

**THE INTERNATIONAL RESEARCH GROUP ON WOOD PROTECTION**

**Section 2**

**Testing Methodology and Assessment**

**Copper sulphate treated Norway spruce**

**Preservative treated timber – Field test results  
IRG/WP Durability Database**

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**Disclaimer**

The responsibility for the data presented in this paper falls to the authors exclusively. The data presented are raw test data and intended to get used for scientific purposes only.

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## AIMS AND SCOPE OF THE IRG-WP DURABILITY DATABASE

The overall aim of the IRG-WP durability data base is the allocation of wood durability test results for comparative studies and re-analyses. The data base shall serve as pool for service life prediction and modelling and shall contribute to an enhanced understanding of wood durability. It is an open web-based platform for scientific exchange in the field of wood durability and wood protection.

It is NOT the aim of the data base to promote or denigrate any product or material. The data base will contain raw data only; no statistical evaluation will be included. Thus it will be the exclusive responsibility of the user to interpret the test results published in the data base.

For each data set, the full range of information about the test method, the test material, and other relevant parameters, is required to guarantee reliability of the data. For this reason every data set submitted is reviewed and checked for completeness of all relevant data.

The database allows submission of assessment data from all kinds of standardized and non-standardized wood durability tests.

Records of the IRG/WP Durability data base shall be cited as in the following example:

*Brischke C., Meyer L. (2013) Douglas fir. Natural durable timber - Field test results. IRG/WP Durability Database. Stockholm: The International Research Group on Wood Protection, IRG/WP/DDB 13-00001.*

## **INFORMATION**

Submission Date 25.03.2014

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## **TESTED TIMBER**

Preservative product name Copper sulphate treated Norway spruce – low retention  
Botanical name *Picea abies* Karst.  
Origin Slovenia  
Active ingredients/concentration 0.35% aqueous solution of Copper (II) sulphate  
Treatment process Vacuum-pressure treatment  
Process parameters vacuum: -0.7 bar 1 h  
pressure: 9 bar 3 h  
vacuum: -0.7 bar 15 min  
normal: 0 bar 30 min  
Dimension and shape of impregnation specimens 25 x 50 x 500 mm<sup>3</sup> (EN 252, 1989)  
Sealing  
Number of replicates 10  
Sampling (optional)  
Timber quality (optional)

## REFERENCE TIMBER

|                           |                           |
|---------------------------|---------------------------|
| Trade name                | Norway spruce             |
| Botanical name            | <i>Picea abies</i> Karst. |
| Origin                    | Slovenia                  |
| Number of replicates      | 10                        |
| Sampling (optional)       |                           |
| Timber quality (optional) |                           |

## TEST METHODS

|                                   |                                                                                                                                                                                                                                                   |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Standard method                   |                                                                                                                                                                                                                                                   |
| Alteration of standard (optional) |                                                                                                                                                                                                                                                   |
| Non-standard method               | Double layer test                                                                                                                                                                                                                                 |
| Reference                         | Rapp, A.O.; Augusta, U. (2004) The full guideline for the “double layer test method” – A field test method for determining the durability of wood out of ground. Stockholm: The International Research Group on Wood Protection, IRG/WP/04-20290. |
| Specimen dimension and shape      | 25 x 50 x 500 mm <sup>3</sup> (EN 252, 1989)                                                                                                                                                                                                      |
| Sealing                           |                                                                                                                                                                                                                                                   |
| Rating scheme                     | 0 (sound), 1 (slight decay), 2 (moderate decay), 3 (severe decay), 4 (failure) after EN 252 (1989)                                                                                                                                                |
| Address of test site              | University of Ljubljana, Jamnikarjava 101, SI-1000 Ljubljana, Slovenia                                                                                                                                                                            |
| Geographic coordinates (optional) | 46°2'55,57"N, 14°28'44,66"E                                                                                                                                                                                                                       |
| Start of test                     | April 07 2006                                                                                                                                                                                                                                     |
| Last evaluation                   | July 02 2013                                                                                                                                                                                                                                      |
| Status of test                    | still running                                                                                                                                                                                                                                     |

## RESULTS

### Additional data

| Material     | Copper sulphate treated Norway spruce - Low retention |                      |               |  |  |  |
|--------------|-------------------------------------------------------|----------------------|---------------|--|--|--|
|              | Solution uptake                                       | Retention            | Concentration |  |  |  |
|              | [kg/m <sup>3</sup> ]                                  | [kg/m <sup>3</sup> ] | [% Cu]        |  |  |  |
| Replicate ID |                                                       |                      |               |  |  |  |
| 1            | 238.7                                                 | 0.84                 | 0.098         |  |  |  |
| 2            | 425.2                                                 | 1.49                 | 0.098         |  |  |  |
| 3            | 246.9                                                 | 0.86                 | 0.098         |  |  |  |
| 4            | 223.7                                                 | 0.78                 | 0.098         |  |  |  |
| 5            | 352.0                                                 | 1.23                 | 0.098         |  |  |  |
| 6            | 288.3                                                 | 1.01                 | 0.098         |  |  |  |
| 7            | 246.0                                                 | 0.86                 | 0.098         |  |  |  |
| 8            | 307.0                                                 | 1.07                 | 0.098         |  |  |  |
| 9            | 348.3                                                 | 1.22                 | 0.098         |  |  |  |
| 10           | 468.7                                                 | 1.64                 | 0.098         |  |  |  |

