GENERAL PRESENTATION

SCHNELL HOME - Green Wall 3D Panels

Schnell Home
Via Borghetto, 2 - zona Ind. San Liberio
61036 Colli al Metauro (PU) Italia
Tel: +39 0721 878711 | Fax: +39 0721 8787330
Website: www.schnell.it
Schnell founded in Italy in 1962 is the leading company in rebar processing equipment, wire & mesh machinery and panels technologies.
CUT & BEND

Schnell innovations have greatly changed the reinforcement processing industry.

Our machines are the most modern and functional.
ASSEMBLING

Schnell has historically been a leader in equipment for cage assembling. Thanks to our solutions, assembly is no longer the critical stage of reinforcement processing.
MESH & WIRE

Schnell has been exploring new concepts and today offers original solutions for the wire and mesh industry.
BUILDING ELEMENTS

Schnell Home challenges tradition and proposes innovative systems for building elements.
SCHNELL GROUP:

> 40.000 mq
Production Area

> 350
Employees

4
Factories

12
Companies
SCHNELL HOME DIVISION

Is an industrial system for the construction of structural walls of reinforced concrete for buildings in single panel up to four stories, G+3, and theoretically unlimited stories in double panel - eventual limitation derived solely after verification in accordance with the Building Codes.

The system is composed of a factory produced panel of undulated (wave shape) polystyrene covered both sides by a electrowelded zinc coated square mesh, which in turn are connected by 33 connectors per m² realising a 3 dimensional hyperstatic reinforcement steel.

The panels are assembled on site and in situ poured concrete (double panel, floors, stairs) and shotcreted concrete (single panel) to realise the different elements of the system:

• Vertical structural walls;
• Horizontal structural elements;
• Cladding element;
• Internal walls.
SINGLE PANEL

USED AS

➢ BEARING STRUCTURE FOR BUILDINGS UP TO 3÷4 STOREY, ON SITE FINISHING WITH STRUCTURAL SHOTCRETE PLASTERING IN BOTH SIDES;
➢ PARTITIONS;
➢ FLOORS WITH SHORT SPAN.
DOUBLE PANEL

Two single panels with internal and external mesh, assembled through connectors, the concrete is poured “in situ”.

The thickness of the core concrete will be defined on the basis of the structural requirements.

The outside panel is finished using standard plaster or ready mix material.
FLOOR PANEL

USED FOR FLOOR SLABS AND ROOFS WITH VARIABLE THICKNESS ACCORDING TO THE SPAN.

THE REINFORCING STEEL IS PLACED INSIDE THE BEAMS AND POURED WITH CONCRETE ON SITE.
1. SIMPLICITY IN THE SITE ASSEMBLING, WITH GEOMETRIES PREDISPOSED IN FACTORY AS FROM THE STRUCTURAL PROJECT;
2. LIGHTNESS, EASY LIFTING AND HANDLING ON SITE
3. DEAD LOAD REDUCED WITH NOTABLE REDUCTION OF THE SEISMIC MASSES;
4. ABSOLUTE CERTAINTY OF THE THERMAL ISOLATION CONTINUITY.
**STAIRCASE PANEL**

The staircase element is constituted by a shaped polystyrene core covered with two electro-welded meshes joined by connectors. This element must be reinforced and completed according to the span on site.

