

TECHNICAL SPECIFICATION

ALLOY STEEL PIPE (AMENDMENTS/SUPPLEMENTS TO ASTM A 691)

MESC SPE 74/007

November 2012

MESC SPECIFICATION DOCUMENT



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All administrative queries should be directed to the MESC SPE Administrator in Shell GSI.

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PART I INTRODUCTION

1.1 SCOPE

This MESC SPE specifies requirements for alloy steel pipe.

This MESC SPE shall apply in addition to the applicable MESC Buying Description, purchase order or requisition sheet.

This MESC SPE only applies to alloy steel pipe to ASTM A 691, Grades 1¼CR (1.25Cr-0.5Mo), 2¼CR (2.25Cr-1Mo), 5Cr (5Cr-0.5Mo) and 9CR (9Cr-1Mo), all of Class 22.

This MESC SPE is written as amendments and supplements to ASTM A 691:2009, which are covered in Part II of this MESC SPE. The clause numbering of ASTM A 691:2009 has been retained and any amendments are identified as 'Add', 'Modify to read' or 'Delete'. Any clauses of ASTM A 691:2009 that are not amended or supplemented by this MESC SPE shall apply as written.

1.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS

Unless otherwise authorised by Shell GSI, the distribution of this MESC SPE is confined to Shell companies and, where necessary, to Contractors and Manufacturers/Suppliers nominated by them.

This MESC SPE is intended for use in oil refineries, chemical plants, gas plants, exploration and production facilities and, where applicable, supply/distribution installations.

If national and/or local regulations exist in which some of the requirements may be more stringent than in this MESC SPE the Contractor shall determine by careful scrutiny which of the requirements are the more stringent and which combination of requirements will be acceptable with regards to safety, environmental, economic and legal aspects. In all cases the Contractor shall inform the Principal of any deviation from the requirements of this MESC SPE which is considered to be necessary in order to comply with national and/or local regulations. The Principal may then negotiate with the Authorities concerned, the objective being to obtain agreement to follow this MESC SPE as closely as possible.

1.3 DEFINITIONS

The **Contractor** is the party that carries out all or part of the design, engineering, procurement, construction, commissioning or management of a project, or operation or maintenance of a facility. The Principal may undertake all or part of the duties of the Contractor.

The **Manufacturer/Supplier** is the party that manufactures or supplies equipment and services to perform the duties specified by the Contractor.

The **Principal** is the party that initiates the project and ultimately pays for its design and construction. The Principal will generally specify the technical requirements. The Principal may also include an agent or consultant authorised to act for, and on behalf of, the Principal.

The word **shall** indicates a requirement.

The word **should** indicates a recommendation.

1.4 CHANGES SINCE PREVIOUS EDITION

The previous edition of this MESC SPE was dated **August 2008. Following is the summary of changes:**

- **Chemical composition requirement has been updated;**
- **Incorporated new section on "Length" for pipes;**
- **Email address of MESC SPE administrator has been updated**

1.5 COMMENTS ON THIS MESC SPE

Comments on this MESC SPE may be sent to the MESC SPE Administrator at MESC@shell.com. Shell staff may also post comments on this MESC SPE on the Surface Global Network (SGN) under the Standards folder.

PART II AMENDMENTS/SUPPLEMENTS TO ASTM A 691:2009

5.1 *Add:*

For pipe furnished to Grade P11 the restrictions in the chemical composition shall be one of the following two options:

1. The carbon content shall not exceed 0.14 % and both the phosphorous and sulphur content shall not exceed 0.010 %.
2. The material shall meet the following additional chemical requirements by heat analysis:

Element	C	P	S	Cu	Ni	X-bar
Max allowed	0.15 %	0.012 wt%	0.007 wt%	0.20 %	0.30%	14

X-bar shall be calculated with the following formula:

$$X - \text{bar} = \frac{10P + 5Sb + 4Sn + As}{100}$$

in which the values of P, Sb, Sn and As are in ppm.

For pipe furnished to Grade P22, the following restrictions shall apply to the pipe and the weld:

- The carbon content shall not exceed 0.14 %.
- The phosphorous content shall not exceed 0.010 %.
- The sulphur content shall not exceed 0.010 %.

