EXPERIMENTAL TESTING OF RESIDENTIAL BUILDING MATERIALS EXPOSED TO INNUNDATION

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THE MAIN OBJECTIVE OF THIS RESEARCH WAS TO ASSESS THE STRENGTH AND DURABILITY IMPLICATIONS OF IMMERSION OF KEY RESIDENTIAL BUILDING MATERIALS / SYSTEMS IN SLOW WATER-RISING CONDITIONS. THE RESEARCH WILL HELP TO ASCERTAIN WHERE DETERIORATION DUE TO WETTING AND DRYING NEEDS TO BE ADDRESSED AS PART OF REPAIR STRATEGIES.

INTRODUCTION

Australia has experienced damaging floods on a regular basis due to inappropriate urban development in floodplains. The project entitled 'Cost-effective mitigation strategy development for flood prone buildings' aims to support the address of this issue and is targeted at assessing mitigation strategies to reduce the vulnerability of existing residential building stock.

EXPERIMENTAL TESTS ON SELECTED BUILDING MATERIALS / SYSTEMS

Three types of tests have been carried out at James Cook University, Townsville, on selected building materials/systems to ascertain their resilience to floodwater.

Test 1: Structural wall sheet bracing (20 samples)

The aim of this test programme was to assess the effect of flooding on the racking strength of Oriented Strand Board (OSB) and High Density Fibreboard (HDF) wall sheet bracing (see Table 1 & Figure 1).

Test 2: Bathroom and shower subassembly (6 samples)

The aim of this test programme was to assess the effect of flooding on the bond strength of wall and floor ceramic tiles to their substrate (see Table 2 & Figure 2).

Test 3: Timber I section joists (48 samples)

The aim of this test was to assess the effect of flooding on the four point bending strength of manufactured HJ20045 timber 'I' section joists with OSB webs (see Table 3 & Figure 3).

Table 1: Racking Strength Testing Results

Test	Sheet	Flooded	Comment	Load (kN)
A1 –A5	OSB	YES	Tested after drying	5.47
A6 –A10	OSB	NO	Control Specimens	5.35
B1 –B5	HDF	YES	Tested after drying	5.60
B6 –B10	HDF	NO	Control Specimens	6.23

Table 2: Static Pull-Out Strength Testing Results

Test	Simulation	Flooded	Comment	Floor Tile Failure Load (kN)	Wall Tile Failure Load (kN)
A1	Bathroom	NO	Control Specimens	9.27	2.82
A2	Bathroom	YES	Tested after drying	12.44	3.66
A3	Bathroom	YES	Tested after drying	11.69	3.64
B1	Shower	NO	Control Specimens	8.92	3.57
B2	Shower	YES	Tested after drying	8.96	3.15
B3	Shower	YES	Tested after drying	9.72	3.70