**LANDING PANEL**
**TWO WAY SLAB**

[Video Link]
### RAW MATERIAL CHARACTERISTIC

**Polystyrene (EPS)**

<table>
<thead>
<tr>
<th></th>
<th>Unit of measurement</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV A</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Volume mass</strong></td>
<td>Kg/m³ (%)</td>
<td>15</td>
<td>20</td>
<td>25</td>
<td>30</td>
<td>UNI 6349</td>
</tr>
<tr>
<td>- tolerance per single sheet</td>
<td></td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td><strong>Compression resistance</strong></td>
<td>KPa</td>
<td>60</td>
<td>100</td>
<td>140</td>
<td>180</td>
<td>UNI 6350</td>
</tr>
<tr>
<td>- of 10% of min. deform.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Min. tension strength</strong></td>
<td>KPa</td>
<td>130</td>
<td>170</td>
<td>220</td>
<td>320</td>
<td>UNI 8071</td>
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<tr>
<td><strong>Thermal conductivity</strong></td>
<td>W/mK</td>
<td>0,037</td>
<td>0,035</td>
<td>0,034</td>
<td>0,034</td>
<td>UNI 7891</td>
</tr>
<tr>
<td>- at 10° C</td>
<td></td>
<td>0,040</td>
<td>0,037</td>
<td>0,036</td>
<td>0,036</td>
<td>UNI 7891</td>
</tr>
<tr>
<td>- at 23° C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Coefficient of linear expansion</strong></td>
<td>K⁻¹</td>
<td>50x10⁻⁶</td>
<td>50x10⁻⁶</td>
<td>50x10⁻⁶</td>
<td>50x10⁻⁶</td>
<td></td>
</tr>
<tr>
<td><strong>Fire reaction</strong></td>
<td>Class</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>UNI 8457</td>
</tr>
<tr>
<td><strong>Dimensional stability</strong></td>
<td>%</td>
<td>0,2</td>
<td>0,2</td>
<td>0,2</td>
<td>0,2</td>
<td>UNI 8069</td>
</tr>
<tr>
<td>- at 10° C</td>
<td></td>
<td>0,5</td>
<td>0,5</td>
<td>0,5</td>
<td>0,5</td>
<td>UNI 8069</td>
</tr>
<tr>
<td>- at 70° C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Gas diffusion resistance</strong></td>
<td>Adimens.</td>
<td>20-40</td>
<td>30-50</td>
<td>40-70</td>
<td>50-100</td>
<td>UNI 8054</td>
</tr>
<tr>
<td><strong>Water absorption by immersion</strong></td>
<td>% Vol</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>ISO 2896</td>
</tr>
</tbody>
</table>
RAW MATERIAL CHARACTERISTIC

Steel

A wire with high limit of breakage, ftk > 600 MPa, with an adequate ductility is employed for the production of the panels. The hot-dip galvanized steel is therefore protected towards corrosive processes.

The steel used for the wire of both meshes and connectors has the following reference standards:

1. Mechanical Characteristics

<table>
<thead>
<tr>
<th>Tensile Strength (N/mm²)</th>
<th>Ø2,5 ÷ 750</th>
<th>Ø3 ÷ 700</th>
<th>Ø3,5 ÷ 600</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield Strength (N/mm²)</td>
<td>Ø2,5 ÷ 680</td>
<td>Ø3 ÷ 600</td>
<td>Ø3,5 ÷ 550</td>
</tr>
<tr>
<td>Elongation (%)</td>
<td>Ø2,5 &gt; 8</td>
<td>Ø3 &gt; 8</td>
<td>Ø3,5 &gt; 8</td>
</tr>
</tbody>
</table>

2. Chemical Characteristics

<table>
<thead>
<tr>
<th>% C &lt; 0,24</th>
<th>% P &lt; 0,055</th>
<th>% S &lt; 0,55</th>
<th>% Ceq &lt; 0,52</th>
</tr>
</thead>
</table>

3. Zinc Covering

The zinc covering is variable with the diameter of the wire mesh. Standard mesh wire is with 2.5 mm using 60 grams/sqm zinc covering with a tolerance of + / - 5 grams.
**STRUCTURAL PLASTER**

The Concrewall single panel used as bearing element is finished on site thought structural plaster application on each side. The standard final thickness of about 3 cm. The panel will form a plate of reinforced concrete with expanded polystyrene core. The structural plaster will have mixed choosing sand with granulometry from 0 to 5mm and final resistance of at least $200 \div 250$ daN/cm², variable according to the structural panels and geometry building conditions. The plaster should have a plastic consistency $S2$ (measured settlement with Abrams cone less than 5cm).

For standard dosage in one cubic meter of mass, the indicative quantity of each material should be:

- Cement: 350 kg
- Sand with mixed granulometry: 1600 kg
- Water: 160 Kg (Liters)

The quantity of water may be different according to the natural sand humidity. The following parameter that should be constant:

\[
\frac{W}{C} \sim 0,52 \\
\frac{S}{C} \sim 4,5
\]

The sand quality should be without clay or any organic substances and totally washed.

Any problems of workability must be solved without adding water, and using fluidifying additives dosed according to the manufacturer’s specifications.

