PARTITION PERFORMANCE

OF

AUTOCLAVED LIGHTWEIGHT CONCRETE (ALC)

WALL PANEL

TESTED FOR: GISS Pty Ltd (ACN 125 794 649)
Gr Flr, 2 Mill Street
Perth, WA 6000
Australia

PREPARED BY: Tay Wei Liang
Associate Engineer

APPROVED BY: Raymond Tan
Senior Engineer
Building & Industrial Products,
Testing Group
SUMMARY
TESTED FOR  GISS Pty Ltd

TEST SAMPLE PANEL  Autoclaved Lightweight Concrete (ALC) Wall Panel with thickness of 100mm

TEST DATE  10 Dec 2007 to 31 Dec 2007

TEST METHOD  SS 492 : 2001 & BS 5234 Part 2 : 1992

TEST DESCRIPTION  The purpose of the test is to determine the resistance to damage of partition system for use as internal walls of buildings.

Tests for grade compliance:

a. Stiffness  Load of 500N applied through an area of 150 mm diameter plate perpendicular to the partition surface. 10 mm maximum deflection allowable.

b. Small hard body impact  Impact by a 50 mm diameter / 3 kg steel ball with a swinging arm of 600 mm long swung perpendicularly against the wall. Test on 11 positions (includes a corner). Criteria: no significant damage.
   i. Surface damage  Impact energy of 10 Nm (swing angle of 63.6 degree)
   ii. Perforation  Impact energy of 30 Nm (swing angle of 131.8 degree)

c. Large soft body impact  Impact by a 50 kg sphericoconical bag of 600 mm X 400 mm diameter filled with hardened glass beads. Test on 3 positions (includes a corner). Criteria: no significant damage.
   i. Resistance to damage  Impact energy of 100 Nm (drop height of 204 mm). Single impact at two selected positions and one on corner.
   ii. Resistance to structural damage  Impact energy of 120 Nm (drop height of 245 mm). Three impacts at two selected positions.

d. Door slam  Partition wall is being slammed a hundred times with a 60 kg door leaf by a force of 15 kg. Door frame shall not be permanently displaced by 1mm.

Other tests:

a. Crowd pressure  A load of 3.0 kN/m is applied through a 2.5 m wooden beam at a height of 1.2 m. No damage or collapse that would render the partition dangerous be allowed.
### SUMMARY OF TEST RESULTS:

Summary of strength and robustness tests to SS492 :2001 & BS 5234 : Part 2 : 1992  
(Details of partition specimen and test report are attached)

<table>
<thead>
<tr>
<th>Tests for grade compliance</th>
<th>Requirements tested</th>
<th>Grade performance achieved</th>
<th>Pass/Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Stiffness</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Surface damage by small hard body impact</td>
<td></td>
<td>Passed</td>
</tr>
<tr>
<td></td>
<td>Straight partition</td>
<td></td>
<td>Tested</td>
</tr>
<tr>
<td></td>
<td>Right angle partition</td>
<td></td>
<td>Tested</td>
</tr>
<tr>
<td></td>
<td>Surface damage by large soft body impact</td>
<td></td>
<td>Passed</td>
</tr>
<tr>
<td></td>
<td>Straight partition</td>
<td></td>
<td>Passed</td>
</tr>
<tr>
<td></td>
<td>Right angle partition</td>
<td></td>
<td>Passed</td>
</tr>
<tr>
<td></td>
<td>Perforation by small hard body impact</td>
<td></td>
<td>Passed</td>
</tr>
<tr>
<td></td>
<td>Straight partition</td>
<td></td>
<td>Passed</td>
</tr>
<tr>
<td></td>
<td>Right angle partition</td>
<td></td>
<td>Passed</td>
</tr>
<tr>
<td></td>
<td>Resistance to structural damage by large soft body impact</td>
<td></td>
<td>Passed</td>
</tr>
<tr>
<td></td>
<td>Door slamming</td>
<td></td>
<td>Passed</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Summary of other tests on partition specimen</th>
<th>Requirement tested</th>
<th>Performance achieved</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Crowd pressure</td>
<td>3.0 kN/m</td>
</tr>
</tbody>
</table>
TABLE OF CONTENTS

SUMMARY

1. Introduction
2. Description of sample
3. Test standard
4. Test setup
5. Description of tests
   5.1 Partition stiffness
   5.2 Small hard body impact
      5.2.1 Surface damage
      5.2.2 Perforation
   5.3 Large soft body impact
      5.3.1 Resistance to surface damage
      5.3.2 Resistance to structural damage
   5.4 Door slam
   5.5 Crowd pressure
6. Test results
   6.1 Partition stiffness
   6.2 Small hard body impact
      6.2.1 Surface damage
      6.2.2 Perforation
   6.3 Large soft body impact
      6.3.1 Resistance to surface damage
      6.3.2 Resistance to structural damage
   6.4 Door slam
   6.5 Crowd pressure
7. Conclusion
1. INTRODUCTION

This document describes the test procedures and reports the performance of partition system.

