



Eco Block Aust Pty Ltd, Design Considerations February 2007

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Eco-Block™ (Aust) Pty Ltd

(Saving Australian Energy)

“Changing the way you build”

Application

Eco-Block™ ICF can be used for below and above grade construction. It can be used for single level and multistory residential, commercial, institutional and industrial construction. They can be used for fire and noise resisting party walls and provide the necessary sound blocking for building next to airports, highways and railroad tracks.

The Eco Block building product is purchased from **Eco Block agents** in your State or Territory as a package of forms and connectors. Accessories resources such as screws, steel ties, “C” channel etc can be purchased from hardware stores.

The building owner must engage an Architect or Building Designer to design their project by using the technical details within the design manual. Note that the Design Manual and Technical drawings CD do not exhaust how a building is to be designed.

The Eco-Block™ Advantages

- **Environmentally friendly** – use of wood products is significantly reduced and **green house gas emissions**
- **Energy efficient** – provides excellent insulation and air infiltration resistance that can reduce heating / cooling costs by up to fifty percent (50%).
- **Sound suppressing** – interior spaces are effectively shielded from environmental noise and from adjacent space noise.
- **Reduced labor costs** – due to the speed of construction, less trades, less craning and handling, less coordination hold ups.
- **Extremely strong** – the structure is reinforced cast in place monolithic concrete.
- **Easy to work** – EPS panels can be cut and shaped using wood working tools. Chases can be made with a router or a hot knife.
- **Versatile** – The concrete wall can be of any thickness (100mm – 610mm) using the same side panels. Any standard interior or exterior finish can be applied. Pre-formed ninety degrees (90) corners are catalog items. Corners other than ninety degrees and **curved** walls can easily be created. Can be used for insulation on tilt-slab wall systems a under elevated slabs.
- **Precision rebar placement**- rebar is accurately placed into notches in the connectors.
- **Steel Fibers**- For single story construction steel fibers can replace all N12 shrinkage reinforcing steel in horizontal and vertical directions except for above openings doors and windows. Refer to the Engineering tables for details.
- **Precision walls**- block to block alignment is perfect due to panel interlocks. Forms can be moved into plumb and flatness after assembly. Simple alignment tools maintain the perfect wall during concrete placement.
- **Concrete curing** – concrete remains moist during curing. Because of the slow hydration process this allows 125% realization of compressive strength. Tests conducted by Coffey Geosciences Pty Ltd confirm that after 7days the compressive strength (Mpa) is 45.5 and then after 30 days the Mpa had increased to 59.5.
- **Easier to transport** – Components allow assembly on site; almost no “dead air” is shipped during transport.
- **Less expensive** – Single EPS panels reduce mold and manufacturing costs, which are passed on to the customer. Inventory cost is reduced because one size panel fits all wall thickness.
- **Structure life** – there is no limit to the life expectancy of the Eco-Block™ wall.



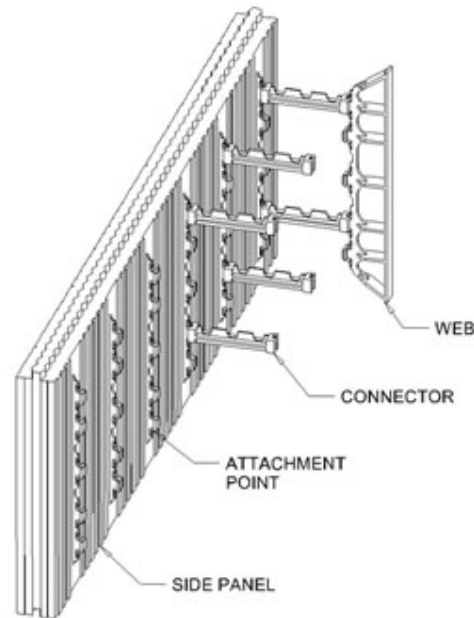
Design Considerations

Construction Process

The ECO-Block ICF is composed of three components (See Cutaway View):

- Side panels
- Webs
- Side panel connector elements

The ECO-Block ICF system consists of two types of plastic: Expanded Polystyrene (EPS) and high-density plastic. Each block has two side panels, each measuring 1219 mm long by 406 mm high by 64 mm thick. These side panels are made of flame-retardant EPS. Every 203 mm on the horizontal axis of the side panel, there is a **high-density plastic web** that has been moulded into the EPS side panel. These webs provide a surface on both the exterior and interior to attach finishing materials.