The retraction cracks formation can be avoided by adding polypropylene fibers into the mix (one kg per m³).
System Performance

1. LIGHT MATERIAL
2. EASY TO INSTALL - FAST CONSTRUCTION
3. FIRE RESISTANT
4. ENERGY EFFICIENT
5. LOWER UTILITY COSTS
6. EARTHQUAKE RESISTANT
7. VERSATILE – FLEXIBLE DESIGN
8. STORMS RESISTANT
9. SUPERIOR STRENGTH
Polystyrene Production

COMPLETE THERMAL PLANT:
1. STEAM GENERATOR
2. STEAM ACCUMULATOR
3. WATER SOFTENER
4. TANK FOR CONDENSATE COLLECTION
5. FLUE OF STEAM GENERATOR

BATCH PREEXPANDER
• HAS THE FUNCTION OF EXPANDING RAW MATERIAL UNIFORMLY AND ACCURATELY
Polystyrene Production

SILO PLANT FOR MATERIAL STORAGE AND TRANSPORT

VERTICAL BLOCK MOULDING MACHINE

RECYCLING PLANT
Cutting EPS Blocks Machine
Strightening and Cutting Wire Machine
ASSEMBLING PANELS MACHINE
ELECTRIC
ASSEMBLING PANELS MACHINE
Robotic System
BENDING MESH MACHINE

CUTTING MESH MACHINE
BENDING & CUTTING MESH MACHINE

VIDEO
SEVERAL INSTALLATION OF SCHNELL PRODUCTION IN THE WORLD:
ALGERIA, ARGENTINA, BULGARIA, DOMINICAN REPUBLIC, ECUADOR, ETHIOPIA, GHANA, INDIA, INDONESIA, IRAN, ITALIA, JAMAICA, KENYA, MALAYSIA, MALTA, MEXICO, MONGOLIA, NICARAGUA, QATAR, DEMOCRATIC REPUBLIC OF CONGO, SOUTH AFRICA, SRI LANKA, TUNISIA, URUGUAY.
SchnellCAD

SchnellHome creates and distributes a specific program for budgeting structures with panels working in AutoCAD.
Walls Insertion

Estimate

Floors Insertion

Assembling Plan
TRAINING

Local Personnel Training: Instruction and preparation of the technical personnel for the use and the maintenance of the machineries.
LOCAL PERSONNEL TRAINING:
INSTRUCTION AND PREPARATION OF THE TECHNICAL PERSONNEL FOR THE USE OF THE PANELS ON THE JOB-SITE. WALL PANELS ASSEMBLING, FLOORS PANEL ASSEMBLY AND PLASTER APPLICATION.
LOCAL PERSONNEL TRAINING: INSTRUCTION AND PREPARATION OF THE TECHNICAL PERSONNEL FOR THE USE THE CONCREWALL SOFTWARE.
CONSTRUCTION DETAILS WITH SINGLE PANELS

ANCHORING TO FOUNDATION

VERTICAL WALL/FLOOR—PANEL VIEW

HORIZONTAL SECTION

THE ABOVE-MENTIONED DIAMETERS AND PITCHES OF REINFORCEMENTS SHOULD BE CALCULATED ACCORDING TO THEIR LOAD-BEARING. WHAT SHOWN IS ONLY USED AS AN EXAMPLE.
CASE 1 - Flat mesh – 45° – installed on door/window opening corner
CASE 2 - Bent mesh/internal and external reinforcement (wall/wall)
CASE 3 - Bent mesh/horizontal edges reinforcement (door/window)
CASE 4 - Bent mesh/opening jambs' reinforcement (door/window)
The company SCHNELL has recently achieved the certification of ISO 9001 Quality System, a system of Quality Management according to the standard UN EN ISO 9001:2000.

SCHNELL HOME develops its activity mostly in the sector of the creation of machinery for the manufacture of products for construction.