2. DESCRIPTION OF SAMPLE

The following components information were supplied by GISS Pty Ltd.

Project Name: GISS
Panel Name: Autoclaved Lightweight Concrete (ALC) Wall Panel (without finishing)
Components:

1) Screw used in mock-up of partition wall system : M12 Grad 4.6 bolt
2) Jointing compound (wall) : - ALC Grout
   - AC-810 Sealant
   - construction concrete mix
3. **TEST STANDARD**

BS 5234: 1992 “Partitions (including matching linings)  
Part 2: Specification for performance requirements for strength and robustness including  
methods of test”

4. **TEST SETUP**

A mock-up test specimen 4.8 m length X 3.0 m height and a partition junction assembly of a right-angle  
corner with a return of 1.2 m were installed onto the test rig for the performance test.  

A total of 2 sheet of attached company’s drawings contain the details of the mock-up specimen.  

The test specimen includes a doorset 0.84 m width X 2.16 m height and a 0.59 m run of partition flanking at  
one side of the doorset.

Figure 1: Full Test specimen mock-up
5. DESCRIPTION OF TESTS

The following tests were conducted:

i. Partition stiffness

ii. Small hard body impact
   a. Surface damage
   b. Perforation

iii. Large soft body impact
   a. Resistance to surface damage
   b. Resistance to structural damage

iv. Door slam

v. Crowd pressure

5.1 Partition stiffness

This test is to establish the ability of the partition to withstand people or ladder leaning against the partition wall without causing unacceptable cracking or movement.

A static horizontal load of 500 N was applied through a 150 mm diameter steel plate with a contact rubber pad of 6 mm thick. The load was applied to the partition at a height of 1500 mm from the bottom of the setup. Deflection was taken on the load side at 125 mm above the centre point of load application. A pretest load of 100 N was applied and stabilised for 1 min before unloading. The load was then applied in steps of 100 N until 500 N before unloading. Each loading was maintained for about 2 minutes for stabilisation.

Deflection was taken at the end of the 2 minutes interval. The residual deflection was taken 1 hour after unloading.

5.2 Small hard body impact

The test is to simulate impact caused by sharp or pointed objects such as trolleys and wheelchairs. A 3 kg / 50 mm diameter steel sphere impactor was used to simulate a hard body object. It was attached to a 600 mm long swinging arm.

5.2.1 Surface damage

This test is to determine the resistance of the partition to damage from impacts by small, hard body objects.

Ten positions on the main wall of the test setup were chosen for the test. Each position was subject to a 10 Nm impact energy. The swinging arm was raised by 0.33 m or an angle of 63.6 degree and released. The rebound of the steel arm was withheld to prevent it from making a second impact.

The depth of indentation was taken after each impact for a position.

The test was repeated at a corner position 75 mm away from the corner edge.
5.2.2 Perforation

This test is to determine the resistance of the partition to perforation from impacts by small, hard objects.

Ten positions on the main wall of the test setup were chosen for the test. Each position was subject to a 30 Nm impact energy. The swinging arm was raised by 1 m or 131.8 degree and released. The rebound of the steel arm was withheld to prevent it from making a second impact. The partition was inspected for any damage or perforation.

The test was repeated at a corner position 75 mm away from the corner edge.

5.3 Large soft body impact

The test is to simulate impact caused by people falling against or any large soft body object such as a ball hitting the partition wall. The impactor is a spherocongical bag of 600 mm X 400 mm filled with hardened glass beads. It has a total weight of 50 kg.

5.3.1 Resistance to surface damage

Two positions on the partition wall were selected for the test. Each location was subject to a single swinging impact. A linear gauge was placed behind the impacted panel to measure the permanent deformation.

The impact energy was 100 Nm. The impactor was raised by 204 mm before releasing. Permanent deformation was taken after 5 minutes from the impact.

The test was repeated at a corner position 200 mm away from the corner edge.

5.3.2 Resistance to structural damage

Two positions on the partition wall were selected for the test. Each location was subject to three swinging impacts.

The impact energy was 120 Nm. The impactor was raised by 245 mm before releasing. The partition was inspected for any surface or structural damage.

5.4 Door slam

The test simulates a door being forcefully slammed by a person, wind or tensioned door closer.

