INTERNATIONAL STANDARD

ISO 19821

First edition
2017-11

Determination of span rating for natural fibre-reinforced plastic composite (NFC) deck boards

Détermination de la portée nominale des lames de platelage en composite plastique renforcé de fibres naturelles (NFC)

Reference number
ISO 19821:2017(E)

© ISO 2017



COPYRIGHT PROTECTED DOCUMENT

© ISO 2017, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

Contents

Page

Foreword ... **iv**
Introduction ... **v**
1 Scope ... **1**
2 Normative references ... **1**
3 Terms and definitions ... **1**
4 Test specimen ... **2**
5 Sampling ... **2**
6 Conditioning ... **2**
7 Evaluation methods of performance ... **2**
7.1 General ... 2
7.2 Temperature and moisture effects ... 2
7.2.1 Temperature effect ... 2
7.2.2 Moisture effect ... 3
7.2.3 Acceptance criteria ... 3
7.3 Weatherproofing ... 3
7.3.1 Test method ... 3
7.3.2 Acceptance criteria ... 3
7.4 Freeze-thaw resistance ... 4
7.4.1 Test method ... 4
7.4.2 Acceptance criteria ... 4
7.5 Biodeterioration ... 4
7.5.1 General ... 4
7.5.2 Fungal decay resistance ... 4
7.5.3 Termites ... 4
7.6 Creep-recovery ... 5
7.6.1 Test method ... 5
7.6.2 Acceptance criterion ... 5
7.7 Creep-rupture ... 5
7.7.1 Test method ... 5
7.7.2 Acceptance criterion ... 5
7.8 Mechanical fastener holding ... 5
7.9 Slip resistance ... 6
8 Determination of span rating ... **6**
8.1 Deck board span rating ... 6
8.2 Two-span adjustment ... 6
9 Report ... **7**
9.1 Test report ... 7
9.2 Product description ... 7
9.3 Installation instructions ... 7
Annex A (informative) **Adjustment factor — Examples** ... **8**
Annex B (normative) **Two-span test method** ... **9**
Bibliography ... **10**

© ISO 2017 – All rights reserved

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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html

This document was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 11, *Products*.

© ISO 2017 – All rights reserved

Introduction

Natural fibre-reinforced plastic composites (NFC) are made of one or several cellulosic materials combined with one or several thermoplastics. Currently, cellulosic materials mainly come from different natural plant sources and the most common thermoplastics, including virgin and recycled forms, are polyethylene, polypropylene and polyvinyl chloride. In the past, these composites used to be called wood plastic composites (WPC). In this document, NFC is used instead of WPC, in line with the terminology used in ISO 16616.

The production of NFC in the thermoplastics industry has gained much acceptance in recent years and is expected to keep growing rapidly. This type of composite material has become an important family of engineering materials due to the increasing need for sustainable and biodegradable renewable materials, which are known as “green composites.” NFC has sustainable character due to the presence of wood as a natural component, which enables environmental protection and minimization of waste formation. Such materials offer significant advantages which justify their use.

NFC has recently found wide applications in construction and decoration areas including decking, fencing, flooring, landscaping, railings, window framing, and roof tiles. Meanwhile it is also applied for packaging, automotive industries, furniture and other items.

For deck boards used in outdoor environments, some performance measurements, such as temperature and moisture effects, ultraviolet resistance, freeze-thaw resistance, etc., are used in the determination of the span rating in order to assist in the proper installation and using. However, due to the lack of a unified testing method to evaluate a span rating indicating the board’s ability to comply with functions identified for its specific end use, therefore, it would be required to establish an ISO standard for removing the barriers of deck boards in the application and sales, and encouraging technology development in the NFC production field.

© ISO 2017 – All rights reserved

Determination of span rating for natural fibre-reinforced plastic composite (NFC) deck boards

1 Scope

This document specifies the procedures to establish a span rating for natural fibre-reinforced plastic composite (NFC) deck boards and deck boards used as stair treads, provided that the stair treads are produced from the same materials and processing techniques as the deck boards. This document covers test methods of performance, acceptance criteria and determination of span rating. It is intended to establish the basis for code recognition of deck boards used in exterior applications where combustible construction is allowed.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 291, *Plastics — Standard atmospheres for conditioning and testing*

ISO 4892-2:2013, *Plastics — Methods of exposure to laboratory light sources — Part 2: Xenon-arc lamps*

ISO 16616:2015, *Test methods for natural fibre-reinforced plastic composite (NFC) deck boards*

EN 15534-1:2014, *Composites made from cellulose-based materials and thermoplastics (usually called wood-polymer composites (WPC) or natural fibre composites (NFC)) — Part 1: Test methods for characterization of compounds and products*

ASTM D7032-17, *Standard Specification for Establishing Performance Ratings for Wood-Plastic Composite and Plastic Lumber Deck Boards, Stair Treads, Guards, and Handrails*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1
natural fibre-reinforced plastic composite
NFC
product made thereof being the result of the combination of one or several cellulosic materials with one or several thermoplastics

3.2
flexural strength
maximum load achieved by the test specimen during flexural test, and reported as modulus of rupture (MOR)

© ISO 2017 – All rights reserved

3.3
flexural stiffness
value calculated from a linear least squares fit of the stress-strain curve over the range of 10 % to 40 % of ultimate stress, and reported as either modulus of elastic (MOE) or MOE × moment of inertia (EI)

Note 1 to entry: If the cross-section of deck boards is complicated to calculate moment of inertia, it is better to use EI to indicate flexural stiffness.

3.4
span rating
maximum centre-to-centre support spacing for the specified end use

4 Test specimen

Test specimens with the original thickness and width of the product are used in the tests unless otherwise specified. In general, test specimens of the product are rectangular in cross-section for deck boards and stair treads.

5 Sampling

It is important to select test specimens that reflect the variability of the population. It is essential to consider batch-to-batch and shift-to-shift variability when sampling actual production. Test specimens shall be selected from several production runs of a given item.

6 Conditioning

Prior to testing, all specimens shall be conditioned to environmental conditions appropriate for the intended end-use of the product. Alternatively, the test specimens used for the determination of the product performance shall be conditioned for a minimum of 72 h and testing shall be carried out at the standard atmosphere 23/50 (23 °C ± 2 °C, 50 % ± 5 % RH) in accordance with ISO 291. When the product is to be subjected to a water soak environment, the test specimens shall be tested within 30 min upon removal from the treatment.

7 Evaluation methods of performance

7.1 General

Deck boards and stair treads are structural elements and shall be tested in flexure to establish a span rating. For products often used in diverse outdoor environments, the temperature and moisture effects (see 7.2) shall be used in the determination of the span rating. In addition, several other performance measures shall be evaluated and used to adjust the span rating in order to assist in the proper installation and using, including tests on ultraviolet resistance (see 7.3), freeze-thaw resistance (see 7.4), biodeterioration effects (see 7.5), creep-recovery (see 7.6), and creep-rupture (see 7.7), mechanical fastener holding capacity (see 7.8), and slip resistance (see 7.9).

7.2 Temperature and moisture effects

7.2.1 Temperature effect

Testing shall be conducted to verify that allowable span and load ratings are applicable at a range of temperatures expected in service. For the purposes of this document, the lower and upper temperatures shall be −30 °C ± 2 °C and 55 °C ± 2 °C, respectively. Flexure tests shall be conducted to failure at the desired span. A minimum of 10 specimens shall be tested at each temperature. The flexural strength and flexural stiffness shall be determined in accordance with ISO 16616:2015, 6.2.

© ISO 2017 – All rights reserved