REPORT-2025-27

CUSTOMER: Vinyylitalo Oy / Jukka Toivola

ASSIGNMENT: Vinyylitalo's Barrier Structure Strength Tests

CONTENT:

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1. Test Programme

This test programme was carried out to obtain information on the horizontal load-carrying capacity of the Vinyylitalo's barrier structures. Two tests were conducted on identical barrier structures.

The tests were performed in the research hall of HAMK Tech Research Unit laboratory in Hämeenlinna on 14.08.2025. The test was carried out by Mr. Lev Antimonik, Mr. Silver Jänes and Mr. Kai Mannila from HAMK University of Applied Sciences.

2. Test Specimens

The dimensional drawing of the tested structure is shown in Figure 1. The structure consisted of two 90x90 mm glue-laminated timber columns, two 43x43 mm aluminum H-profile rails covered by PVC casings and vertical hollow PVC slats. Each side of the rail was connected to the column by PVC connector and 4 screws. The screws were Würth chipboard screws pan head TX20 4x30. The assembly was performed by the laboratory personnel according to the manufacturer's guidelines and instructions. The assembled fence structure is illustrated in Figure 2.

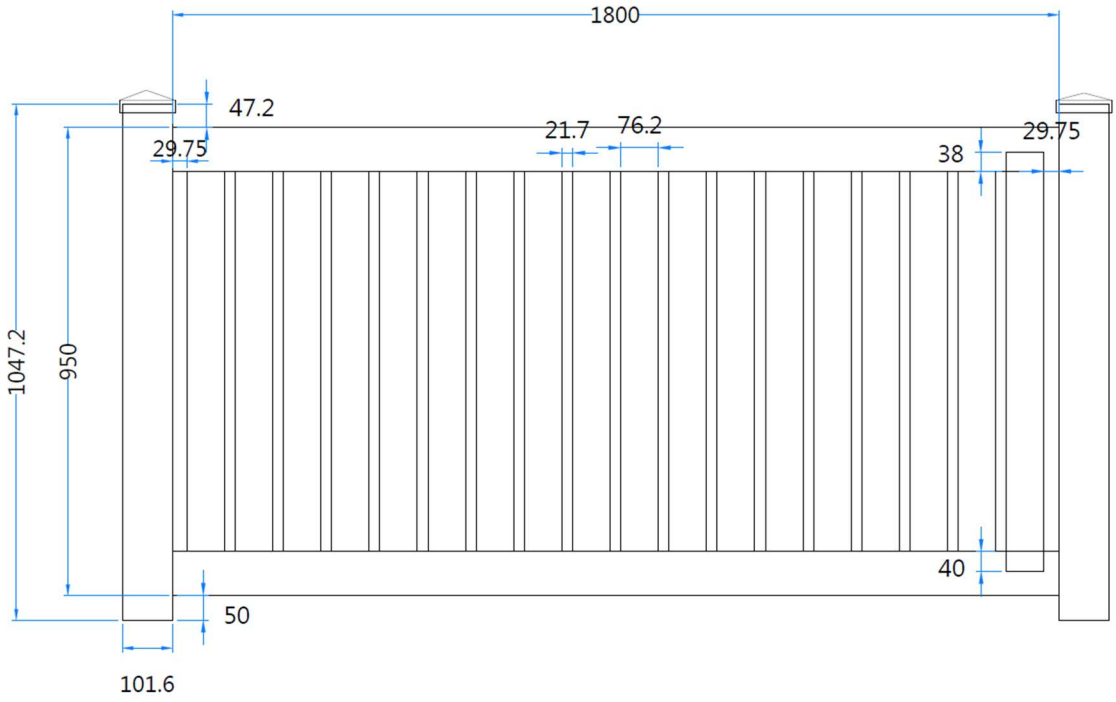

Figure 1. Dimensional drawing of the tested structure.

