

Lunawood Oy (Ltd)
Asemantie 52
74170 Iisalmi
FINLAND



16 December 2008

Our Ref. 250-204

Service life of Luna Thermo-D Thermally Modified Timber (TMT) for exterior cladding

BRE has a long record of assessing the properties and performance of ThermoWood® (the collective name for Finnish TMT product). In December 2003 BRE extensively reviewed VTT technical data which is the cornerstone for the development of the technology. In 2008 we published our BRE Digest 504 “Modified Wood – an introduction to products in UK construction”. In that we considered the properties and performance of ThermoWood®.

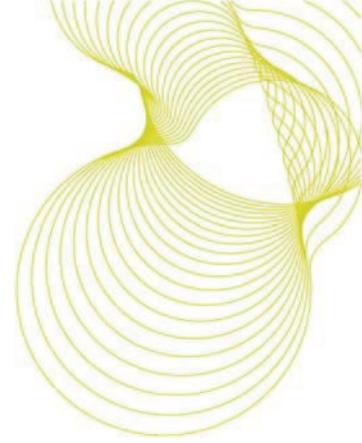
Two documents that are especially pertinent to the consideration of Luna Thermo-D are as follows:

The first is an accelerated weathering performance study conducted by the Helsinki University of Technology (Virta *et al.*). It shows the reduced cupping of cladding boards made from Lunawood thermally modified timber. This dimensional stability of the material is recognised as a considerable advantage for cladding for extending the service life of coatings and the boards.

The second is the KOMO certificate (32941/04) for your product that declares legitimate confidence that modified wood produced by Lunawood complies with the stated technical specification of the certificate. This includes a durability class 2 for the substrate. We would expect a timber of natural durability class 2 to be able to deliver a 30 year service life for a Use Class 3 application such as exterior cladding.



BRE's Quality Management System is approved to BS EN ISO9001:2000,
certificate number LRQ 4001063



Considering all these points we are able to provide the following statement:

BRE is able to conclude that the expected service life for the Luna Thermo-D used in the UK for exterior cladding will be 30 years, when following manufacturer's guidance and best practice construction principles.

If you have any questions I'd be happy to answer them.

Yours sincerely,

Dr E D Suttie
Director, Timber
For and on behalf of BRE
Telephone: +44 (0)1923 664158
E-mail: suttie@bre.co.uk

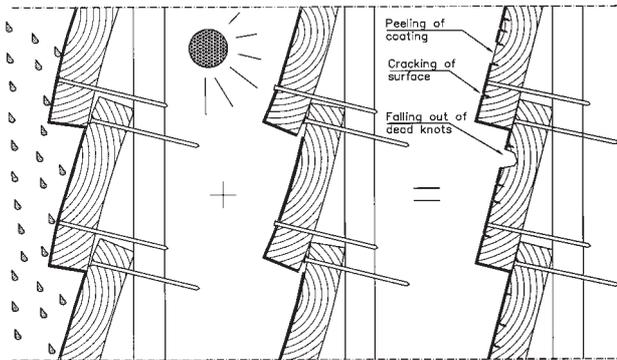
RESTRICTED CUPPING OF CLADDING BOARDS IN CYCLIC CONDITIONS: A STUDY OF HEAT-TREATED AND NON-HEAT-TREATED BOARDS

Jari Virta¹⁾, Aulis Kärkkäinen²⁾ & Olavi Kärkkäinen²⁾

¹⁾Helsinki University of Technology, Finland, ²⁾Oy Lunawood Ltd, Soinlahti, Finland

INTRODUCTION

One reason for the limited service life of modern claddings is assumed to be the use of deformation-sensitive cladding boards.



In the end of the 18th century, cladding boards were about 40 mm thick, whereas modern instructions recommend about 20 mm thick boards for claddings.

