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BUILDING PRODUCTS & SYSTEMS

Appraisals

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TECHNICAL ASSESSMENT 354

May 2007

MasterWall

PURPOSE

Insulation and surface cladding of external walls of buildings.

APPLICANT

MasterWall Pty Ltd (ABN 37 100 945 355), PO Box 3168, Moorabbin East, Victoria 3189
(Manufacturer/Distributor).

TECHNICAL OPINION

In the opinion of CSIRO Appraisals, MasterWall is suitable for the insulation and weatherproof protection of external walls for buildings up to three storeys, under the following conditions:

1. The system is installed in strict compliance with the MasterWall Installation Manual (January 2005).
Note: These instructions are available from MasterWall Pty Ltd (ABN), PO Box 3168, Moorabbin East, Victoria 3189.
E-mail: sales@masterwall.com.au
PH: (03) 9553 3211
FAX: (03) 9553 3123
2. The system is not installed in an area subjected to tropical cyclones as defined in AS 4055 - 1992 'Wind loads for housing' (Amdt 1 December 1994).
3. Fixing of the MasterWall system is set on 600mm maximum stud spacings except closer stud spacings are determined by the wind loads. Fixer spacings are 600mm maximum except where closer spacings are determined by the wind loads. Fixer spacings for Wind Classification, as defined in AS 4055-2006, 'Wind loads for housing' (Amdt 1 December 1994), are as follows for 450 mm stud spacings:
 - Wind Classification N3: Within 1200mm of a building edge at 400mm centres, elsewhere 600mm centres.
 - Wind Classification N4: Within 1200mm of a building edge at 300mm centres, elsewhere 600mm centres.
 - Wind Classification N5: Within 1200mm of a building edge at 200mm centres, elsewhere 400mm centres.
 - Wind Classification N6: Not suitable

Fixer spacings for Wind Classification, as defined in AS 4055-1992, 'Wind loads for housing' (Amdt 1 December 1994), are as follows for 600 mm stud spacings:

 - Wind Classification N3: Within 1200mm of a building edge at 400mm centres, elsewhere 600mm centres.
 - Wind Classification N4: Within 1200mm of a building edge at 200mm centres, elsewhere 400mm centres.
 - Wind Classification N5: Not suitable
 - Wind Classification N6: Not suitable
4. The maximum height from ground level that the system should be installed is 9 metres.
5. Use of timber framing must be in accordance with AS 1684.1-1999 'Residential timber-framed construction – Design criteria' and the framing manufacturer's specifications.

6. The surface of the MasterWall panel must be free of all dust and foreign matter before the application of the Render.
7. MasterWall is fire retardant 'M' grade EPS to AS 1366 'Rigid cellular plastics sheets for thermal insulation' Part 3-1992 'Rigid cellular polystyrene - Moulded (RC/PS-M)' (Amdt 1 February 1993).
8. Where the building is required to be protected from concealed subterranean termite entry, the building shall be protected by a barrier system that complies with the requirements of AS 3660.1-2000 'Termite management -New building work'.
9. The system is not cleaned, painted or otherwise treated with materials containing hydrocarbon solvents. This requirement applies both during construction and occupancy.
10. MasterWall Panel System is suitable for use in Class 1 and 10 buildings provided that it is more than 900mm from the allotment boundary and 1.8m from another building on the same allotment, other than an appurtenant Class 10 building or a detached part of the same Class 1 building.
11. The system is not suitable for use in bushfire-prone areas.

BUILDING CODE of AUSTRALIA 2007

In the opinion of CSIRO Appraisals, the MasterWall system as described in this Technical Assessment and installed under the conditions listed in the Technical Opinion section of this Technical Assessment will satisfy the performance requirements of P2.1, P2.2.2, P2.6.1 Volume 2 (Class 1 and 10) of the Building Code of Australia 2007.

Notes:

- (i) The inclusion of this clause with reference to the BCA is aimed at assisting those involved in the design, specifying and building approval/permit process relate the Appraisal to the relevant Performance Requirements of the BCA.
- (ii) Users of this Technical Assessment need to take into account any changes made to the BCA during the term of validity of this Technical Assessment.