Fundamental processes:

Sales and trading activities;
Design and development;
Supplies;
Plants;
Manufacture building panels;
Installation and support.
SOUND PROOFING

RISULTATI SPERIMENTALI

<table>
<thead>
<tr>
<th>FREQ. Hz</th>
<th>R dB</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>33.8</td>
</tr>
<tr>
<td>125</td>
<td>34.0</td>
</tr>
<tr>
<td>160</td>
<td>36.0</td>
</tr>
<tr>
<td>200</td>
<td>30.0</td>
</tr>
<tr>
<td>250</td>
<td>30.0</td>
</tr>
<tr>
<td>315</td>
<td>27.1</td>
</tr>
<tr>
<td>400</td>
<td>20.0</td>
</tr>
<tr>
<td>500</td>
<td>33.8</td>
</tr>
<tr>
<td>630</td>
<td>29.7</td>
</tr>
<tr>
<td>800</td>
<td>20.0</td>
</tr>
<tr>
<td>1000</td>
<td>33.8</td>
</tr>
<tr>
<td>1250</td>
<td>36.4</td>
</tr>
<tr>
<td>1600</td>
<td>41.3</td>
</tr>
<tr>
<td>2000</td>
<td>43.0</td>
</tr>
<tr>
<td>2500</td>
<td>44.6</td>
</tr>
<tr>
<td>3150</td>
<td>46.2</td>
</tr>
<tr>
<td>4000</td>
<td>48.6</td>
</tr>
<tr>
<td>5000</td>
<td>50.7</td>
</tr>
</tbody>
</table>

$R_{eq} (C;C_p) = 37 \left( -1 . . 3 \right) \ dB$

Valutazione secondo ISO 717-1 (nella banda 100–3150 Hz) basata su misurazioni ottenute in laboratorio.

**IL RESP. Divisione Costruzioni**
Division Head

Ing. Mele

**IL RESP. DEL CENTRO**
Managing Director

P. Can
FIRE RESISTANCE

Bollette, 23/05/2008

OGGETTO: PROVA DI RESISTENZA AL FUOCO secondo D.M. del 16.2.2007 e norma EN 1364-1

Si dichiara che il Laboratorio CSI S.p.A., il giorno 31/03/2006, ha eseguito una prova di resistenza al fuoco di una parete divisoria, denominata "PANNELLO SINGOLO CONCREWALL PCS08", per il Cliente in Indirizzo, secondo Norma Europea EN 1364-1.

Dal risultato sperimentale della prova, si attesta che la resistenza al fuoco del prototipo è la seguente:

"PANNELLO SINGOLO CONCREWALL PCS08", El 92 E 240
Il campione è classificato El 90 e E 240.

Seguirà il rapporto di prova: n°CSI1386FR.
In fede.

Il Responsabile Area Resistenza al Fuoco
Ing. Giuseppe Grelia

Quello attinente all'evento e il presente sotto ad esso viene ottenuto e seguito di una prova di resistenza al fuoco effettuata conformemente al D.M. del 16.2.2007, esso infatti, non sostituisce il rapporto di prova e il rapporto di classificazione originale. Tuttavia, il risultato presente sembra essere un'analisi più approfondita dei dati in possesso del laboratorio.
La validità di questo documento è di 6 mesi, a meno dell'erogazione da parte di CSI S.p.A. della Relazione di Prova originale.

Single Panel PCS08
FIRE TEST
WFCI - Western Fire Center Inc (Fire testing facility - Kelso, WA)

Fire Performance of ASTM E119 Evaluation of a Symmetric, Load-Bearing Wall Assembly

Indicative testing conducted in accordance with the test methodology described in ASTM E119, Standard Test Methods for Fire Tests of Building Construction and Materials

Conducted For:
Schnell Home s.r.l.
Via Borghetto, 2B - zona Ind. San Liberio
61050 Montemaggiore al Metauro (PU) Italia

WFCI Report #12160ar3

Test Date: October 14, 2013
Original Report Issued: October 25, 2013
Revision Issued: February 20, 2015

13 ton/m
External face after water application
FIRE TEST
WFCI - Western Fire Center Inc (Fire testing facility - Kelso, WA)

Fire Resistance Testing of Floor/Ceiling Assembly

Indicative testing conducted in accordance with the test methodology described in ASTM E119, Standard Test Methods for Fire Tests of Building Construction and Materials

Conducted For:
Schnell Home s.r.l.
Via Borghetto, 2B - zona Ind. San Liberio
61030 Montemaggiore al Metauro (PU) Italia

