

Certificate of Test

Title: Floodtesting of the Limetics Insulated Cladding System comprising Foamglas a cellular glass insulation and Unilit natural hydraulic lime render.

Certificate of Test Number: 9486

Client's Name & Address:

Telling Lime Products Limited
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Our Ref: N950/T555

TW Job No: 3JS3

Your Ref:

Date: 30 January 2008

Date sample(s) received: 2 November 2007

Sample(s) received from: Telling Architectural

Sample No: C2118

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Taylor Woodrow

1. INTRODUCTION

This certificate of test describes a flood test carried out at the request of Telling Lime Products Limited on the 5th to the 7th November 2007 at the Taylor Woodrow Technology Centre in Leighton Buzzard.

The test was an ad-hoc test to check the flood resistant properties of the test sample.

2. SAMPLE DESCRIPTION

The water containment perimeter walls were constructed with the Durisol Wall Forming System and coated with Unilit hydraulic lime water resistant renders. The wall side walls measured approximately 1 metre in depth and height and the back wall 2.4 metres in width.

Details of the test sample and tank are included as an appendix to this certificate.

PHOTO 080002

TEST SAMPLE ELEVATION



3. TEST PROCEDURE

The tank was filled to a depth of 1 metre with water and left for a period of 72 hours.

The tank was checked for signs of water leakage during this period.

At the end the level of water was measured to see how much water had been lost.

4. TEST RESULTS

Over the 72 hour period, the level of water in the tank dropped by 115 mm.

No water leakage was observed through the joints in the tank or through the back of the rendered wall.

The water was observed seeping at ground level only.

During dismantling of the tank no evidence of water penetration through the side walls was observed.

5. CONCLUSION

The sample provided satisfactory flood defence capabilities during this ad-hoc test.

6. APPENDIX

The following six un-numbered pages are copies of the Telling sample and test description and the Durisol concrete wall forming system.

END OF CERTIFICATE

(Telling Lime – FOAMGLAS® system PR)

UNILIT AND FOAMGLAS® : WORKING TOGETHER MAKES US STRONGER

THE ULTIMATE ECOLOGICAL ANSWER IN MODERN METHODS OF CONSTRUCTION

Telling Lime Products have completed testing at the Taylor Woodrow Laboratories upon their insulated cladding system developed under a collaborative agreement with Pittsburgh Corning (PC UK) to provide an insulated render system with uniquely superior characteristics to meet the challenges posed in modern methods of construction.

Sustainability of source, maximised use of recycled materials, resilience to flooding, non combustibility, strength, water resistance, durability and ease of installation in an on or off-site condition are priorities applied to these tests as well as currently under evaluation by the acclaimed consultants, Mtech Limited, who have been engaged to undertake a study for system development.

In addition to testing to gain CWCT certification the system was subjected to a unique evaluation to establish the resilience of the system to flooding when applied upon a panel of lightweight steel walling immersed under a one metre head of water for a 72 hour period. Without special preparation of the concrete slab sub-base a tank was constructed using a Durisol Wall Forming system wall with the cavity filled with poured concrete. The test tank measured one metre in width and height and spanned the 2.40 metre length of the test panel. The inner wall of the tank was constructed with Kingspan steel wall sections lined with Pyrok cement particle board to which the Unilit/ Foamglas® was then applied. At the base of the steel wall within the tank the Foamglas® was sealed with a bitumen adhesive to the slab. No other seals were created between the Durisol walls and the slab. An application of a Unilit natural hydraulic lime render (10-12mm thick) containing a glass fibre lightweight mesh reinforcement and a 3mm decorative layer was then applied to the Foamglas®. The inner face of the Durisol walls were coated with Unilit 30 water resistant hydraulic lime plaster. The junction between the Durisol walls and the steel walling were tied with re-bar to restrain the weight of the water and were reinforced only with the lightweight mesh within the render coats.

During the currency of the test no water passed through the insulated walling unit or the Durisol Wall Forms. Seepage was evident on the junction of the Durisol blocks with the concrete slab. During the three days of the water resilience test, 11% of the water within the tank was lost to evaporation, leakage, absorbed by the lime render and the concrete slab. During dismantling no evidence of water penetration within the wall system were discovered.

The CWCT system test regime requires the walling unit as a whole to:

- withstand positive and negative air pressures of 3600 kPa per metre square and the deflections that these impose upon the structural panel.
- provide resistance to air and water penetration
- sustain hard and soft body impact.
- upon dismantling demonstrate that no detachment or deterioration of the system or its components has occurred.

