



NSAI
Standards

Irish Standard
I.S. EN ISO 13704:2007

Petroleum, petrochemical and natural gas industries - Calculation of heater-tube thickness in petroleum refineries (ISO 13704:2007)

I.S. EN ISO 13704:2007

Incorporating amendments/corrigenda issued since publication:

EN ISO 13704:2007/AC:2009

<i>This document replaces:</i>	<i>This document is based on:</i> EN ISO 13704:2007	<i>Published:</i> 15 November, 2007	
This document was published under the authority of the NSAI and comes into effect on: 21 December, 2007		ICS number: 75.180.20	
NSAI 1 Swift Square, Northwood, Santry Dublin 9	T +353 1 807 3800 F +353 1 807 3838 E standards@nsai.ie W NSAI.ie	Sales: T +353 1 857 6730 F +353 1 857 6729 W standards.ie	Price Code: AB
Údarás um Chaighdeáin Náisiúnta na hÉireann			



NSAI
Standards

Corrigendum
I.S. EN ISO 13704:2007/AC:2009

Petroleum, petrochemical and natural gas industries - Calculation of heater-tube thickness in petroleum refineries (ISO 13704:2007/Cor 1:2008)

I.S. EN ISO 13704:2007/AC:2009

Incorporating amendments/corrigenda issued since publication:

<i>This document replaces:</i>	<i>This document is based on:</i> EN ISO 13704:2007/AC:2009	<i>Published:</i>	
This document was published under the authority of the NSAI and comes into effect on: 21 August, 2009		ICS number: 75.180.20	
NSAI 1 Swift Square, Northwood, Santry Dublin 9	T +353 1 807 3800 F +353 1 807 3838 E standards@nsai.ie W NSAI.ie	Sales: T +353 1 857 6730 F +353 1 857 6729 W standards.ie	Price Code: AB
Údarás um Chaighdeáin Náisiúnta na hÉireann			

EUROPEAN STANDARD

EN ISO 13704:2007/AC

NORME EUROPÉENNE

April 2009

EUROPÄISCHE NORM

Avril 2009

April 2009

ICS 75.180.20

English version
Version Française
Deutsche Fassung

Petroleum, petrochemical and natural gas industries - Calculation of
heater-tube thickness in petroleum refineries (ISO 13704:2007/Cor 1:2008)

Industries du pétrole, de la pétrochimie et
du gaz naturel - Calcul de l'épaisseur des
tubes de fours de raffineries de pétrole
(ISO 13704:2007/Cor 1:2008)

Erdöl- und Erdgasindustrie - Berechnung
der Wanddicke von Heizrohren in
Erdölraffinerien (ISO 13704:2007/Cor
1:2008)

This corrigendum becomes effective on 29 April 2009 for incorporation in the three official language versions of the EN.

Ce corrigendum prendra effet le 29 avril 2009 pour incorporation dans les trois versions linguistiques officielles de la EN.

Die Berichtigung tritt am 29. April 2009 zur Einarbeitung in die drei offiziellen Sprachfassungen der EN in Kraft.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: Avenue Marnix 17, B-1000 Brussels

© 2009 CEN All rights of exploitation in any form and by any means reserved worldwide for CEN national Members.
Tous droits d'exploitation sous quelque forme et de quelque manière que ce soit réservés dans le monde entier aux
membres nationaux du CEN.
Alle Rechte der Verwertung, gleich in welcher Form und in welchem Verfahren, sind weltweit den nationalen Mitgliedern
von CEN vorbehalten.

Endorsement notice

The text of ISO 13704:2007/Cor.1:2008 has been approved by CEN as a European Corrigendum without any modification.



National Standards Authority of Ireland
Údarás um Chaighdeáin Náisiúnta na hÉireann

IRISH STANDARD

I.S. EN ISO 13704:2007

ICS 75.180.20

**PETROLEUM, PETROCHEMICAL AND
NATURAL GAS INDUSTRIES - CALCULATION
OF HEATER-TUBE THICKNESS IN
PETROLEUM REFINERIES (ISO 13704:2007)**

National Standards
Authority of Ireland
Glasnevin, Dublin 9
Ireland

Tel: +353 1 807 3800
Fax: +353 1 807 3838
<http://www.nsai.ie>

Sales
<http://www.standards.ie>

*This Irish Standard was
published under the authority
of the National Standards
Authority of Ireland and
comes into effect on:
21 December 2007*

**NO COPYING WITHOUT NSAI
PERMISSION EXCEPT AS
PERMITTED BY COPYRIGHT
LAW**

© NSAI 2007

Price Code AB

Údarás um Chaighdeáin Náisiúnta na hÉireann

This page is intentionally left BLANK.