WFCi Report #14030b

Test Date: December 15, 2014
Report Issued: January 30, 2015

250 kg/m²

250 kg/m²
THERMAL TRANSMITTANCE

ONE OF THE MOST IMPORTANT PANEL SYSTEM FEATURES IS THE HIGH THERMAL INSULATION. THE POSITION OF CONNECTORS IS PUNCTUAL AND IT DOESN’T REPRESENT A PROBLEM THEREFORE IN TERMS OF THERMAL CONDUCTIVITY. THE JOINT METALLIC CONNECTORS ARE 33 PER M² WITH 3 MM DIAMETER, AND SURFACE Ø3 = 0.07 CM², IN PERCENTAGE THEY REPRESENT LESS THAN 0.03% OF THE SURFACE OF THE PANEL. FOLLOWING THE THERMAL TRANSMITTANCE STUDIED BY A CERTIFIED INSTITUTE:

Single Panel

PCS08 → $\text{Up} = 0.56 \text{ W/m2K}$

PCS16 → $\text{Up} = 0.30 \text{ W/m2K}$
Green Building Product
Awarded to
Green Wall Factory
For
Green Wall Panel

Meshal Al Shamari
Director
Qatar Green Building Council

Member of World Green Building Council
The 6th Annual Celebration of the National Program for Conservation & Energy Efficiency "Tarsheed"

Certificate

شهادة تقدير للفائز

of Achievement for the Winner of

مسابقة افضل منتج محلي مستدام

Best Sustainable Local Product

This Certificate is proudly presented to

مصنع منتج الحوائط الخضراء - عن منتج الحوائط الخضراء

The Green Wall Factory - Green Wall

Eng. Essa Bin Hilal Al-Kuwari
President Qatar General Electricity and Water Corporation
MECHANICAL RESISTANCE TESTS: COMPRESSION

Numerous tests of centered and eccentric compression have been performed on single panels with different thickness in the Laboratory of the Marche Polytechnic University. The maximum compression load was 70 t, 23 t with a safety factor 3. Therefore only considering the axial pressure, the structure will be able to support an exercise load for a building of 6 storey.

<table>
<thead>
<tr>
<th>tipo di rottura</th>
<th>instabilità flessionale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car. max</td>
<td>701.2 kN</td>
</tr>
<tr>
<td>Acc. Max (retro)</td>
<td>7.92 mm</td>
</tr>
<tr>
<td>All. max (fronte)</td>
<td>2.14 mm</td>
</tr>
<tr>
<td>Spos. Lat. max</td>
<td>18.59 mm</td>
</tr>
</tbody>
</table>
MECHANICAL RESISTANCE TESTS

SHEAR
Single Panel PCS12
21411 daN

NODE
Single Panel PCS12
21798 daN

FLEXION
Floor Single Panel PCSS08
1960 daN

HIGHEST BREAKING LOAD ON SPECIMENS
Structural Engineering Testing Hall (SETH) Civil & Environmental Engineering Department The Henry Samueli School of Engineering University of California, Irvine

Monotonic and cyclic shear test

Flexural test

Centered compression test

Eccentric compression test
Monotonic and cyclic shear test, $h=1.82\,\text{m}$ and $h=2.43\,\text{m}$

Monotonic test results
Horizontal load average: 103 KN

<table>
<thead>
<tr>
<th>Analysis Results (kips)</th>
<th>Experimental Results (kips)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SH-SM-08-01</td>
<td>20</td>
</tr>
<tr>
<td>SH-SM-08-02</td>
<td>20</td>
</tr>
<tr>
<td>SH-SM-08-03</td>
<td>20</td>
</tr>
<tr>
<td>SH-SM-06-01</td>
<td>26.8</td>
</tr>
<tr>
<td>SH-SM-06-02</td>
<td>26.8</td>
</tr>
<tr>
<td>SH-SM-06-03</td>
<td>26.8</td>
</tr>
</tbody>
</table>

Cyclic test results
Horizontal load average: 117.6 KN

<table>
<thead>
<tr>
<th>Analysis Results, (kips)</th>
<th>Experimental Results, (kips)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SH-SM-08-01</td>
<td>20</td>
</tr>
<tr>
<td>SH-SM-08-02</td>
<td>20</td>
</tr>
<tr>
<td>SH-SM-08-03</td>
<td>20</td>
</tr>
<tr>
<td>SH-SM-06-01</td>
<td>26.8</td>
</tr>
<tr>
<td>SH-SM-06-02</td>
<td>26.8</td>
</tr>
<tr>
<td>SH-SM-06-03</td>
<td>26.8</td>
</tr>
</tbody>
</table>
Wall compression test, h=2.43m and h=4.26m