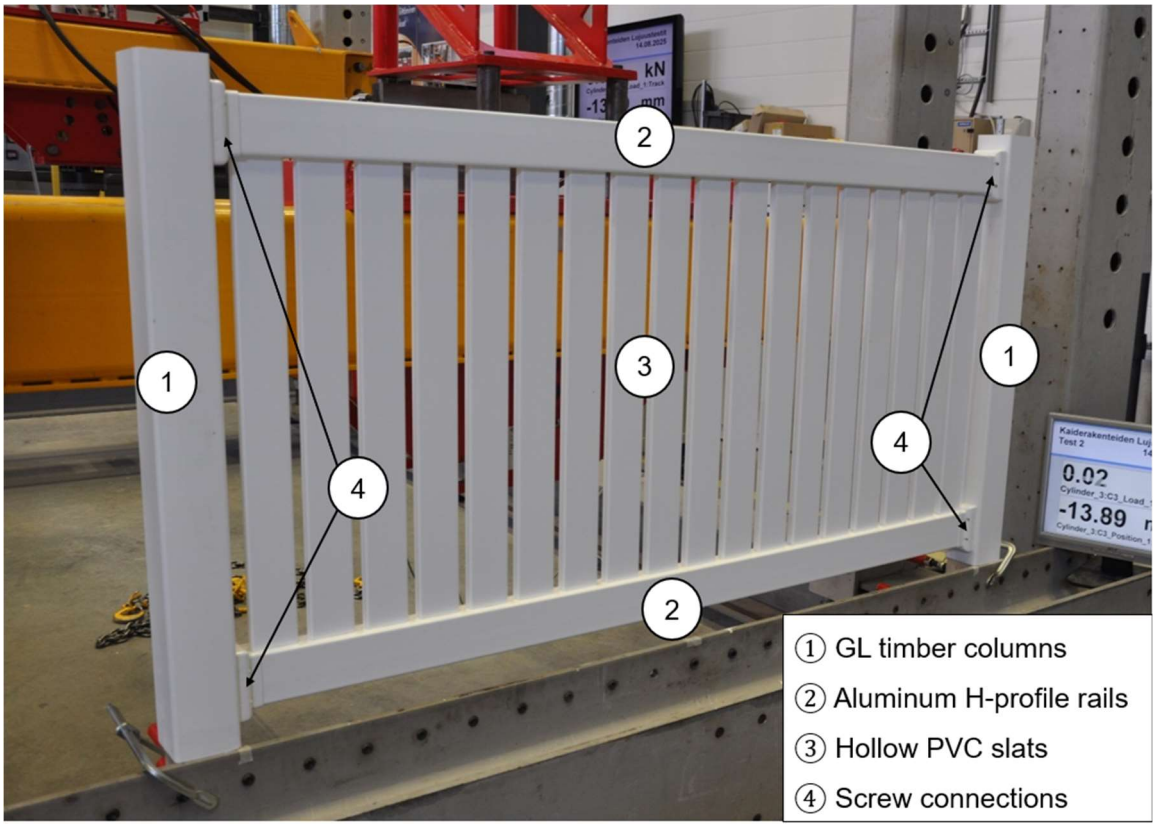

Figure 2. Assembled fence structure before the test.

3. Test Arrangement

The barrier strength test arrangement is illustrated in Figure 3. The tested structure was clamped to the testing bench at the bottom of the columns and the timber stoppers were attached to the floor to prevent the movement of timber columns during the loading. The load was applied to the middle of the upper rail through 100x200 mm plywood board piece by the hydraulic cylinder pushing forwards with the constant displacement rates of 20 mm/min and 200 mm/min for the first and second tests respectively. The force and the displacement were measured by the load cell and the displacement transducer integrated into cylinder's crosshead.