I.S. EN ISO 13704:2007

EUROPEAN STANDARD

EN ISO 13704

NORME EUROPÉENNE

EUROPÄISCHE NORM

November 2007

ICS 75.180.20

English Version

Petroleum, petrochemical and natural gas industries -
Calculation of heater-tube thickness in petroleum refineries (ISO
13704:2007)

Industries du pétrole, de la pétrochimie et du gaz naturel -
Calcul de l'épaisseur des tubes de fours de raffineries de
pétrole (ISO 13704:2007)

Erdöl- und Erdgasindustrie - Berechnung der Wanddicke
von Heizrohren in Erdölraffinerien (ISO 13704:2007)

This European Standard was approved by CEN on 3 November 2007.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

Contents

Page

Foreword.....3

Foreword

This document (EN ISO 13704:2007) has been prepared by Technical Committee ISO/TC 67 "Materials, equipment and offshore structures for petroleum and natural gas industries" in collaboration with Technical Committee CEN/TC 12 "Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries" the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2008, and conflicting national standards shall be withdrawn at the latest by May 2008.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

Endorsement notice

The text of ISO 13704:2007 has been approved by CEN as a EN ISO 13704:2007 without any modification.

INTERNATIONAL STANDARD

ISO 13704

Second edition
2007-11-15

Petroleum, petrochemical and natural gas industries — Calculation of heater-tube thickness in petroleum refineries

*Industries du pétrole, de la pétrochimie et du gaz naturel — Calcul de
l'épaisseur des tubes de fours de raffineries de pétrole*



Reference number
ISO 13704:2007(E)

© ISO 2007

ISO 13704:2007(E)

PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.



COPYRIGHT PROTECTED DOCUMENT

© ISO 2007

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

Foreword	iv
1 Scope	1
2 Terms and definitions	1
3 General design information	3
3.1 Information required	3
3.2 Limitations for design procedures	4
4 Design	4
4.1 General	4
4.2 Equation for stress	7
4.3 Elastic design (lower temperatures)	7
4.4 Rupture design (higher temperatures)	8
4.5 Intermediate temperature range	8
4.6 Minimum allowable thickness	8
4.7 Minimum and average thicknesses	8
4.8 Equivalent tube metal temperature	9
4.9 Component fittings	13
5 Allowable stresses	15
5.1 General	15
5.2 Elastic allowable stress	16
5.3 Rupture allowable stress	16
5.4 Rupture exponent	16
5.5 Yield and tensile strengths	16
5.6 Larson-Miller parameter curves	16
5.7 Limiting design metal temperature	17
5.8 Allowable stress curves	17
6 Sample calculations	18
6.1 Elastic design	18
6.2 Thermal-stress check (for elastic range only)	19
6.3 Rupture design with constant temperature	23
6.4 Rupture design with linearly changing temperature	25
Annex A (informative) Estimation of remaining tube life	28
Annex B (informative) Calculation of maximum radiant section tube skin temperature	33
Annex C (normative) Thermal-stress limitations (elastic range)	44
Annex D (informative) Calculation sheets	48
Annex E (normative) Stress curves (SI units)	50
Annex F (normative) Stress curves (USC units)	70
Annex G (normative) Derivation of corrosion fraction and temperature fraction	90
Annex H (informative) Data sources	98
Bibliography	103

ISO 13704:2007(E)

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 13704 was prepared by Technical Committee ISO/TC 67, *Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries*, Subcommittee SC 6, *Processing equipment and systems*.

This second edition cancels and replaces the first edition (ISO 13704:2001), which has been technically revised.

Petroleum, petrochemical and natural gas industries — Calculation of heater-tube thickness in petroleum refineries

1 Scope

This International Standard specifies the requirements and gives recommendations for the procedures and design criteria used for calculating the required wall thickness of new tubes and associated component fittings for petroleum-refinery heaters. These procedures are appropriate for designing tubes for service in both corrosive and non-corrosive applications. These procedures have been developed specifically for the design of refinery and related process-fired heater tubes (direct-fired, heat-absorbing tubes within enclosures). These procedures are not intended to be used for the design of external piping.

This International Standard does not give recommendations for tube retirement thickness; Annex A describes a technique for estimating the life remaining for a heater tube.

2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

2.1

actual inside diameter

 D_i

inside diameter of a new tube

NOTE The actual inside diameter is used to calculate the tube skin temperature in Annex B and the thermal stress in Annex C.

2.2

component fitting

fitting connected to the fired heater tubes

EXAMPLES Return bends, elbows, reducers.

NOTE 1 There is a distinction between standard component fittings and specially designed component fittings; see 4.9.

NOTE 2 Typical material specifications for standard component fittings are ASTM A 234, ASTM A 403 and ASTM B 366.

2.3

corrosion allowance

 δ_{CA}

additional material thickness added to allow for material loss during the design life of the component

2.4

design life

 t_{DL}

operating time used as a basis for tube design

NOTE The design life is not necessarily the same as the retirement or replacement life.

This is a free preview. Purchase the entire publication at the link below:

[Product Page](#)

-
- [Looking for additional Standards? Visit Intertek Inform Infostore](#)
 - [Learn about LexConnect, All Jurisdictions, Standards referenced in Australian legislation](#)
-