MATERIALS AND METHODS

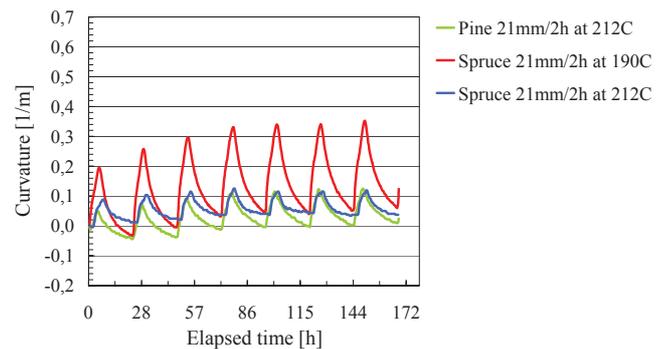
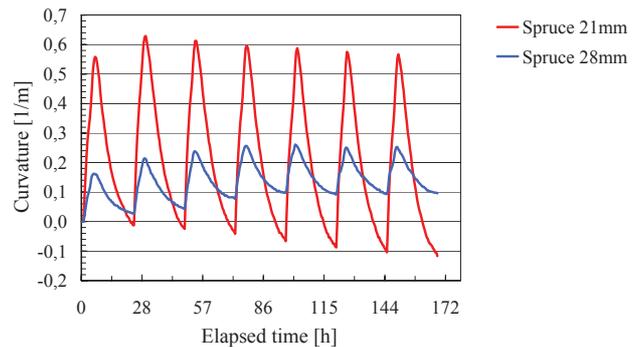
The aim of the study was to examine how increasing board thickness and heat-treatment of the board prevents cupping when the board is exposed to cyclic conditions. The specimens consisted of heat-treated and non-heat-treated boards made of Norway spruce and Scots pine timber. The restricted cupping measurements were conducted with full-scale test walls, which were 1300 mm high and 650 mm wide.



The boards fitted from both edges using fastenings which were 75 mm length nails so that the pith side of the board located in the front side. The test period consisted of 7 wetting and drying periods. In a wetting period, the surface of the element was wetted using a driving rain test apparatus, which sprayed 1.35 l/m²/h to the surface for 3 hours. After wetting period, the element was exposed to drying at 30±5% RH for 21 hours.

RESULTS

The cupping values, which were averages of 4 specimens, were converted into time-dependent curving results. Thus, the results are independent of the width of the board.



CONCLUSIONS

On the basis of the results, the thickness and heat-treatment of the board both have a significant influence on the cupping behaviour. The thickness and heat-treatment affect both the rate and the extent of cupping.

The non-heat-treated 21 mm thick boards were sensitive to cupping, whereas the non-heat-treated 28 mm thick boards were rather stable, and thus more advisable for claddings. By increasing the board thickness from 21 mm to 28 mm, the average curvature decreased by about 76%. However, the lowest curvatures detected with heat-treated boards, which were considerably more stable than non-heat-treated boards. The heat-treatment decreased curvature even 90%.

The conclusion from these measurements is that non-heat-treated thin boards cup faster and more extensively than thicker ones. This may be one reason for the limited service life of modern thin claddings. The solution for more durable claddings is the use of heat-treated boards as a cladding material.



Semi-manufactured product

SKH

Visiting address:

'Het Cambium', Nieuwe Kanaal 9c, 6709 PA Wageningen, the Netherlands

Mailing address:

P.O. Box 159, 6700 AD Wageningen, the Netherlands

Telephone: +31 (0) 317 45 34 25

E-mail: mail@skh.org

Fax: +31 (0) 317 41 26 10

Website: <http://www.skh.org>

MODIFIED TIMBER

Number: 32941/11
Issued: 11-02-2011
Replaces: 32941/07

Producer

Oy Lunawood Ltd.

Asemantie 52

74170 IISALMI

FINLAND

Tel. +35 81 77 70 02 00

Fax +35 81 17 74 21 99

Website: <http://www.lunawood.fi>

Factories at

Asemantie 52

74170 IISALMI

FINLAND

Kaivoksentie 22

82200 HAMMASLAHTI

FINLAND

SKH declaration

This product certificate has been issued by SKH on the basis of BRL 0605 'Modified timber' dd. 31-01-2003, in accordance with the SKH Regulations for Certification.

SKH declares that there is a legitimate confidence that the modified timber manufactured by the producer continuously complies with the technical specifications laid down in this product certificate, provided that the modified timber has been marked with the KOMO®-mark depicted hereunder, in a way as indicated in this product certificate.