The **connector element** spans the cavity between the two side panels and connects the two side panels together to make the blocks. The connector elements and the EPS side panels are easily and quickly assembled on site. The cavity made by the connector element can be varying sizes from 101 mm to 254 mm or more depending on the length of the connector element. It is in this cavity that concrete is placed to make the concrete walls of the building. After the concrete cures, the ECO-Block side panels remain in place and provide the insulation for the building.

Stack-and-Pour for Fast Walls

ECO-Block's easy-to-use process eliminates several steps that are necessary with wood-frame construction, such as sheathing and insulating the exterior walls. Made of expanded polystyrene (EPS), ICFs stack and lock into place much like LEGO's™. Extreme heat, frigid cold, rain or sun — it doesn't matter — EPS insulates concrete, allowing it to wet-cure as it strengthens.

After the concrete cures, the plumbing and electrical installation can begin. The foam is easy to cut and remove so electrical lines can be installed. Plus, any exterior or interior finish can be applied.

ECO-Block features a bracing system with unique alignment features to ensure a smooth wall finish. Only basic hand tools are needed to position and secure our lightweight blocks. High-density webs, integral to ECO-Block, provide furring strips for any standard wall-finishing product.

High-density plastic webs are recessed by 10mm, providing a uniform exterior to which any stucco or EIFS material can be applied. Having such a uniform surface provides superior adhesion and crack resistance.

Radius walls and angled walls can also be constructed with ease through simple mitering techniques.

ECO-Block leads the ICF industry in research and development. It's this dedication to continuous improvement that allows our customers to rest easy. We stand behind our products.

1.1 Product Details.

Eco-Block flat panels

ECO-Block 2000 - Dimensions and Characteristics

	101mm Cavity Block	152mm Cavity Block	203mm Cavity Block
Block Dimensions (Standard Block)	1219 x 406 x 229 mm	1219 x 406 x 279 mm	1219 x 406 x 330 mm
Concrete Thickness	102 mm	152 mm	203 mm
Concrete Volume per block	0.05 m ³	0.07 m ³	0.1 m ³
EPS Thickness (total)	127 mm	127 mm	127 mm
Wall Surface Area per block	0.5 m ²	0.5 m ²	0.5 m ²
Fire Rating*	2 hours	4 hours	4 hours
Sound Insulation*	42 dB	51 dB	51+ dB
Thermal Insulation* U- Value	R-3.78 0.26	R-3.78 0.26	R-3.78 0.26
Block Dimensions (90 deg Corner) * concrete-filled	Long side: 813 mm Short side: 406 mm	Long side: 813 mm Short side: 406 mm	Long side: 813 mm Short side: 406 mm



(1) Eco Blocks packaged in bags of 6, weigh approximately 15kg

Eco Block is delivered in bags of six blocks and the bag weighs approximately 15 kilos each. So they are very easy to load and unload, saving costs and time. Most importantly from an occupational health and safety perspective there is much less stress on workers.



(2) Example of a 152mm thick concrete cavity

An Eco-Block™ concrete wall can be of any thickness (101mm to 610mm) using the same side panels. Our patented connector system of various sizes allows the flexibility to expand and contract the Eco-Block™ forms.

1.2 THERMAL PERFORMANCE

The BCA contains energy provisions with the objective of reducing greenhouse gas emissions by efficiently using energy. The requirement is that building must have, to the degree necessary, a level of thermal performance to facilitate the efficient use of energy for artificial heating and cooling.

**Eco Block has a total R-Value of 3.78
U-Value of 0.26**

The total R-Value achieved with the Eco Block wall exceeds that required in all climate zones both under the current BCA and under the amendments proposed for mid 2006.

1.3 Acoustic Performance.

The acoustic test for airborne sound has been completed by Palmer Acoustics (Australia) Pty Ltd. Palmer Acoustics is a member firm of the Association of Australian Acoustical Consultants.