The insulation system combined FOAMGLAS™ insulation slab with Unilit natural hydraulic lime render. Sustainable, inert and with an attractive natural appearance, it offers significant benefits to architects, specifiers and contractors.

ULTIMATE ECOLOGY
Sustainability is a major feature. FOAMGLAS® is a dense cellular glass slab manufactured from 66% recycled glass with a global warming potential of less than 5. The Unilit render is produced from hydraulic lime mined from naturally occurring limestones containing deposits of clay. The colours are derived from ochres created from natural iron oxides and mineral pigments.

superior characteristics to meet the challenge.
Harmful CO₂ emissions are acknowledged as being a major cause of the greenhouse effect occur during the production of both cement and lime. However with lime burnt at temperatures of circa 900°C and cement exceeding >1450°C, more energy is required for the production of cement. The lime manufacturing process can be determined as being carbon neutral since a study of the lime cycle shows that equal amounts of CO₂ are retained in the setting of the mortar as are released during production, making lime mortar an ecologically preferable product.

For building managers FOAMGLAS® offers outstanding stability. With a life cycle of 50-100 years, it provides surety that the thermal value of the glass slab will not diminish over time. The material is inert and totally impervious to moisture or water penetration. FOAMGLAS® is non-combustible, Euroclass A1 – no contribution to fire.

Using a Durisol
When bonded to a stable substrate and rendered, the system provides similar characteristics to a thermal masonry unit with excellent impact resistance and sound resonance properties.

to which the Unilit/ Foamglas® was then applied.
Unilit hydraulic lime renders provide creative scope, enabling architects to select attractive, natural finishes for both traditional and contemporary styled buildings. Available in through colours and textures, the finishes are traditional in their appearance with stucco effects and authentic render features including ashlar grooves and struck joints.

Additional information upon the Unilit/Foamglas system, Durisol Wall Forming panels and test report copies can be supplied upon request from.....

During the currency of the contract, the Durisol Wall Forms, 500mm x 1000mm x 100mm, were used. During the test regime, the Durisol Wall Form was lost to the test regime. The Durisol Wall Form was replaced by a Durisol Wall Form.

The CWCF system test regime requires the wall to be tested under the following conditions:

- with a positive air pressure difference of 10 Pa
- with deflections of 10 mm
- with a maximum air flow rate of 10 m/s
- with a maximum air flow rate of 10 m/s
- with a maximum air flow rate of 10 m/s

Durisol ICF vs Polystyrene ICF

ENVIRONMENTAL CONSIDERATIONS

- Durisol Wall Forms contain no polystyrene, foams or plastics. Unlike other ICF systems, there are no VOCs or offgasing with Durisol.
- There are no CFC or HCFC released during the Durisol manufacturing process. Most blowing agents that are used in the polystyrene manufacturing and processing operation contain CFC or HCFC, both of which contribute to the destruction of the Ozone layer. Durisol is comprised of simple ingredients; cement and wood aggregate. Nothing in the Durisol process is remotely hazardous or detrimental to the environment.
- 100% recycled wood content. We only use recycled waste wood (100% clean, natural softwood lumber) that is taken from sources such as truss manufacturing operations, and otherwise being sent to landfill sites.