### Assessment

| Material     | Copper sulphate treated Norway spruce - Low retention |            |            |            |            |            |
|--------------|-------------------------------------------------------|------------|------------|------------|------------|------------|
| Date         | 28.05.2007                                            | 19.06.2008 | 03.06.2009 | 07.06.2010 | 31.05.2011 | 10.07.2012 |
| Assessment   | 1                                                     | 2          | 3          | 4          | 5          | 6          |
| Replicate ID | [0-4]                                                 | [0-4]      | [0-4]      | [0-4]      | [0-4]      | [0-4]      |
| 1            | 0                                                     | 0          | 0          | 0          | 1          | 1          |
| 2            | 0                                                     | 0          | 0          | 1          | 1          | 0          |
| 3            | 0                                                     | 0          | 0          | 0          | 0          | 1          |
| 4            | 0                                                     | 0          | 0          | 0          | 1          | 3          |
| 5            | 0                                                     | 0          | 0          | 0          | 0          | 1          |
| 6            | 0                                                     | 0          | 0          | 0          | 0          | 1          |
| 7            | 0                                                     | 0          | 0          | 0          | 1          | 1          |
| 8            | 0                                                     | 0          | 0          | 0          | 0          | 1          |
| 9            | 0                                                     | 0          | 0          | 0          | 0          | 0          |
| 10           | 0                                                     | 0          | 0          | 0          | 0          | 1          |

| Material     | Copper sulphate treated Norway spruce - Low retention |       |       |       |       |       |
|--------------|-------------------------------------------------------|-------|-------|-------|-------|-------|
| Date         | 02.07.2013                                            |       |       |       |       |       |
| Assessment   | 7                                                     | 8     | 9     | 10    | 11    | 12    |
| Replicate ID | [0-4]                                                 | [0-4] | [0-4] | [0-4] | [0-4] | [0-4] |
| 1            | 2                                                     |       |       |       |       |       |
| 2            | 2                                                     |       |       |       |       |       |
| 3            | 2                                                     |       |       |       |       |       |
| 4            | 3                                                     |       |       |       |       |       |
| 5            | 2                                                     |       |       |       |       |       |
| 6            | 1                                                     |       |       |       |       |       |
| 7            | 1                                                     |       |       |       |       |       |
| 8            | 2                                                     |       |       |       |       |       |
| 9            | 2                                                     |       |       |       |       |       |
| 10           | 0                                                     |       |       |       |       |       |

### Decay types

| Material     | Copper sulphate treated Norway spruce - Low retention |            |            |            |            |            |
|--------------|-------------------------------------------------------|------------|------------|------------|------------|------------|
| Date         | 28.05.2007                                            | 19.06.2008 | 03.06.2009 | 07.06.2010 | 31.05.2011 | 10.07.2012 |
| Assessment   | 1                                                     | 2          | 3          | 4          | 5          | 6          |
| Replicate ID |                                                       |            |            |            |            |            |
| 1            |                                                       |            |            |            | B          | B          |
| 2            |                                                       |            |            |            | B          |            |
| 3            |                                                       |            |            |            |            | B          |
| 4            |                                                       |            |            |            | B          | B          |
| 5            |                                                       |            |            |            |            | B          |
| 6            |                                                       |            |            |            |            | B          |
| 7            |                                                       |            |            |            | B          | B          |
| 8            |                                                       |            |            |            |            | B          |
| 9            |                                                       |            |            |            |            |            |
| 10           |                                                       |            |            |            |            | B          |

| Material     | Copper sulphate treated Norway spruce - Low retention |   |   |    |    |    |
|--------------|-------------------------------------------------------|---|---|----|----|----|
| Date         | 02.07.2013                                            |   |   |    |    |    |
| Assessment   | 7                                                     | 8 | 9 | 10 | 11 | 12 |
| Replicate ID |                                                       |   |   |    |    |    |
| 1            | B                                                     |   |   |    |    |    |
| 2            | B                                                     |   |   |    |    |    |
| 3            | B                                                     |   |   |    |    |    |
| 4            | B                                                     |   |   |    |    |    |
| 5            | B                                                     |   |   |    |    |    |
| 6            | B                                                     |   |   |    |    |    |
| 7            | B                                                     |   |   |    |    |    |
| 8            | B                                                     |   |   |    |    |    |
| 9            | B                                                     |   |   |    |    |    |
| 10           | B                                                     |   |   |    |    |    |