For SKH

drs. H.J.O. van Doorn, director

Users of this product certificate are advised to enquire at SKH whether this document is still valid.

This product certificate consists of 3 pages.

The Dutch version shall be consulted in case of doubt.



The following has been assessed:
quality system
product
Periodic control

MODIFIED TIMBER

1 PRODUCT SPECIFICATION

1.1 Description of product

The definition of Luna Thermo-D in this KOMO[®] product certificate is: the product of thermally modified European spruce, European pine and Radiata pine, botanically derived from resp. *Picea abies* L. Karst., *Pinus sylvestris* L. and *Pinus radiata* D, treating class D2. By means of the modification process the durability of the timber has been increased in relation to the natural durability of European spruce, European pine and Radiata pine, whereas a number of other properties of the timber have changed.

The performances in respect of the properties laid down in BRL 0605 "Modified timber" are laid down in "Technical specification".

2 TECHNICAL SPECIFICATION

2.1 Durability

The durability of Luna Thermo-D complies at least with the requirements for durability class 2 (durable), tested in accordance with EN 350-1.

2.2 Timber moisture content

Luna Thermo-D is supplied with a moisture content of $6 \pm 2\%$.

2.3 Equilibrium moisture content

The equilibrium moisture content of Luna Thermo-D at a relative humidity of 65%, and a temperature of 20°C is $6 \pm 2\%$. At 98% relative humidity the equilibrium moisture content is below 16%.

2.4 Water absorption

When applying Luna Thermo-D in contact with (rain) water the moisture absorption is equal to that of untreated timber. The quality declaration does not express an opinion about the speed of water absorption.

2.5 Dimensional stability

The swelling in radial and tangential direction of Luna Thermo-D shall, when absorbing moisture, be at least 50% less, compared with untreated European spruce, European pine and Radiata pine.

2.6 Glue ability

The quality declaration does not express an opinion about the glue ability.

2.7 Hardness

The average Janka hardness is less than 29 MPa, the average Brinell hardness is 15 ± 2 MPa.

2.8 Finish

The quality declaration does not express an opinion about the finishing.

2.9 Mechanical properties

In particular the bending strength of the treated timber shall, by thermal modification, be less, compared with untreated timber. The quality declaration does not express an opinion about the decrease in mechanical properties.

2.10 Fire behaviour

In relation to its reaction to fire behaviour Luna Thermo-D is classified as D-s2, d0 according to EN 13501-1:2002 provided that the thickness is not less than 21 mm.

2.11 Emission of harmful materials

No harmful materials have been added to Luna Thermo-D. Scrap timber can be processed as untreated timber.

2.12 Marking

Luna Thermo-D shall be marked per package with the KOMO[®]-mark.

The execution of this mark is as follows:

- KOMO[®] trademark or logo;
- no. 32941;
- modified timber, durability class 2;
- hazard class: colour: blue and letter code L.



Location of the mark: clearly visible on each package.

MODIFIED TIMBER

3 SUGGESTIONS FOR THE USER

3.1 On delivery of the Luna Thermo-D inspect whether:

- the products comply with the contract of sale;
- the mark and the manner of marking are correct;
- the products do not show any visible defects due to transport or similar causes.

If the products are rejected on the basis of the above, the user should contact:

Oy Lunawood Ltd.

and if desirable:

The certification-body SKH
Office building 'Het Cambium',
Nieuwe Kanaal 9c, 6709 PA Wageningen, the Netherlands
P.O. Box 159, 6700 AD Wageningen, the Netherlands
Telephone: +31 (0) 317 45 34 25 E-mail: mail@skh.org
Fax: +31 (0) 317 41 26 10 Website: <http://www.skh.org>

3.2 Product certificate

It is the duty of the producer to make sure that the buyer receives a copy of the complete product certificate.

3.3 Applications and use

Transport, storage and deployment shall be effected in accordance with the working instructions of the producer.

3.4 Period of validity

Consult the SKH website <http://www.skh.org> to verify whether the product certificate is still valid.