A 60 kg door leaf was slammed through an opening angle of 60 degrees with a force of 15 kg for 100 times. Residual deflection was taken on the door frame at 1 m above the bottom of the door leaf after 5 minutes from the last slamming.

5.5 Crowd pressure

This test simulates a uniform band load such as a crowd leaning against the wall.

A test load of 3.0 kN/m was applied through a 2.5 m long wooden beam placed at a height of 1.2 m above the bottom of the wall. Deflection was taken at 125 mm above the beam. Residual deflection was taken after 5 minutes upon released of the load.
6. TEST RESULTS

6.1 Partition stiffness

Date of test: 28 Dec 2007
Lab temperature: 28.0 °C

<table>
<thead>
<tr>
<th>Load (N)</th>
<th>Duration (min)</th>
<th>Deflection (mm)</th>
<th>Residual Deflection (mm)</th>
<th>Condition of the specimen tested</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest load of 100 N</td>
<td>1</td>
<td>-0.11</td>
<td>-0.01</td>
<td>No damage was observed.</td>
</tr>
<tr>
<td>100</td>
<td>2</td>
<td>-0.10</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>2</td>
<td>-0.19</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>300</td>
<td>2</td>
<td>-0.30</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>400</td>
<td>2</td>
<td>-0.41</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>500</td>
<td>2</td>
<td>-0.52</td>
<td>-0.07</td>
<td></td>
</tr>
</tbody>
</table>

Figure 2: Location of applied load for partition stiffness test
6.2 Small hard body impact

6.2.1 Surface damage

Date of test: 27 Dec 2007
Lab temperature: 29.0 °C
Impact Energy: 10 Nm

<table>
<thead>
<tr>
<th>Impact Position</th>
<th>Y (mm)</th>
<th>X (mm)</th>
<th>Depth of indentation (mm)</th>
<th>Condition of the specimen tested</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>430</td>
<td>2120</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>750</td>
<td></td>
<td>2.7</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1050</td>
<td></td>
<td>3.3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1250</td>
<td></td>
<td>3.5</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>730</td>
<td>2630</td>
<td>2.3</td>
<td>No damage or dislodgement of partition was observed.</td>
</tr>
<tr>
<td>6</td>
<td>1250</td>
<td></td>
<td>3.5</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>1840</td>
<td></td>
<td>3.5</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>520</td>
<td>4320</td>
<td>2.3</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>980</td>
<td></td>
<td>2.8</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>1380</td>
<td></td>
<td>3.4</td>
<td></td>
</tr>
<tr>
<td><strong>11</strong></td>
<td>1000</td>
<td>75</td>
<td>2.9</td>
<td></td>
</tr>
</tbody>
</table>

**Note: Corner junction**

Figure 3: Locations of small hard body impact for surface damage
6.2.2 Perforation

Date of test: 27 Dec 2007
Lab temperature: 29.0°C
Impact energy: 30 Nm

<table>
<thead>
<tr>
<th>Impact Position</th>
<th>Y (mm)</th>
<th>X (mm)</th>
<th>Depth of indentation (mm)</th>
<th>Condition of the specimen tested</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>610</td>
<td>2220</td>
<td>4.1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1030</td>
<td></td>
<td>5.6</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1350</td>
<td></td>
<td>7.1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1550</td>
<td></td>
<td>7.9</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>520</td>
<td>2570</td>
<td>5.2</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>1030</td>
<td></td>
<td>6.5</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>1710</td>
<td></td>
<td>7.7</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>620</td>
<td>4360</td>
<td>5.4</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>1180</td>
<td></td>
<td>7.1</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>1630</td>
<td></td>
<td>6.8</td>
<td></td>
</tr>
<tr>
<td><strong>11</strong></td>
<td>1370</td>
<td>75</td>
<td>6.2</td>
<td>No damage or dislodgement of partition was observed.</td>
</tr>
</tbody>
</table>

**Note:** Corner junction

Figure 4: Locations of small hard body impact for surface damage

View A
6.3 Large soft body impact

6.3.1 Resistance to damage

Date of test: 27 Dec 2007  
Lab temperature: 28.5 °C  
Impact Energy: 100 Nm

<table>
<thead>
<tr>
<th>Impact Position</th>
<th>Y (mm)</th>
<th>X (mm)</th>
<th>Residual deflection (mm)</th>
<th>Condition of the specimen tested</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1500</td>
<td>2600</td>
<td>0.1</td>
<td>No damage observed.</td>
</tr>
<tr>
<td>2</td>
<td>1570</td>
<td>3930</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td><strong>3</strong></td>
<td>1245</td>
<td>200</td>
<td>0.0</td>
<td></td>
</tr>
</tbody>
</table>