RELATED INFORMATION

VALIDITY OF THE ASSESSMENT

Condition:

This Technical Assessment applies only to the use of MasterWall described herein.

Withdrawal:

This Technical Assessment will be withdrawn or amended if CSIRO Appraisals considers that a change in design or manufacturing quality renders the basis of appraisal invalid, or if reported field experience convinces CSIRO Appraisals of unsatisfactory quality or performance.

Term of Validity:

This Technical Assessment is valid until 31 December 2009. Technical Assessments may be amended during the term of validity. Users of this Technical Assessment should verify that it remains valid and is the current version by checking on the CSIRO Appraisals website: <http://www.cmit.csiro.au/services/appraisals/>.

RELEVANT DOCUMENTS

Standards Australia, AS 4055 - 2006 'Wind loads for housing'.

AS 1366 'Rigid cellular plastics sheets for thermal insulation' Part 3-1992 'Rigid cellular polystyrene - Moulded (RC/PS-M)' (Amdt 1 February 1993).

Standards Australia, AS 3660.1 – 2000 'Termite management – New building work'.

APPROVED ASSESSMENT EXTRACT

The MasterWall system, manufactured and distributed by MasterWall Pty Ltd (ABN 37 100 945 355), PO Box 3168, Moorabbin East, Victoria 3189, is suitable for the insulation and surface protection of external walls of buildings when the conditions listed in the Technical Opinion section of CSIRO Appraisals Technical Assessment 354 are fulfilled.

APPRAISAL**DESCRIPTION**

The following description is based on information provided by the applicant.

General:

The MasterWall system, is a method of applying insulation to the external walls of buildings and providing a weatherproof protection over the insulation.

The MasterWall system is made up of the MasterWall panel with cementitious facing and fibreglass mesh reinforcing.

The MasterWall system is installed over timber frames.

Specifications:

MasterWall Panel System is a panel of fire retardant expanded polystyrene or EPS, manufactured to AS 1366 'Rigid cellular plastics sheets for thermal insulation' Part 3-1992 'Rigid cellular polystyrene - Moulded (RC/PS-M)' (Amdt 1 February 1993). The grade used is 'M' with a density of 20 kg/m³. The sheet comes in sizes 1200 mm by 2400 mm in thicknesses of 50 mm, 75 mm and 100 mm. The sheets are laid either vertically or horizontally provided all joins are staggered between panel courses.

Reinforcing is an alkaline resistant high tensile strength reinforcing fibreglass mesh that is a minimum of 145g/m².

Facing is a flexible cementitious material designed for both a mechanical fix and a chemical bond with the acrylic render. The finished surface has a light trowel type texture. The reinforced facing is mechanically applied to the EPS panels.

Screw fixings are Class (3) screws, 10 gauge fitted with a 50 mm MasterWall plastic button. The screws are available in lengths of 65 mm, 75 mm, 100 mm, 130 mm and 150 mm. For timber frames the screw lengths should always be a minimum of 25 mm longer than the thickness of the panel specified.

Sealant is a longskinning polyurethane elastomeric sealant, TREMCO Dynamic (or equivalent) is applied to all butt joints and openings.

Reinforcing tape is alkaline-resistant fibreglass mesh, of a minimum width of 150 mm or 200 mm, 145 g/m².

Trims are aluminium or stainless steel corner trims applied to all external corners/openings and bottom edges of panels. Plastic or galvanised trims are not recommended.

Installation

Construction and installation instructions are contained in the Masterwall Product Specification & Installation Manual (2006) and the Masterwall Construction Details (2005).

Weather Wrap

The applicant recommends the use of the optional MasterWall Breathable Weather Wrap or other vapour permeable sarking which is to be installed by fixing to studs prior to the installation of MasterWall Panel. Under no circumstances should non-breathable paper be used behind MasterWall panels. If vapour permeable sarking is used it is recommended that the joints between the panels are sealed.

Layout

MasterWall panels may be laid either vertically or horizontally according to the best fit. Horizontal staggered joint layout is the preferred option. If the wall height is greater than 2400 mm, the panels should always be laid horizontally, in a brickwork pattern, with 1200 mm vertical joint staggered up through the height of the wall.