The airborne test, a weighted standardised level difference with spectrum adaptation term (Dnt,w + Ctr) of not less than 45, when determined under AS/NZA 1276.1 or ISO 717.1.

The 152mm Eco-Block wall with 63.5mm of EPS on either side and one layer of 10mm plasterboard each side has a Dnt,w+Ctr of 51. This rating meets the Deemed to satisfy rule of the BCA.

1.4 Impact Acoustic performance.

Expert opinion / judgment given by Palmer Acoustics (Australia) Pty Ltd Consulting Acoustic Engineers and Scientists

Member Firm- Association of Australian Acoustical Consultants AAAC

Certified to Meet the FP5.2 dated 22/11/2004

Mr Ross H. Palmer CPEng, RPEQ (3534)

- **Meets the performance requirements of the Building Code of Australia FP5.2.**

1.5 Fire Performance.

Eco-Block™ EPS is manufactured to AS 1366 part 3 – 1992 and contains a flame retardant. Early fire hazard indices (Test to AS/NZS 1530.4- 1997) demonstrate compliance with AS 3600-2001.

Ignitability Index	0
Spread of flame Index	0
Heat evolved index	0
Smoke development index	0 – 1

1.6 Smoke Toxicity.

A CSIRO and a report commissioned by the National Research Council of Canada titled “Toxic combustion products of wood and polystyrene no 76 and dated September 1971, confirms that EPS is no greater risk than that associated with White Pine.

Result.

Polystyrene Co = 0.09 plus Co2 = 0.01 Total = 0.10

White pine Co = 0.09 plus Co2 = 0.003 Total = 0.09.

BRANZ assessment report FAR 2251 states that the Eco-Block™ wall complies with AS 3600 and provide a Fire Resistance level (FRL) as follows.

Eco-Block™ Core thickness in mm.	Fire Resistance Level in Minutes Structural Adequacy/ Integrity/Insulation
100mm	90 /90 /90
150mm	180 /180 / 180
170mm	240 /240 / 240

1.7 Termite treatments

Eco-Block™ Aust Pty Ltd does not recommend a particular termite treatment. Eco-Block™ recommends that you refer to the Building Code of Australia “Termite Risk Management” and AS 3660 to determine the appropriate termite barriers for the State, Territory or Region where the construction is to take place.

EPS or Concrete does not hold any nutritional value for ants or rodents.

- One measure agreed upon by all parties is the need for a minimum 152mm bare concrete inspection strip at grade level. This is required if foam is used below grade or only above grade. This is extremely easy to accomplish with ECO-Block, since it is a panelised system. A 152mm horizontal strip of EPS is cut out to allow the formation of a solid concrete barrier at grade. This creates a solid concrete barrier, forcing the termite to the outside of the foam where it is visible. Additional steps, together or separately, may meet the “approved method” requirements:
- Protect the foam with a termite barrier made from stainless steel mesh.
- Install “bait systems” on exposed concrete strips or treat the soil as usual.
- Treat footings and backfill with termiticides.
- Eliminate as much wood in the structure as possible by using steel and plastic replacements.
- Remember, in a solid concrete home there is little to eat. The concrete also acts as a solid barrier to termite infestation inside the home.

1.8 Internal and exterior wall finishes

Interior

Plasterboard or any other wall paneling system can be screwed to the plastic wall studs (which are recessed 4mm below the surface) just as you attach to a timber or steel frame construction. Ensure that you use a foam compatible adhesive, **such as the following**,

- **Bostick Ultra set or a product with similar qualities in conjunction with direct fixing as per the BCA and Standards Australia.**
- **Boral New Acrylic and Boral Gold Bond Stud adhesives.**

Note that Eco Block does not represent the above companies. The above is for information purposes only and there will be other adhesives that will be compatible with this form of construction.

For the proper installation requirements, consult the manufacturer of the product you choose to use.

Exterior

Any nailed or screwed product (weather board, vinyl board, aluminum or steel cladding) attaches directly to the Eco-Block™ plastic wall studs. Eco-Block™ **recommends that you consult the manufacturer of the siding for specific installation instructions.**

Cement and Acrylic render from the following manufacturers:

Rockcote, Nuplex, Deco Mix, Supacoat.

