

## საქართველოს სტანდარტი

---

ამწეები- გენერალური დიზაინი - ნაწილი 3-1: ფოლადის სტრუქტურის  
ზღვრული მდგომარეობა და კომპეტენტური მადასტურებელი

საქართველოს სტანდარტებისა და მეტროლოგიის  
ეროვნული სააგენტო  
თბილისი

# სსტ ენ 13001-3-1:2012+A1:2013/2019

## საინფორმაციო მონაცემები

1 შემუშავებულია საქართველოს სტანდარტების და მეტროლოგიის ეროვნული სააგენტოს სტანდარტების დეპარტამენტის მიერ

2 დამტკიცებულია და შემოღებულია სამოქმედოდ საქართველოს სტანდარტების და მეტროლოგიის ეროვნული სააგენტოს 2019 წლის 22 აგვისტოს № 46 განკარგულებით

3 მიღებულია გარეკანის თარგმნის მეთოდით სტანდარტიზაციის ევროპული კომიტეტის სტანდარტი ენ 13001-3-1:2012+A1:2013 „ამწეები- გენერალური დიზაინი - ნაწილი 3-1: ფოლადის სტრუქტურის ზღვრული მდგომარეობა და კომპეტენტური მადასტურებელი“

### 4 პირველად

5 რეგისტრირებულია საქართველოს სტანდარტების და მეტროლოგიის ეროვნული სააგენტოს რეესტრში: 2019 წლის 22 აგვისტო №268-1.3-014918

დაუშვებელია წინამდებარე სტანდარტის სრული ან ნაწილობრივი კვლავწარმოება, ტირაჟირება და გავრცელება სსიპ საქართველოს სტანდარტებისა და მეტროლოგიის ეროვნული სააგენტოს ნებართვის გარეშე

English Version

Cranes - General Design - Part 3-1: Limit States and proof  
competence of steel structure

Appareils de levage à charge suspendue - Conception  
générale - Partie 3-1: Etats limites et vérification d'aptitude  
des charpentes en acier

Krane - Konstruktion allgemein - Teil 3-1: Grenzzustände  
und Sicherheitsnachweis von Stahltragwerken

This European Standard was approved by CEN on 11 February 2012 and includes Amendment 1 approved by CEN on 11 May 2013.

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-CENELEC 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-CENELEC Management Centre has the same status as the official versions.

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



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

Management Centre: Avenue Marnix 17, B-1000 Brussels

# Contents

Page

|  |           |
|--|-----------|
| Foreword.....  | 4         |
| Introduction .....   | 5         |
| <b>1 Scope.....</b>  | <b>6</b>  |
| <b>2 Normative references.....</b>                                   | <b>6</b>  |
| <b>3 Terms ,definitions, symbols and abbreviations.....</b>          | <b>7</b>  |
| 3.1 Terms and definitions .....                                      | 7         |
| 3.2 Symbols and abbreviations .....                                  | 7         |
| <b>4 General .....</b>   | <b>11</b> |
| 4.1 Documentation.....   | 11        |
| 4.2 Materials for structural members .....                           | 12        |
| 4.2.1 Grades and qualities .....                                     | 12        |
| 4.2.2 Impact toughness.....  | 14        |
| 4.3 Bolted connections .....   | 16        |
| 4.3.1 Bolt materials .....   | 16        |
| 4.3.2 General .....  | 16        |
| 4.3.3 Shear and bearing connections.....                             | 17        |
| 4.3.4 Friction grip type (slip resistant) connections.....           | 17        |
| 4.3.5 Connections loaded in tension.....                             | 17        |
| 4.4 Pinned connections .....   | 17        |
| 4.5 Welded connections .....   | 18        |
| 4.6 Proof of competence for structural members and connections ..... | 18        |
| <b>5 Proof of static strength .....</b>                              | <b>19</b> |
| 5.1 General .....  | 19        |
| 5.2 Limit design stresses and forces .....                           | 19        |
| 5.2.1 General .....  | 19        |
| 5.2.2 Limit design stress in structural members .....                | 19        |
| 5.2.3 Limit design forces in bolted connections.....                 | 21        |
| 5.2.4 Limit design forces in pinned connections.....                 | 28        |
| 5.2.5 Limit design stresses in welded connections .....              | 32        |
| 5.3 Execution of the proof .....                                     | 35        |
| 5.3.1 Proof for structural members .....                             | 35        |
| 5.3.2 Proof for bolted connections.....                              | 35        |
| 5.3.3 Proof for pinned connections.....                              | 36        |
| 5.3.4 Proof for welded connections .....                             | 36        |
| <b>6 Proof of fatigue strength.....</b>                              | <b>37</b> |
| 6.1 General .....  | 37        |
| 6.2 Limit design stresses.....                                       | 38        |
| 6.2.1 Characteristic fatigue strength.....                           | 38        |
| 6.2.2 Weld quality.....  | 40        |
| 6.2.3 Requirements for fatigue testing.....                          | 41        |
| 6.3 Stress histories .....   | 41        |
| 6.3.1 General .....  | 41        |
| 6.3.2 Frequency of occurrence of stress cycles .....                 | 42        |
| 6.3.3 Stress history parameter .....                                 | 42        |
| 6.3.4 Stress history classes S .....                                 | 43        |
| 6.4 Execution of the proof .....                                     | 44        |
| 6.5 Determination of the limit design stress range.....              | 45        |
| 6.5.1 Applicable methods .....                                       | 45        |