5.2.2 *Modify to read:*

The longitudinal seam weld shall be made by the automatic submerged arc welding (SAW) process.

5.3 *Modify to read:*

Pipe ordered to Grades 1¼ Cr, 2¼ Cr, 5Cr and 9CR shall conform to one of the following two options:

1. The plate to ASTM A 387 shall be supplied in the normalised and tempered condition. The tempering temperature shall be 740 °C ±8 °C (1365 °F ±13 °F). The tensile properties shall be in accordance with Class 1 of ASTM A 387. The pipe shall be furnished in the post weld heat treated condition. The post weld heat treatment temperature shall be 715 °C ±10 °C (1318 °F ±18 °F).
2. The plate to ASTM A 387 shall be supplied in the normalised and tempered condition. The minimum tempering temperature shall be 720 °C (1330 °F). The tensile properties shall be in accordance with Class 1 of ASTM A 387. The pipe shall be furnished in the post weld heat treated condition. The post weld heat treatment temperature shall be 715 °C ±10 °C (1318 °F ±18 °F). After all processing, one sample from each heat shall undergo three simulated PWHT cycles at 730 °C ±8 °C (1345 °F ±14 °F) with a holding time as per ASME B31.3 Table 331.1.1 for each cycle. Mechanical tests according to ASTM A691 paragraph 8.1 shall be performed after each cycle. If the results of all the tests comply with ASTM A 335, all pipes from that heat shall be considered acceptable.

8.4 *Add:*

Hydrostatic testing shall be performed after heat treatment.

8.4 *Add* **Hardness testing**

Supplementary requirement S3 shall apply.

- 8.5 *Add* **Magnetic Particle Examination**
Supplementary requirement S7 shall apply. The acceptance criteria shall be in accordance with ASME B31.3, Table 341.3.2 for "Severe Cyclic Service", Criteria A. For butt-welding ends no linear indications longer than 1.6 mm (0.06 in) are allowed.
- 8.6 *Add* **Ultrasonic Test**
Supplementary requirement S10 shall apply.
- 11.3 *Modify to read:*
Circumferential welded joints are not permitted.
- 13.2 *Add:*
In addition, marking shall also include the nominal pipe size (DN), and the pipe schedule number or specified wall thickness (mm).
Marking shall also include the charge number (heat number) and, where applicable, the heat treatment batch number.
- 14 *Add* **Certification**
Unless specified otherwise, inspection and test certificates shall be supplied to the Principal.
- 15 *Add* Length**
Unless specified otherwise in the purchase order, the Unit of Length (Uol) for pipe is in meter or feet. The form of delivery shall be in single random length (SRL or double random length (DRL). The specified quantities of random lengths on the purchase order shall be converted to aggregate length on the basis of 6.1 m (20 ft) for single random length and 12.2 m (40 ft) for double random length.
To satisfy the purchase order required pipe length, the delivered quantities of random lengths shall amount to at least the calculated aggregate length.

PART III REFERENCES

In this MESC SPE, reference is made to the following publications:

NOTES:

1. Unless specifically designated by date, the latest edition of each publication shall be used, together with any amendments/supplements/revisions thereto.
2. Most of the referenced external standards are available to Shell staff on the SWW (Shell Wide Web) at <http://sww.shell.com/standards>.

AMERICAN STANDARDS

Recommended Practice for Materials and Fabrication of
1½Cr-½Mo Steel Pressure Vessels for Service above
825 °F (441 °C) API RP 934 E

Issued by:
American Petroleum Institute
1220 L Street NW
Washington, DC 20005
USA

Process Piping ASME B31.3

Issued by:
American Society of Mechanical Engineers
ASME International
Three Park Avenue, M/S 10E
New York, NY 10016, USA

Standard Specification for Pressure Vessel Plates, Alloy
Steel, Chromium- Molybdenum ASTM A 387

Standard Specification for Carbon and Alloy Steel Pipe,
Electric-Fusion-Welded for High-Pressure Service at High
Temperatures ASTM A 691:2009

Issued by:
American Society for Testing and Materials
1916 Race Street, Philadelphia
19103, USA