PERFORMANCE CONSIDERATIONS

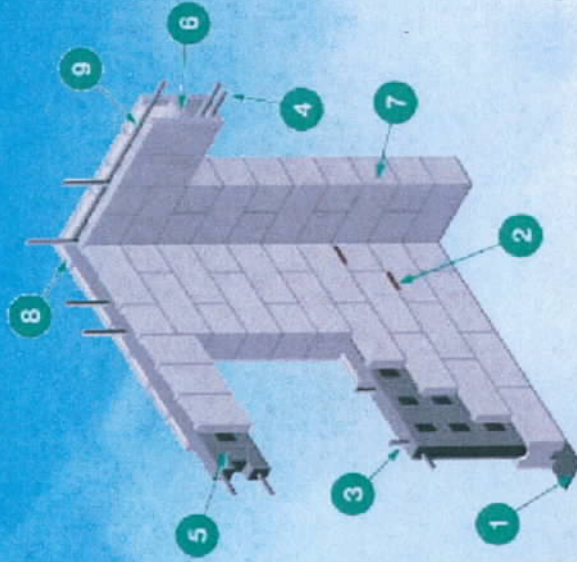
- Durisol does not burn or melt. This is not the case with styrofoam and other ICF products. The smallest Durisol wall has a 4 hour fire rating, zero flame spread, smoke spread of 11 and no black toxic fumes created in the event of a fire.
- More energy efficient. The thermal mass/dynamic effects are better with Durisol than other ICF systems because with Durisol, the insulation is placed primarily on the exterior of the concrete mass. Polystyrene ICF systems put 50% of the total insulation on the interior, which actually prevents the transfer of heat/energy between the concrete mass and the interior conditioned space. With Durisol, all insulation inserts are positioned towards the exterior, where it should be, to maximize any thermal mass gains.
- Improved indoor Air Quality. The Durisol material is a hygroscopic material - which means that it has a very large capacity to store and release moisture as required, depending on the environmental conditions. This storage capacity refers to storing moisture in the form of water vapour and increased material moisture content – not liquid water. Also, the Durisol material and wall system is extremely vapour permeable. It does not act as a vapour barrier, but acts as a vapour regulator. Consequently, the Durisol acts as a moderator for vapour and RH (Relative Humidity) levels. We have conducted full scale wall tests and found that not only did the walls not create any condensation problems without a vapour barrier, but RH levels above RH 65-70 were not possible.
- Promotes healthy indoor environment and inhibits mold growth. Firstly, because the material is hygroscopic and vapour permeable, RH levels are kept low enough such that it is not possible to reach the level of RH where mold can start to grow (typically 70% RH). Combined with the high pH (alkaline) environment resulting from the cement content, this means that the wall system actually helps to inhibit mold growth. Something that doesn't happen with the other systems.
- More impact resistant. Both Stucco and Drywall, when attached to Durisol result in a solid, durable, impact resistant finish. Polystyrene ICF substrates result in stucco and drywall finishes that can easily be damaged through regular use.

CONSTRUCTION CONSIDERATIONS

- Durisol Wall Forms are much stronger, and can withstand higher concrete pressures. We have zero blow-outs in the field when poured in accordance with our recommendations.
- The blocks require less bracing than the foam ICFs and Durisol walls don't bow and bend as easily as the foam blocks. Also, since the blocks are uniform, it is possible to drywall or attach screws to any point on the finished surface, not just at the discrete plastic web locations
- Because the Durisol is a free draining material, it is possible to use a high-slump concrete (7" – 9" slump) without adversely affecting your concrete strength. When pouring a very wet concrete mix, the Durisol material immediately starts to drain the moisture so that it does not result in weaker concrete, while ensuring that there are no voids and making the pouring process easy.

The Durisol Wall Forming System is a straight-forward method of building a reinforced concrete wall with built-in thermal, acoustical and fire protection. The wall forms are interlocking modular units that are dry-stacked (without mortar) and filled with concrete and reinforcing steel.

The Wall Form units are available in a variety of widths and insulation configurations that create a system that is flexible, design friendly and optimized for each specific application (above-ground, below-ground, commercial, residential, etc.).



1. Optional Mortar Bed
2. Levelling Shims
3. Wall Reinforcing
4. Lintel Reinforcing
5. Concrete Fill
6. Lintel Wall Forms (made on-site)
7. Square End Form
8. Corner Form
9. Insulation Inserts (Thermal WFFs)



www.durisol.net

Durisol lends itself to below- and above-ground level building construction. We provide a cost effective solution to many commercial, residential, industrial and agricultural building designs. Our product is the foundation to green building - from passive solar design to environmentally energy efficient construction.

We will work with architects, contractors & homeowners to help create a building that is energy efficient, environmentally friendly, and built with green building practices. Our goal is always to recommend ways of using Durisol and other resources at hand more efficiently, effectively and economically.

Durisol UK have offices in Scotland and London.

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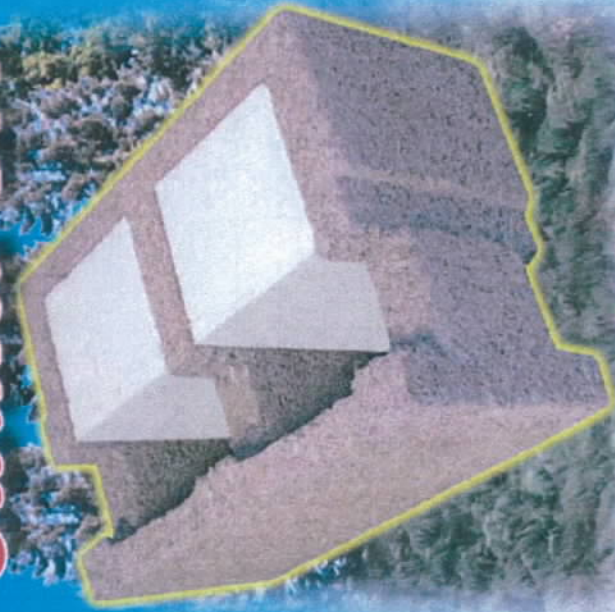
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Durisol UK



the intelligent building system

Durisol is the original stay in place wall form system offering:

- Quick build times
- Durability
- Accuracy
- Dry Stack (no mortar required)
- Site friendly working characteristics
- Fast pour times
- Design flexibility
- Excellent thermal and acoustic properties
- Excellent fire protection



80% recycled/reclaimed
timber and Portland cement

Durisol is a proprietary cement-bonded wood fibre material. It is composed of specially graded recycled waste wood (100% clean, natural softwood lumber), that is neutralized and mineralized, and then bonded together with Portland cement.



Hardened Durisol is lightweight, porous and very durable. It does not rot nor decay. It is vermin, termite and insect proof and does not support fungus growth. Durisol is environmentally safe, does not contain nor emit any toxic elements, and is fully recyclable.

Durisol products have been installed throughout Europe, North America, Asia and Africa for over fifty years. They have withstood hot and humid climates, disasters (fire, bombs, hurricanes, earthquakes), freezing and thawing - all without loss of performance or damage.

Durisol walls provide exceptional insulation and this translates to significant ongoing savings to building owners and increased comfort to the people who live and work in Durisol buildings. The Durisol wall system can provide effective thermal performance values that are more than twice that of conventional walls.

The benefits of thermal mass are increased through the use of Durisol Wall Forms since the majority of the insulation is located on the exterior of the concrete core (still within the Wall Form unit). This unlike foam concrete forms that have 50% of the insulation on the interior face and reduce the net benefit that is obtained through the effects of thermal mass.

The cement content of the Durisol material creates an above average pH environment at the wall surface, that inhibits the growth of fungi and mould. Furthermore, the hygroscopic nature of the material moderates relative humidity levels (65% RH maximum) and provides an inherent moisture regulator that keeps humidity low and further serves to repress any type of fungal growth.

Sound absorptive properties of Durisol in combination with the mass of the wall system provides an ideal combination of sound absorption & sound transmission

Metre squared prices include corner blocks, half blocks and face blocks. Other sizes available.



Block	DM150/90	DMi170/120	DS300/150	DSS300/120	DSS365/120
U value	0.57*	0.57*	0.58	0.33	0.27
dB value	52	68	56	48	50
Length	500mm	500mm	500mm	500mm	500mm
Height	250mm	250mm	250mm	250mm	250mm
Width	150mm	170mm	300mm	300mm	365mm
Backfill /m2	0.075m3	0.103m3	0.105m3	0.09m3	0.09m3
Shipping weight	6kg	11kg	15kg	10kg	14kg
Cost per block	£2.61	£2.82	£4.52	£5.65	£6.63
Cost per m2	£20.88	£26.96	£36.16	£45.20	£53.04

European Type Approval (ETA 005/090) BRE Assessment in Progress

* performance dependent on finish
Price excludes VAT & delivery

properties. Wall Sound Transmission Coefficient (STC) ratings can range between 54 & 72, while the Durisol material itself provides Noise Reduction Coefficients (NRC) ratings as high as 0.95. This means that 95% of the sound that reaches the Durisol material is absorbed and not reflected back into the airspace.

Builders choose Durisol because of the ease with which walls can be constructed. The Durisol material is light-weight (no block exceeds 15kg), easily cut, nailed and screwed with simple carpentry tools.

The unique free-draining Durisol material allows the use of high-slump concrete in the field that makes for easier and faster concrete pouring that ensures a solid wall without any compromise in strength.

Ideally, concrete with a slump between 180mm & 220mm is recommended for use in conjunction with Durisol. The Durisol material is considerably stronger than other ICF materials. Even with high-slump concrete, Durisol Wall Forms never blow-out during concrete pouring (when following requirements in our technical guide). Additional bracing is only required when the Wall Form units have been cut or altered on-site.



Interior and exterior finishes are applied directly to the Durisol material, eliminating subsequent steps in the construction process. Drywall can be attached anywhere on the Wall Form surface, while the open-textured nature of the hardened Durisol makes it an ideal substrate for plasters and stucco