**Note: Corner junction

Figure 5: Locations of large soft body impact for resistance to damage
6.3.2 Resistance to structural damage by multiple impacts

Date of test: 27 Dec 2007
Lab temperature: 29.3 °C
Impact Energy: 120 Nm

<table>
<thead>
<tr>
<th>Impact Position</th>
<th>Y (mm)</th>
<th>X (mm)</th>
<th>Condition of the specimen tested</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1500</td>
<td>2040</td>
<td>No damage observed.</td>
</tr>
<tr>
<td>2</td>
<td>1450</td>
<td>3190</td>
<td></td>
</tr>
</tbody>
</table>

Figure 6: Locations of large soft body impact for resistance to structural damage

Figure 6: Locations of large soft body impact for resistance to structural damage
6.4 Door Slamming

Date of test: 26 Dec 2007
Lab temperature: 29.0 °C

<table>
<thead>
<tr>
<th>Open door to 60° ± 1°</th>
<th>Residual deflection (mm)</th>
<th>Condition of the specimen tested</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest of 3 -0.60</td>
<td></td>
<td>No damage was observed</td>
</tr>
<tr>
<td>100 -0.76</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6.5 Crowd Pressure

Date of test: 28 Dec 2007
Lab temperature: 29.5 °C

<table>
<thead>
<tr>
<th>Load</th>
<th>Duration (min)</th>
<th>Deflection (mm)</th>
<th>Residual Deflection (mm)</th>
<th>Condition of the specimen tested</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest load of 200 (N)</td>
<td>1</td>
<td>-0.11</td>
<td>-0.02</td>
<td>No crackline or damage was observed.</td>
</tr>
<tr>
<td>3.0 KN/M</td>
<td>2</td>
<td>-4.87</td>
<td>-0.12</td>
<td></td>
</tr>
</tbody>
</table>

Figure 7: Locations of applied load for crowd pressure
7. CONCLUSION

The partition system meets the severe duty grade requirements of SS492:2001 & BS 5234 Part 2: 1992.

The partition system has also achieved the following performance:

Crowd pressure : 3.0 kN/m

__________________ _____________________
Tay Wei Liang Raymond Tan
Associate Engineer Senior Engineer
Building & Industrial Products Testing Group
APPENDIX: TEST SET-UP

Door Slamming Test

Large Soft Body Impact – Resistance to Damage

Stiffness Test

Crowd Pressure Test
The following drawing information was supplied by GISS Pty Ltd.
The following drawing informations were supplied by GISS Pty Ltd.
This Report is issued under the following conditions:

1. Results of the testing/calibration in the form of a report will be issued immediately after the service has been completed or terminated.

2. Unless otherwise requested, a report shall contain only technical results. Analysis and interpretation of the results and professional opinion and recommendations expressed thereupon, if required, shall be clearly indicated and additional fee paid for, by the Client.

3. This report applies to the sample of the specific product/equipment given at the time of its testing/calibration. The results are not used to indicate or imply that they are applicable to other similar items. In addition, such results must not be used to indicate or imply that TÜV SÜD PSB approves, recommends or endorses the manufacturer, supplier or user of such product/equipment, or that TÜV SÜD PSB in any way “guarantees” the later performance of the product/equipment.

4. The sample(s) mentioned in this report is/are submitted/supplied/manufactured by the Client. TÜV SÜD PSB therefore assumes no responsibility for the accuracy of information on the brand name, model number, origin of manufacture, consignment or any information supplied.

5. Additional copies of the report are available to the Client at an additional fee. No third party can obtain a copy of this report through TÜV SÜD PSB, unless the Client has authorised TÜV SÜD PSB in writing to do so.

6. TÜV SÜD PSB may at its sole discretion add to or amend the conditions of the report at the time of issue of the report and such report and such additions or amendments shall be binding on the Client.

7. All copyright in the report shall remain with TÜV SÜD PSB and the Client shall, upon payment of TÜV SÜD PSB’s fees for the carrying out of the tests/calibrations, be granted a license to use or publish the report to the third parties subject to the terms and conditions herein, provided always that TÜV SÜD PSB may at its absolute discretion be entitled to impose such conditions on the license as it sees fit.

8. Nothing in this report shall be interpreted to mean that TÜV SÜD PSB has verified or ascertained any endorsement or marks from any other testing authority or bodies that may be found on that sample.

9. This report shall not be reproduced wholly or in parts and no reference shall be made by the Client to TÜV SÜD PSB or to the report or results furnished by TÜV SÜD PSB in any advertisements or sales promotion.

10. Unless otherwise stated, the tests are carried out in TÜV SÜD PSB Pte Ltd, No.1 Science Park Drive Singapore 118221.