**Centered**

- Average load = 775 KN

**Eccentric**

- Average load = 107 KN, h=2.43m
- Average load = 93 KN, h=4.26m

**Centered test results**

<table>
<thead>
<tr>
<th>SPECIMEN CODE</th>
<th>$P_{top}$ (kips)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SH-WC-08-01</td>
<td>183.86</td>
</tr>
<tr>
<td>SH-WC-08-02</td>
<td>158.57</td>
</tr>
<tr>
<td>SH-WC-08-03</td>
<td>185.00</td>
</tr>
<tr>
<td>SH-WC-14-01</td>
<td>170</td>
</tr>
<tr>
<td>SH-WC-14-02</td>
<td>180</td>
</tr>
<tr>
<td>SH-WC-14-03</td>
<td>175</td>
</tr>
</tbody>
</table>

**Eccentric test results**

<table>
<thead>
<tr>
<th>SPECIMEN CODE</th>
<th>DIMENSIONS (L X H X T)</th>
<th>ULTIMATE LOAD (kips, [KN])</th>
</tr>
</thead>
<tbody>
<tr>
<td>SH-WFC-08-01</td>
<td>4&quot;X7.5&quot;X 6&quot;</td>
<td>25.60 [113.87]</td>
</tr>
<tr>
<td>SH-WFC-08-02</td>
<td>4&quot;X7.5&quot;X 6&quot;</td>
<td>28.28 [125.80]</td>
</tr>
<tr>
<td>SH-WFC-08-03</td>
<td>4&quot;X7.5&quot;X 6&quot;</td>
<td>18.62 [82.63]</td>
</tr>
<tr>
<td>SH-WFC-14-01</td>
<td>4&quot;X13.5&quot;X 6&quot;</td>
<td>21.81 [97.00]</td>
</tr>
<tr>
<td>SH-WFC-14-02</td>
<td>4&quot;X13.5&quot;X 6&quot;</td>
<td>21.90 [97.41]</td>
</tr>
<tr>
<td>SH-WFC-14-03</td>
<td>4&quot;X13.5&quot;X 6&quot;</td>
<td>19.51 [86.78]</td>
</tr>
</tbody>
</table>
Wall flexural test $h=2.43\text{m}$ and $h=4.26\text{m}$

Average load $14\text{ KN}$

$h=8'=2.43\text{m}$

Average load $8.6\text{ KN}$

$h=14'=4.26\text{m}$
Joint test: monotonic and cyclic load

Figure (3): L-Shape Joint Specimen Details

Figure (4): T-Shape Joint Specimen Details

<table>
<thead>
<tr>
<th>Specimen Identification</th>
<th>Ultimate Moment (kip-in)</th>
<th>Ultimate Rotation Degrees [Rad.]</th>
</tr>
</thead>
<tbody>
<tr>
<td>WW-A-2</td>
<td>29.49</td>
<td>2.77 [0.048]</td>
</tr>
<tr>
<td>WW-A-3</td>
<td>43.96</td>
<td>2.01 [0.035]</td>
</tr>
<tr>
<td>WW-B-1</td>
<td>51.70</td>
<td>2.35 [0.041]</td>
</tr>
<tr>
<td>WW-B-2</td>
<td>37.62</td>
<td>2.25 [0.039]</td>
</tr>
</tbody>
</table>

Figure (5): Moment Rotation Curve of Specimen WW-B-2
Unidirectional floor tests

Admissible sup load = 280Kg/m² excluding self weight

4m

Admissible sup load = 240Kg/m² excluding self weight

5m

$L/360 = 0.45 \text{ inch} @ P = 1.05 \text{ kips}$
$w = 56.39 \text{ psf}$

$L/360 = 0.59 \text{ inch} @ P = 1.11 \text{ kips}$
$w = 49.05 \text{ psf}$
Floor tests, one and two span, different boundary conditions

