

TECHNICAL SPECIFICATION

CARBON STEEL PIPE (AMENDMENTS/SUPPLEMENTS TO ASTM A 672)

MESC SPE 74/003

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MESC SPECIFICATION DOCUMENT



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

TABLE OF CONTENTS

PART I	INTRODUCTION	4
1.1	SCOPE.....	4
1.2	DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS	4
1.3	DEFINITIONS	4
1.4	CHANGES SINCE PREVIOUS EDITION.....	4
1.5	COMMENTS ON THIS MESC SPE.....	4
PART II	AMENDMENTS/SUPPLEMENTS TO ASTM A 672:14	5
PART III	REFERENCES	8

PART I INTRODUCTION

1.1 SCOPE

This MESC SPE applies to carbon steel pipe to ASTM A 672, Grade C65.

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

This MESC SPE is written as amendments and supplements to ASTM A 672:14, which are covered in Part II of this MESC SPE. The clause numbering of ASTM A 672:14 has been retained and any amendments are identified as 'Add', 'Modify to read' or 'Delete'. Any clauses of ASTM A 672:14 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 version of the MESC SPE was dated **November 2012. The only change is to update the ASTM A672 and ASTM A516 version. and to specify minimum toughness requirements or minimum manganese content.**

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 672:14

- 5.1 *Add:*
- For pipe furnished to Grade C65, the following restrictions shall apply:
- The carbon content shall not exceed 0.23 %.
 - Supplementary requirement S54.2 and S54.3 of ASTM A 516 shall apply, although CE shall not exceed 0.43, irrespective of the specified wall thickness.
 - **The manganese content shall be minimum 1% unless toughness properties are meeting in accordance with section 8.6 of this MESC SPE.**
- 5.2.2 *Modify to read:*
- The longitudinal seam weld shall be made by the automatic submerged arc welding (SAW) process.
- 5.4 *Add* If sour service is specified, the following requirements shall apply:
- Plate material conforming to clause 5.1 of ASTM A 516 shall be supplied in the normalised condition.
 - In order to ensure effective resistance against both Hydrogen Induced Cracking (HIC) and Sulphide Stress Corrosion (SSC), the chemical composition shall be as per Table 3, unless ASTM A 516 Grade 65 is more restrictive.
 - Supplementary requirement S54.2 and S54.3 of ASTM A 516 shall apply, although CE shall not exceed 0.43, irrespective of the specified wall thickness.
 - The micro-alloying elements Boron (B), Titanium (Ti), Niobium (Nb) and Vanadium (V) shall not be intentionally added to the steel unless approved by the Principal.
 - The plate shall be vacuum-treated, fully deoxidised, desulphurised and dephosphorised. The manufacturing/rolling process shall result in a homogeneous microstructure with no ferrite/perlite banding.
 - For plate with sulphur content of 0.001 % and higher, calcium treatment shall be applied for inclusion shape control. The calcium content shall not exceed 3 times the sulphur content.
- 7.5 *Add* If sour service is specified, the weld metal deposit shall not contain more than 1.00 % nickel.
- 8.3 *Add:*
- Hydrostatic testing shall be performed after heat treatment.
- 8.4 *Add* **Hardness testing**
- If post-weld heat-treatment is performed, supplementary requirement S3 shall apply on one finished pipe representing each lot. Hardness tests shall be executed after post-weld heat-treatment. The hardness of the weld, heat affected zone or base metal shall not exceed 248 HV 10.
- 8.5 *Add* **Sour service**
- If sour service is specified, the following requirements for examination shall apply:
- The plate shall be checked for laminations by ultrasonic examination in accordance with EN 10160 with acceptance levels S₁ and E₄.
 - The plate material shall be HIC tested in accordance with MESC SPE 74/125 after a simulation of the final heat treatment of the pipe.
- 8.6 *Add* Impact testing**
- Unless the Manganese content is higher than 1%, impact testing is required in**

accordance with the following:

- Charpy impact tests shall be carried out in accordance with ASTM A 370 at a temperature given in Table-4.
- A set of three transverse Charpy test pieces shall be taken from the base material from one pipe representing each heat. Test pieces shall be located at the mid thickness.
- The notch of all Charpy pieces shall be perpendicular to the pipe surface.
- Sub-size samples can only be applied, if standard 10 mm x 10 mm (0.39 in x 0.39 in) samples are not possible.
- The acceptance criteria shall be in accordance with Table 5.

Table 4 Add

Table-4 Selection of impact test temperature			
Pipe wall thickness (t)		Impact test temperature	
mm	in	°C	°F
$t \leq 12.7$	$t \leq 0.5$	minus 29	minus 20
$12.7 < t \leq 19.1$	$0.75 \leq t \leq 0.75$	minus 22	minus 7
$50.8 \leq t \leq 19.1$	$2 \leq t \leq 0.75$	minus 1	33
$76.2 \leq t \leq 50.8$	$3 \leq t \leq 2$	17	62

Table 5 Add

Table 5 – Acceptance criteria for Charpy impact testing				
Size of specimen mm x mm	Minimum average notched bar impact value of each set of three specimens		Minimum notched bar impact value of one specimen only of a set	
	J	ft-lbf	J	ft-lbf
10 x 10	27	19.5	21	15
10 x 7.5	21	15	16.5	12
10 x 6.67	18	13.5	13.5	10.5
10 x 5	13.5	10.5	10.5	7.5
10 x 3.33	10.5	7.5	6	4.5
10 x 2.5	7.5	6	6	4.5

11.3 *Modify to read:*

Circumferential welded joints are not permitted.

13.1 *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.

13.3 *Add* If die stamping is used, the stamps shall be low-stress stamps.

13.4 *Add* If sour service is specified, marking shall also include the identification "SOUR" behind the ASTM designation.

Table 3 *Add* **Table 3 – Chemical composition for sour service**

Single elements	Identification	Composition %, max
Carbon	C	0.20
Manganese	Mn	1.30
Phosphorous	P	0.01
Sulphur	S	0.002
Silicon	Si	0.40
Copper	Cu	0.40
Nickel	Ni	0.40
Chromium	Cr	0.30
Molybdenum	Mo	0.12
Vanadium	V	0.015
Niobium	Nb	0.015
Titanium	Ti	0.02
Boron	B	0.005
Combined elements		
	Cr + Mo	0.30
	Ni + Cu + Cr + Mo	0.72
	V + Nb	0.02

The manganese content shall be minimum 1% unless toughness properties are meeting in accordance with section 8.6 of this MESC SPE.

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, 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://sww05.europe.shell.com/standards>.

SHELL STANDARDS

Hydrogen Induced Cracking sensitivity test MESC SPE 74/125

AMERICAN STANDARDS

Standard Specification for Pressure Vessel Plates,
Carbon Steel, for Moderate- and Lower-Temperature
Service ASTM A 516:2010

Standard Specification for Electric-Fusion-Welded Steel
Pipe for High-Pressure Service at Moderate
Temperatures ASTM A 672:2014

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

EUROPEAN STANDARDS

Ultrasonic Testing of Steel Flat Product of Thickness
Equal or Greater Than 6 mm (Reflection Method) EN 10160

Issued by:
Comité Européen de Normalisation
Secrétariat Central
Rue de Stassart 36
B-1050 Brussels
Belgium

Copies can also be obtained from national standards bodies