საინფორმაციო ნაწილი. სრული ტექსტის სახსრავად შეიძინეთ სტანდარტი.

|              |   |     |
|--------------|---|-----|
| 6.5.2        | Direct use of stress history parameter .....  | 45  |
| 6.5.3        | Use of class S.....   | 45  |
| 6.5.4        | Independent concurrent normal and/or shear stresses .....   | 47  |
| 7            | Proof of static strength of hollow section girder joints .....  | 47  |
| 8            | Proof of elastic stability .....  | 47  |
| 8.1          | General .....   | 47  |
| 8.2          | Lateral buckling of members loaded in compression .....   | 48  |
| 8.2.1        | Critical buckling load .....  | 48  |
| 8.2.2        | Limit compressive design force .....  | 49  |
| 8.3          | Buckling of plate fields subjected to compressive and shear stresses .....  | 51  |
| 8.3.1        | General .....   | 51  |
| 8.3.2        | Limit design stress with respect to longitudinal stress $\sigma_x$ .....  | 53  |
| 8.3.3        | Limit design stress with respect to transverse stress $\sigma_y$ .....  | 55  |
| 8.3.4        | Limit design stress with respect to shear stress $\tau$ .....   | 57  |
| 8.4          | Execution of the proof.....   | 58  |
| 8.4.1        | Members loaded in compression .....   | 58  |
| 8.4.2        | Plate fields .....  | 58  |
| Annex A      | (informative) Limit design shear force $F_{v,Rd}$ per bolt and per shear plane for multiple shear plane connections.....  | 60  |
| Annex B      | (informative) Preloaded bolts.....  | 61  |
| Annex C      | (normative) Design weld stresses $\sigma_{W,Sd}$ and $\tau_{W,Sd}$ .....  | 63  |
| C.1          | Butt joint .....  | 63  |
| C.2          | Fillet weld.....  | 64  |
| C.3          | T-joint with full and partial penetration .....   | 65  |
| C.4          | Effective distribution length under concentrated load .....   | 66  |
| Annex D      | (normative) Values of slope constant $m$ and characteristic fatigue strength $\Delta\sigma_c$ , $\Delta\tau_c$ .....      | 67  |
| Annex E      | (normative) Calculated values of limit design stress ranges $\Delta\sigma_{Rd}$ and $\Delta\sigma_{Rd,1}$ .....           | 88  |
| Annex F      | (informative) Evaluation of stress cycles (example) .....   | 90  |
| Annex G      | (informative) Calculation of stiffnesses for connections loaded in tension .....  | 92  |
| Annex H      | (informative) Hollow Sections .....   | 95  |
| Annex I      | (informative) Selection of a suitable set of crane standards for a given application.....                                 | 107 |
| Annex ZA     | (informative) Relationship between this European Standard and the Essential Requirements of EU Directive 2006/42/EC ..... | 108 |
| Bibliography | .....   | 109 |

## Foreword

This document (EN 13001-3-1:2012+A1:2013) has been prepared by Technical Committee CEN/TC 147 “Cranes - Safety”, the secretariat of which is held by BSI.

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 January 2014, and conflicting national standards shall be withdrawn at the latest by January 2014.

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

This document includes Amendment 1 approved by CEN on 11 May 2013.

This document supersedes A1 EN 13001-3-1:2012 A1.

The start and finish of text introduced or altered by amendment is indicated in the text by tags A1 A1.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

A1 CEN/TC 147/WG 2 has made a new edition of EN 13001-3-1 to adapt the standard as follows:

- Subclause 4.2.1 is changed in such a way that Table 2 is permanently valid and requirements for other materials are added, and
- editorial changes are done to improve the document. A1

This European Standard is one Part of EN 13001, *Cranes — General design*. The other parts are as follows:

- *Part 1: General principles and requirements;*
- *Part 2: Load actions;*
- *Part 3-2: Limit states and proof of competence of wire ropes in reeving systems;*
- *Part 3-3: Limit states and proof of competence of wheel/rail contacts;*
- *Part 3-4: Limit states and proof of competence of machinery;*
- *Part 3-5: Limit states and proof of competence of forged hooks.*

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

საინფორმაციო ნაწილი. სრული ტექსტის სახანაგად შეიძინეთ სტანდარტი.

## Introduction

This European Standard has been prepared to be a harmonized standard to provide one means for the mechanical design and theoretical verification of cranes to conform with the essential health and safety requirements of the Machinery Directive, as amended. This standard also establishes interfaces between the user (purchaser) and the designer, as well as between the designer and the component manufacturer, in order to form a basis for selecting cranes and components.

This European Standard is a type C standard as stated in EN ISO 12100.

The machinery concerned and the extent to which hazards, hazardous situations and events are covered are indicated in the scope of this standard.

When provisions of this type C standard are different from those which are stated in type A or B standards, the provisions of this type C standard take precedence over the provisions of the other standards, for machines that have been designed and built according to the provisions of this type C standard.