Spans = 8’ (2.43m) each

TS-PB-1

TS-FB-1

TS-PB-1

TS-FB-1

Figure (62): Load-Displacement Curve of Slab Specimen SS-PB-1

Figure (67): Load-Displacement Curve of Slab Specimen SS-FB-2

Figure (75): Load-Displacement Curves of 2-spans Slab Specimen TS-PB-1

Figure (82): Load-Displacement Curves of Slab Specimen TS-FB-2
Bidirectional floor tests, still on progress

Displacement-load graphics, cracking configuration and analytic results confirm that the single floor panel can be reasonably used a bidirectional floor/roof.
The testing object is a 2 story building, in actual scale, over 6 meter high, without any additional reinforcing beams and columns. More than 60 strain gauges located around the building to monitor the strain level of the structure at various points. To simulate the forces of a maximum earthquake, two large capacity hydraulic jacks capable of exerting in excess of 100 ton were mounted at the top of the second story structure.

For the target Zone 6 (Most severe earthquake event classification in Indonesia), the team set the target threshold force from the hydraulic jack of -6.5 ton for SRPMK (Purpose designed quake structure) and approximately 18 ton for SRPMB (General purpose structure). Confirming the carefully done theoretical calculations 18 tons of hydraulic jack pressure was reached, without any significant structural damage, and only when the force exceeded 25 ton that cracks started to become observable around the lower half of the structure, and finally after the force exceeded 40 ton, more than 2 times of target threshold test structure suffered failure at the connection to the foundation.
The load test was carried out gradually until reaching the collapse of the slab, corresponding to a rated load uniformly distributed load acting on the portion of the floor of 2000 Kgf / sq. The load was achieved by the progressive filling a water tank with dimensions in plan of 300 cm x 300 cm and height 200 cm.
4.0 TEST RESULTS

4.1 SCOPE: Conduct Missile Test on Panel Assemblies

4.2 SUMMARY OF RESULTS:

<table>
<thead>
<tr>
<th>Test Method</th>
<th>Test Conditions</th>
<th>Test Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Missle Impact Test</td>
<td>4 kg x 50.8 mm x 101.6 mm (9.8 lb x 4&quot;)</td>
<td>Series 1 panel is resistant to the Florida building Code &amp; Dade County, 54.7 km/h (34 mph) impact &amp; 122 km/h (76 mph); Series 2 panel is resistant up to 143 km/h (90 mph) impacts</td>
</tr>
<tr>
<td>FEMA 320, 361 &amp; ICC-500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Threshold testing for panel resistance to impacts produced by different speeds of hurricane.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4.3 OUTDOOR WEATHER CONDITIONS:

| Temperature | 32.2 degrees C (90 degrees F) |
| Wind        | 30.6 km/h (19 mph)            |
| Relative Humidity | 33 %                  |

4.4 MISSILE IMPACT TEST RESULTS:

| Missile Type: 90.8 mm x 101.6 mm (2" x 4") |
| Missile Weight: 4 kg (9.8 lb) |
| Missile Impact Speed: various speeds |

Impact Tests:

<table>
<thead>
<tr>
<th>Impact No.</th>
<th>Velocity km/h (mph)</th>
<th>Location</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP 1</td>
<td>56 (35)</td>
<td>Panel center</td>
<td>Slight indentation; no cracking observed; see Specimen 1, Panel 1, Impact 1 photos, pages 6 &amp; 7.</td>
</tr>
<tr>
<td>Panel 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impact 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impact 2</td>
<td>113 (70)</td>
<td>Upper right corner</td>
<td>40 mm penetration; 80 mm x 105 mm affected area; 170 mm crack above impact area; 220 mm right side crack; 270 mm right top crack; backside unremarkable; see Specimen 1, Panel 1 Impact 2 photos, pages 8 &amp; 9.</td>
</tr>
</tbody>
</table>

•130 mm and 150 mm panels - are resistant to the Florida Building Code & Dade County Hurricane Envelope resistance = 55 km/h missile & 225 km/h hurricane (34 mph & 140 mph hurricane).
•130 mm panel - threshold of perforation = 129 km/h missile & 322 km/h hurricane (80 mph & 200 mph hurricane) impact resistance, however since panel cracking becomes an issue with each impact, the panel resistance therefore considered as 122 km/h missile & 306 km/h hurricane (76 mph impact/190 mph). These are ICC-500 Storm Shelter standards.
•150 mm panel - threshold of perforation = 142 km/h missile & 354 km/h hurricane (88+ mph & 220 mph hurricane) impact resistance. Since two of the panels were tested to the highest standard for hurricanes 177 km/hr & 354 km/h hurricane (110 mph & 220 hurricane - FEMA 361 Standard) and were reasonably resistant, the 150 mm panel can be rated to 146 km/h & 362 km/h hurricane (90 mph & 225 mph hurricane) impact resistance, which is the highest rating per the ICC-500 standard.
TEST RESULTS

