ELOT EN ISO 10700

3.1.2 Alloys, including castings, verified by an approved analysis method shall contain the amounts of alloying elements specified in the material specification plus the tolerance of the approved equipment and method used.

3.2 Sorting Methods

The following sorting methods of alloy verification will be used only when specified by the Purchaser. All parties involved shall be properly notified if these sorting methods are used instead of analysis methods.

a. Verification of magnetic properties with a permanent magnet or instruments that measure magnetic properties.

b. Visual spark testing (with a grind wheel).

c. Chemical spot testing.

d. Electroanalyzer testing

e. Thermoelectric separator.

f. Eddy current sorters.

4.0 REJECTION

4.1 General

4.1.1 If the alloy verification test results fall outside of the acceptable range, or if the results of the analysis are unacceptable to the Purchaser's inspector, the Seller shall either:

a. Obtain a quantitative check analysis performed by an independent test laboratory using the "referee" method referenced by the material specification.

b. Submit other corrective action plan for the Purchaser's acceptance.

4.1.2 All items of the type in question, or all similarly identified materials of that lot or shipment shall not be accepted pending results of the independent tests. If the test results of the independent laboratory tests are not within the acceptable range of the European Standards or other applicable material specification, the material shall be rejected.

5.0 MARKINGS

5.1 General

5.1.1 All verified materials with acceptable analysis shall be marked with the letters "AV" using a certified low-stress stamp. The marking shall be placed as follows:

a. Pipe: two marks, 100 degrees apart, 75 mm from each end of each length on the outer surface of the pipe.
b. Welds: adjacent to the welder's mark on the weld.
c. Fittings and Forgings: adjacent to the Seller's markings.
d. Valves: adjacent to the Seller's markings on bodies and other pressure parts.
e. Plates: adjacent to the heat numbers.
f. Castings: adjacent to the Seller's markings and heat numbers.
g. Tubes for heat transfer service: stenciled, not stamped on each end. The marking shall be done with a water insoluble material that contains no harmful substance, such as metallic pigments, sulfur, or chlorides, which would attack or harmfully affect austenitic or nickel alloy steels at ambient or elevated temperature. The Seller shall submit analysis of marking materials to the Purchaser. Submittal shall demonstrate, by chemical analysis and history of use, that material meets the requirements.

5.1.2 If the material is too light, too small, or cannot otherwise be stamped, vibro-etching or color coding shall be applied in conjunction with Seller's standards and the requirements of Paragraph 5.1.1 and noted on the alloy verification reports.