The minimum length of a trimmed MasterWall panel should be 450 mm or one stud spacing.

The MasterWall panels should be set out with a 2mm – 3 mm gap to window frames and similar items to allow for joint sealing, fibreglass reinforcing-mesh taping and render application to exposed reveals and edges.

Supporting Framework

Edges of the MasterWall panels require support on studs, noggings or other intermediate blocking. MasterWall panels may be cantilevered or projected beyond supports by a maximum distance of the panel's thickness. Fixed-back blocking is mandatory. Full stud width (90 mm) support is required to each edge. Back blocking timber must be MGP 10 or greater. Merchant grade is not permitted. Adhesive back blocking is not permitted.

Supports/blocking are required to all edges around openings. Double studs are required for vertical, full-length butt joints or where a control joint is to be located.

Cutting Panels

MasterWall panels should be accurately cut to size to produce close butt joints between panels.

Masonry blade: a diamond tipped masonry blade is the most accurate and clean way to cut panels, particularly when cutting 45° angles for external corners.

Note: Cutting EPS can be hazardous. It is essential that the Health & Safety instructions in the Masterwall Product Specification & Installation Manual (2006) and the MSDS are followed when cutting. Cutting should always be performed in the open air or well ventilated spaces and personal protective equipment (face masks and safety goggles) should be worn at all times.

Fixing to Framing

On a stud spacing of 450 mm or 600 mm, fixings are to be at a maximum 400 mm centres vertically to all perimeter and intermediate supports. Average 10 fixings per m².

When fastened correctly, the screw head and button should be slightly countersunk in a concave recess on the outer surface of the panel, and located so as not to crush the edge of the panel. The button should always retain its circular shape (if the button begins to flare it has been screwed in too far).

Fixing to Masonry/Concrete

Prior to the application of the panel, 50 × 50 mm batons are fixed to the masonry at 450 mm centres (vertically or horizontally). These battens are fastened to the masonry using impact anchors at 500 mm centres. Panels are then to be fixed to the batons at 400 mm centres with back blocking techniques to be utilised.

Sealing – Joints

Prior to closing of all joints between panels (and between panels and other building elements) a 15 mm (40 mm removed from nozzles provided) bead of construction urethane is applied to the centre of meeting surfaces. Urethane sealant is required for all butt joints; all mitred external corners and butt joined internal corners; and all vertical returns on all roof fastenings to maintain a weatherseal with the panel.

Although this joint sealing is optional, the applicant recommends that it be used to enhance the weatherproofness of the Masterwall system.

Sealing – Openings

Prior to the application of the panels all openings must be flashed from the reveal to the frame. MasterWall supplies adhesive aluminium flashing tape for this purpose which is suitable for both timber and aluminium framed windows. In turn the panels are then sealed with urethane at the rear to the flashing tape.

Although the sealing of opening in this manner is optional, the applicant recommends that it be used to enhance the weatherproofness of the Masterwall system.

Note: The MasterWall panels should not be sealed to window/door reveals at this point. Sealants should never be rendered over, as render systems, will restrict the urethane's ability to move according to the manufacturer's specification. Sealants for openings should always be applied after the render system has been applied.

Render systems are not sealants.

Control & Expansion Joints

Control and expansion joints will be determined by the building structure and substrate. Control joints shall always be located over solid timber backing and shall be provided on all walls over 20 metres long or over 6 metres high. Control joints are to be expressed in the MasterWall panels as an open joint, free of construction urethane, and finished as for all other open edges. Panel to panel control joints are located in double studs, which are then to be sealed with flashing tape, which is then sealed to the rear of each panel with the use of polyurethane sealant. Refer to the MasterWall Construction Details Manual where the MasterWall panels meet other building elements. All control joints should feature either Ableflex (or similar) or backing rod as the primary sealer, which should set back in the control joint a minimum of 8 mm where it must be sealed after the render process has been completed.

Corners, Edges Openings & Returns

All panels to external corners must be mitred to 45° so that the maximum area of the facing is retained. This mitred joint has a larger area for sealant coverage than an overlapping butt joint.