W = White rot, B = Brown rot, S = Soft rot

#### Assessment Reference

| Material     | <i>Picea abies</i> Karst. |            |            |            |            |            |
|--------------|---------------------------|------------|------------|------------|------------|------------|
| Date         | 28.05.2007                | 19.06.2008 | 03.06.2009 | 07.06.2010 | 31.05.2011 | 10.07.2012 |
| Assessment   | 1                         | 2          | 3          | 4          | 5          | 6          |
| Replicate ID | [0-4]                     | [0-4]      | [0-4]      | [0-4]      | [0-4]      | [0-4]      |
| 1            | 0                         | 1          | 2          | 3          | 3          | 4          |
| 2            | 0                         | 1          | 1          | 3          | 3          | 3          |
| 3            | 0                         | 1          | 2          | 3          | 3          | 4          |
| 4            | 1                         | 1          | 2          | 4          | 4          | 4          |
| 5            | 0                         | 2          | 2          | 3          | 3          | 4          |
| 6            | 0                         | 0          | 1          | 1          | 3          | 3          |
| 7            | 0                         | 0          | 1          | 3          | 3          | 3          |
| 8            | 1                         | 0          | 2          | 2          | 4          | 4          |
| 9            | 0                         | 2          | 3          | 3          | 3          | 3          |
| 10           | 0                         | 0          | 2          | 3          | 3          | 4          |

| Material     | <i>Picea abies</i> Karst. |       |       |       |       |       |
|--------------|---------------------------|-------|-------|-------|-------|-------|
| Date         | 02.07.2013                |       |       |       |       |       |
| Assessment   | 7                         | 8     | 9     | 10    | 11    | 12    |
| Replicate ID | [0-4]                     | [0-4] | [0-4] | [0-4] | [0-4] | [0-4] |
| 1            | 4                         |       |       |       |       |       |
| 2            | 4                         |       |       |       |       |       |
| 3            | 4                         |       |       |       |       |       |
| 4            | 4                         |       |       |       |       |       |
| 5            | 4                         |       |       |       |       |       |
| 6            | 4                         |       |       |       |       |       |
| 7            | 4                         |       |       |       |       |       |
| 8            | 4                         |       |       |       |       |       |
| 9            | 4                         |       |       |       |       |       |
| 10           | 4                         |       |       |       |       |       |

#### Decay types reference

| Material     | <i>Picea abies</i> Karst. |            |            |            |            |            |
|--------------|---------------------------|------------|------------|------------|------------|------------|
| Date         | 28.05.2007                | 19.06.2008 | 03.06.2009 | 07.06.2010 | 31.05.2011 | 10.07.2012 |
| Assessment   | 1                         | 2          | 3          | 4          | 5          | 6          |
| Replicate ID |                           |            |            |            |            |            |
| 1            |                           | B          | B          | B          | B          | B          |
| 2            |                           | B          | B          | B          | B          | B          |
| 3            |                           | B          | B          | B          | B          | B          |
| 4            | B                         | B          | B          | B          |            |            |
| 5            |                           | B          | B          | B          | B          | B          |
| 6            |                           |            | B          | B          | B          | B          |
| 7            |                           |            | B          | B          | B          | B          |
| 8            | B                         |            | B          | B          | B          |            |
| 9            |                           | B          | B          | B          | B          | B          |
| 10           |                           |            | B          | B          | B          | B          |

|                     |                           |   |   |    |    |    |
|---------------------|---------------------------|---|---|----|----|----|
| <b>Material</b>     | <i>Picea abies</i> Karst. |   |   |    |    |    |
| <b>Date</b>         | 02.07.2013                |   |   |    |    |    |
| <b>Assessment</b>   | 7                         | 8 | 9 | 10 | 11 | 12 |
| <b>Replicate ID</b> |                           |   |   |    |    |    |
| <b>1</b>            | B                         |   |   |    |    |    |
| <b>2</b>            | B                         |   |   |    |    |    |
| <b>3</b>            | B                         |   |   |    |    |    |
| <b>4</b>            | B                         |   |   |    |    |    |
| <b>5</b>            | B                         |   |   |    |    |    |
| <b>6</b>            | B                         |   |   |    |    |    |
| <b>7</b>            | B                         |   |   |    |    |    |
| <b>8</b>            | B                         |   |   |    |    |    |
| <b>9</b>            | B                         |   |   |    |    |    |
| <b>10</b>           | B                         |   |   |    |    |    |

W = White rot, B = Brown rot, S = Soft rot

## REFERENCES

Humar M, Thaler N (2014) Performance of copper treated and naturally durable wood in laboratory and outdoor conditions. International Conference on Durability of Building Materials and Components. September 02-05 2014, Sao Paulo, Brazil. In press.