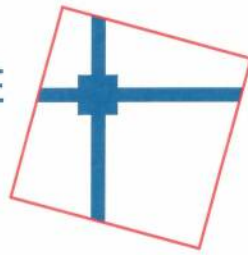


REPORT 3249-12G-S:

**SHEAR STRENGTH AND SHEAR MODULUS OF MAGOXX®-BOARD
GREY, 12 MM**

Project number: 3249
Author: drs. H. Schinkel
Date: November 26, 2020

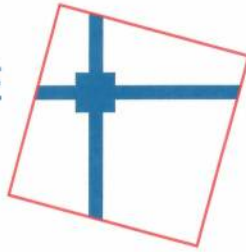
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1. PROJECT DATA

Commissioner : SINH Building Solutions B.V.

Address : Saturnusstraat 60, unit 67
NL - 2216 AH Den Haag

Contact person : Mr. J. Engels

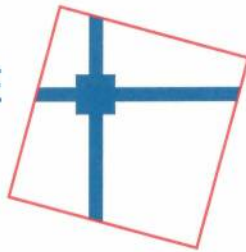
Project : Shear strength and shear modulus of Magoxx®-Board

Project number : 3249

Project manager : drs. H. Schinkel

Date of examination: October 2020

Date of report : November 26, 2020



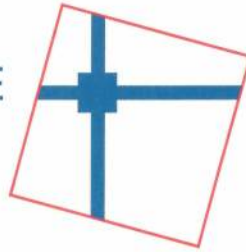
2. INTRODUCTION

BouwTechnologie RDA was commissioned by SINH Building Solutions BV to test Magoxx[®]-board as commercialized by SINH Building Solutions at Den Haag (NL). The shear properties shall be determined in accordance with EN 789 on five specimens, cut with it longest size parallel to the longest dimension of the board and five specimens, perpendicular to the longest dimension of the board.

The 28th of August 2020 SINH Building Solutions B.V. supplied five boards with a thickness of 12 mm. The width of all boards was 1200 mm and the length of the boards was 3000 mm. The sheets were marked on their surface:

MAGOXX-CE-ETA 15/0634 NLW19-12mm-05/04/20

BouwTechnologie cut the test pieces for the different tests in accordance to EN 326 and EN 12467, dimensions 900 x 450 mm.



3. DESCRIPTION

According to the cutting plan the samples were sawn by BouwTechnologie RDA BV. The samples were coded as follows:

Sheet number (1 trough 5)

Direction of cutting (P =parallel, L=perpendicular)

Sh (stands for shear)

3.1 Method

The tests were carried out in accordance with EN 789.

The deformation over 100 mm was measured using two Linear Variable Differential Transformers (LVDT's), mounted to two sides of the specimens. The characteristic value of the shear modulus ($G_{v,mean}$) was determined from the force and the dimension of the section.

The maximum force (F_{max}) and the dimensions were used for calculating the characteristic value of the shear strength ($f_{v,k}$).

In order to ensure a correct propagation of the force into the specimen both ends were packed between two pieces of wood, 35 mm thick fir.

Figure 1 shows the test set-up.

The deformation velocity was kept constant at 5 mm/min, at this loading rate the specimens yielded in 300 s \pm 120 s.

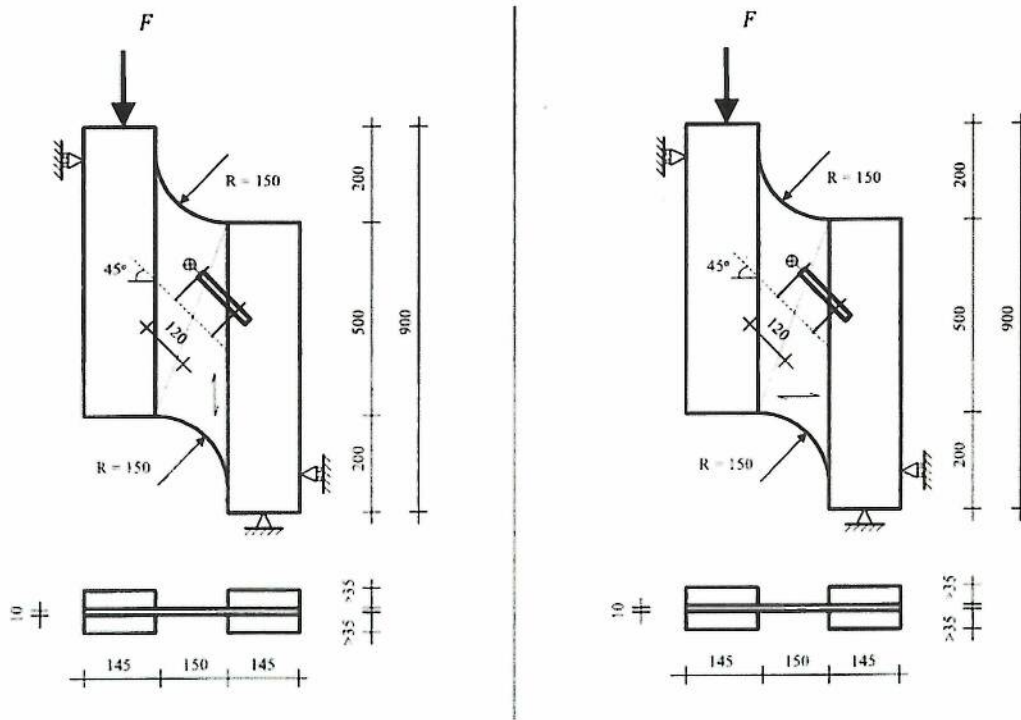
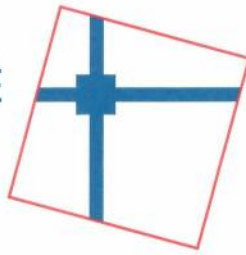