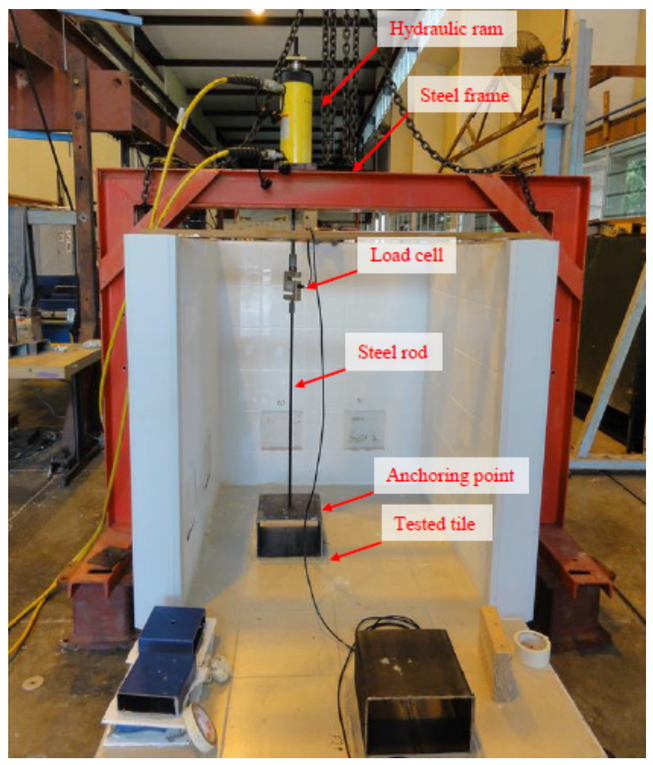

Figure 2: Floor Tile Hydraulic Test Setup

Table 3: Four Point Bending Strength Testing Results

Test	Treated	Flooded	Comment	Failure Load (kN)
A1 –A8	H2	YES	Tested after drying	16.53
A9 –A16	H2	NO	Control Specimens	17.21
A17 –A24	H2	YES	Tested wet	9.23
B1 –B8	NIL	YES	Tested after drying	16.21
B9 –B16	NIL	NO	Control Specimens	18.64
B17 –B24	NIL	YES	Tested wet	9.30

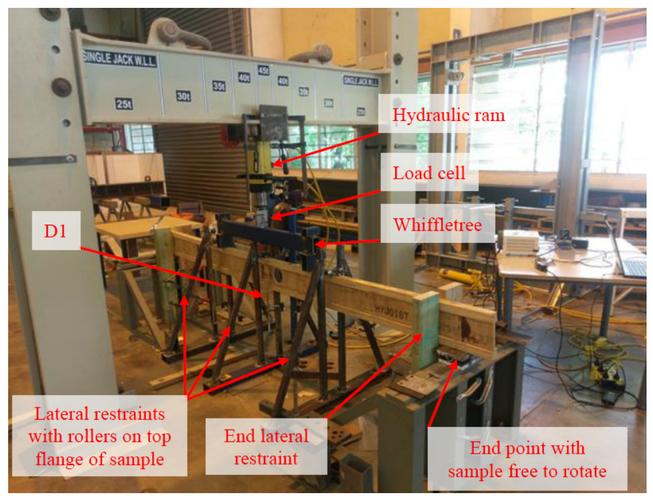

Figure 3: Four Point Bend Test Setup

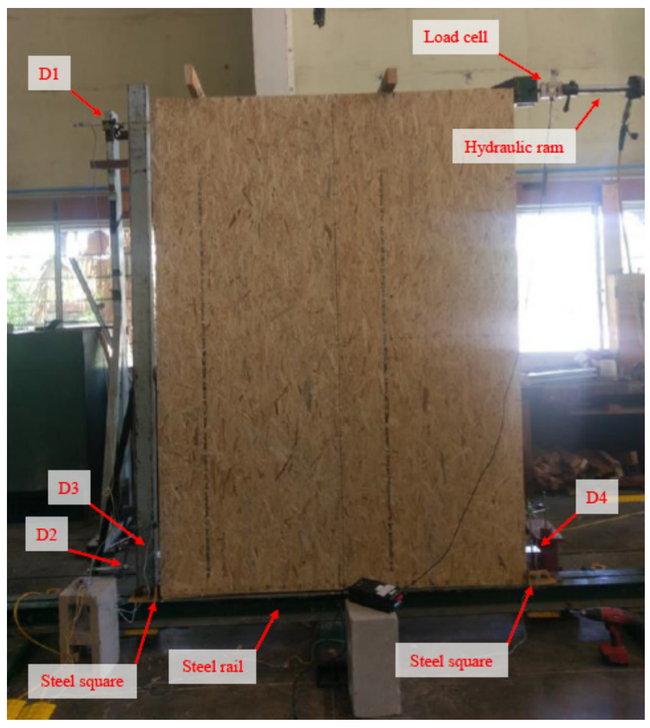

Figure 1: Racking Strength Testing Frame

CONCLUSION

The results showed that flooding did not have any significant effect on the pull-out strength of the bond of the ceramic floor and wall tiles to their substrate, nor on the racking strength of the OSB and HDF wall sheet bracing.

However, there was a significant reduction (~45%) in load carrying capacity of the timber joists when tested in the wet condition. Moreover, it was observed that the moisture content level after the test returned close to pre-inundation level within a week.