Mitred joints are not required on internal angle corners, as the joint will occur in the apex of the corner. Construction urethane is required in this butt joint.

All joints and abutments require sealing with the construction urethane.

MasterWall's Meshed Aluminium External Corners should be applied to all external corners, openings and bottom edges of the panels. These trims should be in long lengths and set accurately to be plumb, level and straight.

Jointing

All joints, corners and edges (with the exception of control joints) are to include fibreglass reinforcing mesh within the acrylic render. A skim coat of the render should be applied over the joint, and the 150 mm – 200 mm width reinforcing mesh applied. For best results, the reinforcing should be suspended in the render and not stapled or stuck flush onto the face of the panel.

Flashing & Waterproofing

The MasterWall panel has a sealed face and there is no drainage cavity. All door frames, window frames and other items set into the wall must include integral drainage provisions. Drained sub-sills are an alternative. All exposed edges to parapets and similar locations must be fitted with a folded metal capping (zincalume or Colorbond is recommended). Junctions with lower roofs, balconies, terraces and decks must be fitted with a folded metal underflashing (zincalume to metal roofs, lead to tiled roofs, and stainless steel to terraces).

An air gap of a minimum of 20 mm is required between the finished bottom edge and the finished surface of the terrace or balcony.

A minimum air gap of 15 mm is recommended between the finished bottom edge of the panels and the roof flashing.

At ground level all exposed raw edges and exposed rear areas of panels up to the bottom plate or last fix point must be sealed with an acrylic tanking formula (MasterWall can provide details) as an additional waterproofing action.

Any exposed plinth is to be finished separately to the MasterWall panels.

Finishing

When all MasterWall panels have been installed (including with sealants and edge trims) a 5 mm – 7 mm minimum thickness of an approved acrylic render system

is required. The reinforcing mesh over the sheet joints is incorporated in the first skim coat.

The render is applied using conventional techniques. No primer is required. The render finishes all mechanical fixings.

The surface of the MasterWall panel must be free of all dust and foreign matter before the application of the render. It is recommended that the time between installation of the MasterWall panel system and application of render be no greater than twelve weeks.

Note: Traditional sand/cement renders are not suitable for MasterWall panels.

When the skim coats are dry, the selected finishing coat can be applied.

A nominal minimum acceptable sequence is:

- 2.5 mm skim coat of render (including reinforcing mesh jointing tape).
- 2 mm skim coat of render
- 1.5 mm top coat texture
- The applicant recommends the use of an optional roll on membrane, particularly in harsh conditions.

The bottom of the MasterWall system should be no less than 150 mm above finished ground level.

Timber framing should comply with AS 1684-1999, 'Residential timber-framed construction – Design criteria'.

DESIGN INFORMATION

General:

Based on information from the applicant, MasterWall is a method of applying insulation to the external walls of buildings and providing weatherproof protection over the insulation.

Design considerations:

According to the applicant, MasterWall consists of an expanded polystyrene sheet mechanically fixed to a framed wall. Sheet joints are reinforced by treated fibreglass mesh bonded with a polymeric render. A minimum 5-7mm thick render is applied over the expanded polystyrene sheets.

Durability:

CSIRO Appraisals has not assessed the durability of The 'MasterWall Panel System'. It is expected to have a durability equivalent to other polystyrene claddings currently in use in Australia.

BASIS OF APPRAISAL

CSIRO Appraisals has assessed the following aspects in undertaking this appraisal:

- (a) installation procedures,
- (b) the bonding of the system on to the substrate,
- (c) the durability of the system,
- (d) the ability of the system to resist impact loadings and
- (e) the fire performance of the system.

The following documents and inspections were used in carrying out the appraisal.

Manufacturer's Information

1. **MasterWall Product Specification & Installation Manual (2005). MasterWall Pty Ltd.**
2. **MasterWall Technical Document: Construction Details (2006) MasterWall Pty Ltd.** Types and amounts of materials are supplied for each installation and contains an installation checklist.
3. **Foamex Styroboard Expanded Polystyrene Technical Data** This document contains information on the expanded polystyrene used in the MasterWall panel including manufacturing information, physical properties, chemical properties, toxicity, and safe handling procedures.

