Bending Tests with Glulam Columns under Eccentric Normal Force Stress

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Summary:

The force-displacement behaviour of structural timber members subjected to axial compression or combined axial compression and bending is distinctively non-linear. This behaviour is caused by the non-linear increase of the deformation due to the increasing eccentricity of the axial load as well as by the non-linear material behaviour of timber when subjected to compression. The present report describes experimental investigations on glued laminated timber members subjected to eccentric compression. The aim of these experimental investigations was to create a data base, which can be used to validate theoretical calculation models and to assess the accurateness of the design approaches given in the design codes for timber structures.
The specimens for the main bunch of experiments were produced using lamellas made of Norway spruce grown in Switzerland. For this purpose, a total of 336 lamellas were available. In the first step, non-destructive tests on the lamellas were performed. These tests aimed at the collection of data in order to characterise the raw material.
In the second step, the lamellas were strength graded. The aim of the grading process was to select two classes of lamellas for the production of the test specimens. The lamellas were selected so that they were suitable to produce glued laminated timber of strength classes GL24h and GL32h. Within the grading process, visual grading criteria as well as machine grading criteria were used.
In the third step, the graded lamellas were used to produce glued laminated timber members. Five tests series were produced. Each of the test series consisted of ten specimens. Three series were made of glued laminated timber GL24h and two series were made of glued laminated timber GL32h. The length of the timber members was varied between the different test series. The lengths were L = 1’400 mm, L = 2’300 mm and L = 3’200 mm respectively. During the production, the setup of the test specimens was recorded. Hence, the position and the orientation of every lamella within the test specimen were documented. Additionally, some non-destructive tests were performed using the test specimens.
In the last step, the glued laminated timber members were subjected to buckling tests. The test specimens were loaded with an eccentric compression force up to failure. During the tests, different measurements were carried out in order to document the experimental investigations as accurate as possible. Amongst others, the applied loads as well as horizontal and vertical deformations were recorded. For a subsample of 20 test specimens, additional local deformation measurements were performed using an optical measurement device.

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Multifunction Timber Wall Design for High Loads: Use of Reinforced CLT Thin Panel

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Summary:

This paper presents a multifunction timber wall concept. It is adapted to create frame and envelope of multi-storey buildings. This wall is composed of a reinforced CLT thin panel to support the loads. Other layers are used to provide insulation, internal and external coatings. In this study, Solid-beams are chosen to reinforce the CLT panel. Bending and buckling tests are carried out to assess the mechanical behavior of the wall concept. The implementation of reinforcements increases significantly the stiffness of CLT thin panel and its buckling stability. In this way, the use of this wall reduces the amount of material employed. This study also shows that it is possible to reduce the length of the reinforcements without significantly reducing the buckling stability of the wall.

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