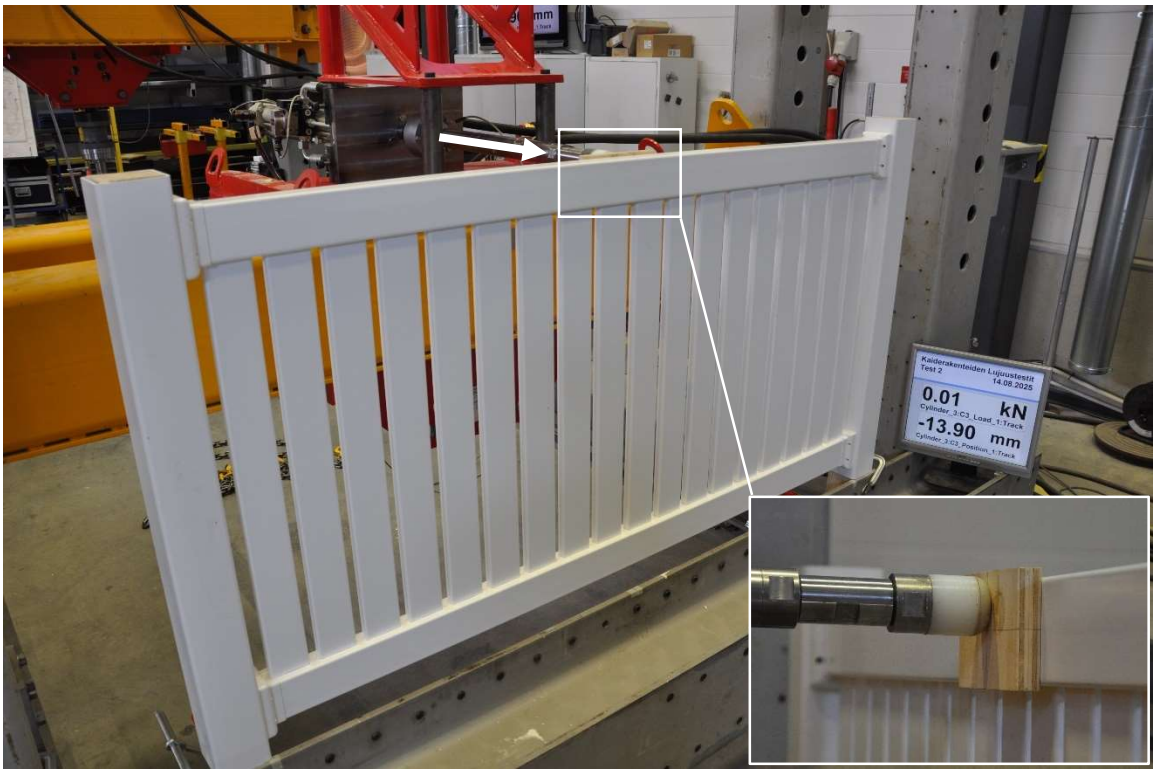

Figure 3. Barrier strength test arrangement.

4. Test Results

The summary of the test results is listed in Table 1. The result summary presents the loading speed, ultimate force achieved during the test and its corresponding displacement. The force versus displacement curves for each test are shown in Figure 4.

Table 1. Barrier strength test result summary.

Test name	Loading speed [mm/min]	Ultimate force [kN]	Corresponding displacement [mm]
Test 1	20	1.84	173.41
Test 2	200	1.95	172.17

The failures in both tests were bending of the upper rail and consequent snapping out of its side plastic holders. The photographs of the tested structure under load and their failure modes are presented in Figures 5 to 9.

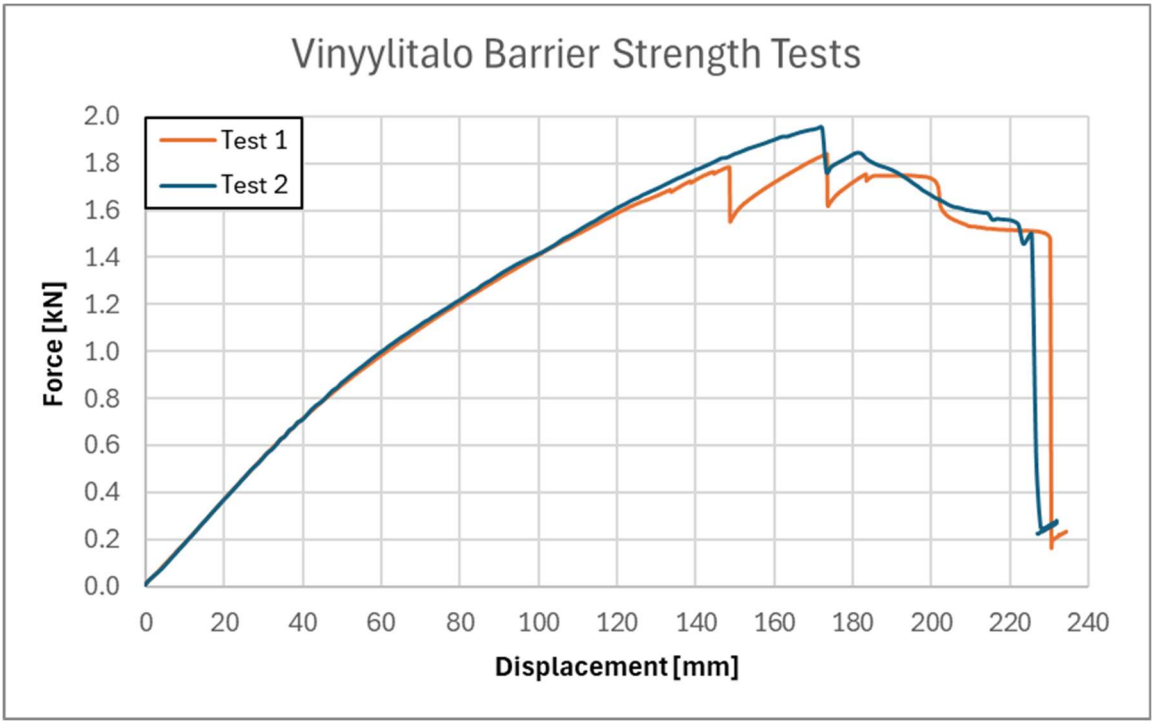

Figure 4. Force versus displacement curves of the tests.

Figure 5. The barrier structure under load and bending of the upper rail during Test 1.

Figure 6. Test 1 barrier structure failure.

Figure 7. The barrier structure under load during Test 2.

Figure 8. Test 2 barrier structure failure.

Figure 9. Test 2 upper rail damage.