Note: Any EPS, fire retardant grade 'M' with a density of 20 kg/m³, that is manufactured to AS 1366 'Rigid cellular plastics sheets for thermal insulation' Part 3-1992 'Rigid cellular polystyrene - Moulded (RC/PS-M)' (Amdt 1 February 1993), is suitable for use with the Masterwall system.

Reports:



Simon Hanson
CSIRO Appraisals

1. **CSIRO Manufacturing and Infrastructure Technology, Graham Road, Highett, Victoria 3190, Report No CMIT(C)-2005-516 (November 2005) Masterwall Cladding Bending, Shear and Fastener Testing:** This reports provide results of testing of the MasterWall system for the structural strength of the mechanical fastening system used to fasten the expanded polystyrene boards to the framing system. They outline the fastener spacings for studs spaced at 450 mm and 600 mm centres.
2. **CSIRO Building, Manufacturing and Infrastructure Technology, Graham Road, Highett, Victoria 3190, Report No 3616 (21 July 2006) Water Penetration and Leakage Through Masonry:** This report provides results of testing of the 'MasterWall Panel System' for water penetration to ASTM E514-03. No water penetration was observed to the back of the joins in the expanded polystyrene sheeting at the end of the four hour exposure to simulated wind driven rain.

Note: Outdoors exposure testing and in field use are the only reliable means of obtaining information about the durability of materials in terms of their continuing satisfactory performance. Such testing takes a long time. CSIRO Appraisals does not consider it warranted to await results from such tests before issuing an appraisal. This appraisal is based on laboratory assessments, inspections and the history of completed installations.

Inspection:

Representatives of CSIRO Appraisals have inspected installations of this system and found them to be satisfactory.



CSIRO Appraisals is a project of CSIRO Manufacturing and Infrastructure Technology providing a range of assessment products including:

- Technical Assessments – appraisals of innovative products, systems or materials that may or may not be covered by Australian Standards or building regulations.
- Interim Reports – appraisals of products that have not yet reached the fully developed or manufacturing phase. They aid with product development and may be used as a step towards a subsequent Technical Assessment.
- Certification Assessments – appraisals of products, systems or materials solely against the requirements of the BCA and used for gaining approval from Federal or State authorities.

From 1978, under the auspices of the Australian Building Systems Appraisal Council (ABSAC), CSIRO ran an appraisal service in conjunction with the Australian Institute of Building Surveyors, the Housing Industry Association, the Insurance Council of Australia and the Master Builders Association. In 1999, CSIRO Appraisals was formed to continue the business of ABSAC under the sole patronage of CSIRO. This new scheme retains the committee structure of technical and interstate advisers that operated as ABSAC. All past ABSAC publications and appraisals are being continued and supported by CSIRO Appraisals.

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Each Technical Assessment has been prepared by CSIRO Appraisals and then reviewed, revised and finally endorsed by the Technical Advisory Committee (TAC), detailed below. CSIRO makes the appraisals on a national basis by obtaining input from regional committees in each State and Territory to take account of variations in local building regulations, practice and local climatic features.

CSIRO Appraisals bases its assessment on the product and information it receives and cannot accept responsibility for deviations in the manufactured quality and performance of the material, product or system. However, Technical Assessments will be withdrawn where adequate quality or performance has not been maintained.

This Technical Assessment has been given a term of validity until 31 December 2009. Technical Assessments may be amended during the term of validity. Users of Technical Assessments should verify that Technical Assessments remain valid and are the current version by checking on the CSIRO Appraisals website: <http://www.cmit.csiro.au/services/appraisals/>.

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H. RELATED DOCUMENTS**J. OTHER/OPTIONAL INFORMATION****14. ABSTRACT** *(CSIRO Appraisals Approved Assessment Extract)*

The MasterWall system, manufactured and distributed by MasterWall Pty Ltd (ABN), PO Box 3168, Moorabbin East, Victoria 3189, is suitable for the insulation and surface protection of external walls of buildings when the conditions listed in the Technical Opinion section of CSIRO Appraisals Technical Assessment 354 are fulfilled.