SOFT BODY TEST

Two panel PCS08 cement plaster thickness of 3.5 cm each side, 112x100 cm. After 28 days are subject with pressure of 500 kPa at 1.0 m distance. After 3 hours it is possible to see the probable penetration of water in the panel connection.

Water Penetration Test

Two panel PCS08 cement plaster thickness of 3.5 cm each side, 112x100 cm. After 28 days are subject with pressure of 500 kPa at 1.0 m distance. After 3 hours it is possible to see the probable penetration of water in the panel connection.

No Penetration

Soft Body Test

Panel PCS08 cement plaster thickness of 3.5 cm each side, 112x100 cm, after 28 days is subjected to the soft pile shock of 50 kg with impacts of 900 and 1200 J.

No Cracks
EXTERNAL INFILLING WALLS WITH CONCREWALL PANELS

Infilling system with armed and external thermal isolation panels for buildings erected with traditional structure in RC or metallic, whose advantages are:

- Complete Absence of thermal bridges;
- Increase the value of the properties;
- Greater durability of the façades;
- Reduction of the fuel consumptions;
- Increase of the comfort;
- Limitation of the condensation risk and formation of mold;
- Notable increase of the inside habitable surface;
The realization of the external infilling walls for residential buildings with thermal insulating panels "Concrewall" introduces the interesting described advantages and is a technique of application of easy realization on site.
Industrial Building
INDUSTRIAL BUILDING FILLING WALLS
RESIDENTIAL BUILDING FILLING WALLS
DECORATIONS
PANELS WITH R.C. FRAME
MANUFACTURING PROCESS WITH PRECAST CONCRETE WALL PANELS

- **Standard Precast Line**
- **Assembling and Pouring Concrete**
- **Store Area - Floor Panels**
- **Prefab Panel**
- **Panels Handling**
- **Panels Finishing**
The versatility of the assembly panels machine allow to shape walls with variable geometry and insulation thickness up to 300mm – Finished panels up to 400mm with 50mm concrete layer
Continuity of thermal insulation - No thermal bridges - Adaptable to all weather conditions

Lighter than the classic prefab - Easy to install on site
Two Storey Semi-detached dwellings

Two Storey Dwelling with option of converting attic space
ALTERNATIVE WAY TO COMPLETE THE PANELS - PANEL CAST IN FORMWORK

1. CONTINUOUS INSULATION;

2. RESOLVED THE ISSUES RELATED TO THE APPLICATION OF THE PLASTER SPRAYED;

3. DEAD LOAD REDUCED WITH NOTABLE REDUCTION OF THE SEISMIC MASSES;

4. LOWER AMOUNT OF CEMENT, COST REDUCTION.
SITE PICTURES - Structures with Double and Floor Panel

RESIDENTIAL BUILDING
RESIDENTIAL BUILDING
School Complex
Touristic Complex
RESIDENTIAL

6 STOREY BUILDING
SITE PICTURES - Structures with Single Panel

Low Cost Housing
RESORTS - BUNGALOWS
BUILDING WITH SINGLE PANELS
ONE-STORY BUILDING
BUILDING WITH SINGLE PANELS
ONE-STORY BUILDING
BUILDING WITH SINGLE PANELS
ONE-STORY BUILDING
BUILDING WITH SINGLE PANELS
TWO-STORY BUILDING
BUILDING WITH SINGLE PANELS
TWO-STORY BUILDING
BUILDING WITH SINGLE PANELS
THREE-STORY BUILDING
BUILDING WITH SINGLE PANELS
FOUR-STORY BUILDING
BUILDING WITH SINGLE PANELS
FOUR-STORY BUILDING
MOBILE HOMES WITH SINGLE PANELS
THE VERSATILITY OF THE SYSTEM
Curved Roof
ARCHES
FENCE WALL
FIRST PROJECTS IN QATAR
THANK YOU