Figure 1. Dimensions and arrangement of the specimens and sensors

3.2 Calculations

Shear strength f_v was calculated using the formula:

$$f_v = \frac{F_{max}}{A}$$

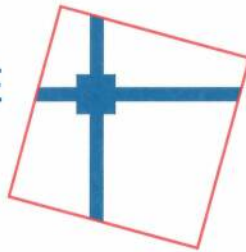
where:

f_v	shear strength	[N/mm ²]
F_{max}	maximum load at yield	[N]
A	surface of the section (height x thickness)	[mm ²]

Shear modulus G_v was calculated between $0,1 F_{max}$ and $0,4 F_{max}$ using:

$$G_v = \frac{0,5 \cdot l1 \cdot (f40 - f10)}{A \cdot (u40 - u10)}$$

where:



G_v	shear modulus	[N/mm ²]
l_1	distance between the measuring points (120 mm)	[mm]
A	surface of the section (height x thickness)	[mm ²]
$F_{40}-F_{10}$	increment of force between 10% and 40% of yield load	[N]
$u_{40}-u_{10}$	increment of deformation 10% and 40% of yield load	[mm]

The characteristic values are calculated according with EN 14358, under the assumption that the test values have a log normal spread.

3.3 Apparatus used

Universal test bank Schenk (calibrated)
 Digital (calibrated)

3.4 Time frame of tests

The tests were done October 9, 2020

3.5 Deviations from standard

The surface of the fixings of the LVDT's was superior to 5 mm².

4. RESULTS

The individual test results of the different tests are given in table 2. The average values are the arithmetic means by calculation.

The results didn't show a difference in the two directions of cutting. Table 1 summarizes therefor all results without the distinction of direction.

Table 1. Characteristic values of shear strength and shear modulus

MAGOXX [®] -board 12 mm	Shear strength ($f_{v,k}$) [N/mm ²]	Shear modulus (G_{mean}) [N/mm ²]
Independent of board direction	5,86	3021

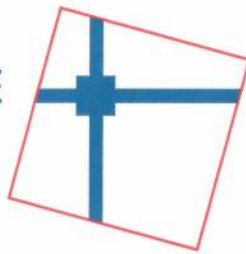


Table 2. Individual results.

Sample	t _{up} [mm]	t _{down} [mm]	t _{mean} [mm]	F _{max} [kN]	f _v [N/mm ²]	ln mi [N/mm ²]	(ln mi-y) ² [N/mm ²]	F ₁₀ [kN]	F ₄₀ [kN]	U10 [mm]	U40 [mm]	G _v [N/mm ²]
1LSh	11,9	11,9	11,9	40,46	6,24	1,83	0,0104	4,03	16,16	0,008	0,036	3395
1PSh	11,9	11,9	11,9	40,55	6,25	1,83	0,0100	3,79	16,14	0,009	0,041	3026
2LSh	12,0	11,9	11,9	46,12	7,08	1,96	0,0006	4,60	18,42	0,005	0,035	3538
2PSh	11,9	11,9	11,9	47,68	7,35	1,99	0,0038	4,74	19,07	0,011	0,052	2744
3LSh	11,9	11,9	11,9	41,92	6,47	1,87	0,0043	4,18	16,73	0,012	0,047	2732
3PSh	11,9	11,8	11,9	49,40	7,65	2,03	0,0104	4,77	19,69	0,011	0,049	3055
4LSh	11,9	11,8	11,9	50,41	7,80	2,05	0,0146	4,98	20,14	0,011	0,048	3186
4PSh	12,0	11,9	11,9	43,28	6,67	1,90	0,0013	4,25	17,31	0,012	0,044	3085
5LSh	11,9	11,9	11,8	44,11	6,84	1,92	0,0001	4,41	17,57	0,013	0,054	2455
5PSh	11,9	11,8	11,9	44,94	6,94	1,94	0,0000	4,38	17,93	0,009	0,044	2989
Average			11,9	44,89	6,37							3021
St.Dev			0,0	3,51	0,55							320
VC (%)			0	8	8							11
Characteristic values EN 14358:2016												
y	mean										1,93	
s _y	st,dev										0,079	
n											10	
k _s (n)											2,10	
f _{v,k}		[N/mm ²]										5,86
G _{v,mean}		[N/mm ²]										3021