Note that Eco Block does not represent the above companies. The above is for information purposes only.

Eco-Block can accommodate render or external finishes from many other manufacturers. **For the proper installation requirements, consult the manufacturer of the product you choose to use for their warranties.**

Note: Products with solvents in them can dissolve the foam, so check with the manufacturer or distributor prior to application.



(3) Finished home formed from Eco Block



1.9 Services

Electrical and plumbing lines are easily installed into the Eco-Block™ wall. To create channels in the foam for electrical wiring and plumbing you can use a hot knife or router. **Angle the channel so it has a lip on the bottom** to hold the cable or plumbing lines in place. You can then spot glue the electrical cable and plumbing line in place with EPS compatible foam adhesive.



(4) Example of plumbing installation



(5) Example of electrical installation

1.10 Penetrations

Gaps created by service penetrations through the exterior wall will require waterproofing. The most common method is to use an EPS compatible foam adhesive and if required seal with a long lasting, exterior gap sealant.

1.11 Waterproofing- Below grade

There are many different waterproofing products available. These range from self-adhesive membranes too spray on and roll-on products **so long as they are foam compatible**. Products with solvents in them can dissolve the foam so always check with the manufacturer or distributor of the water proofing product concerning application to EPS, prior to the application.

Waterproofing products such as the following:

Hitchens Polyeu – H7 and FORMSTAR CLEAR GLAZE TOP COAT

1.12 Windows and doors

- Eco-Block™ can accommodate all types of window designs and materials. Windows and door connections are fixed in the same manner as you would fix too masonry.
- We have some window details please refer to appendices.



(6)An example of window & door frames. These frames are made from steel and powder coated. The frames **ARE MADE EXCLUSIVELY FOR ECO BLOCK**. The frames remove the need for traditional formwork, because they act as a permanent formwork as well as window frames with reveals. They are designed to allow plaster board to slip neatly inside reducing further time to set and fix around windows and doors.

Engineering

1.13 Walls to roof

- **Roof Rafter Eaves** detail, please refer to the technical drawing C/D, drawings numbered from M-60-0001

1.14 Footing details – External walls

- **Typical footing detail**, please refer to technical drawing C/D, drawings numbered from M-20-000. **Use N12 steel bars unless otherwise specified by your Engineer.**

1.15 Footing details – Internal walls

- For internal walls built from Eco Block a footing is to be located beneath each wall and in accordance with your Engineers design. The method of connection of the wall to the slab should be the same as for an external wall. **Use N12 steel bars unless otherwise specified by your Engineer.**

1.16 Hollow Core Precast Floor Slab – Ext, Bearing

- Refer to technical C/D drawings numbered from M-40-0001
- The Eco Block technical C/D will provide examples of most details. Please review the index at the start of the C/D

Whilst our engineering tables refer to two story building, Eco Block is not limited to that number of floors. You will require your engineer to calculate the appropriate steel and concrete tables applicable. We will be working towards further detailed engineering tables for buildings greater than two stories.



(7) Lintels over door and window openings are formed using Eco Block and rebar to provide additional strength. Please refer to our engineering tables for further details.

Note that the appendix details are examples and it is the responsibility of the Architect and Building Designer to ensure that they meet BCA requirements.

1.17 Product Support

Certified Eco-Block™ installers are trades people that have been trained by an Eco-Block™ certified trainer. Your authorised Eco-Block™ distributor shall supply all of the Eco-Block™ panels, connectors and braces. The Distributor also sells a wide variety of accessories and is fully trained on the Eco-Block™ building system.

We recommend you seek advice from all manufacturers or suppliers, regarding correct installation and maintenance requirements which may compromise the exterior coating, sealant, flashing, weatherproofing and waterproofing, will render any manufacturers warranty void.

Eco-Block™ (Aust) Pty Ltd regularly updates its literature to keep up with product development and BCA changes and therefore reserves the right, to revise and change its technical information without notice. To ensure the latest information contact your local distributor or Eco-Block™ (Aust) Pty Ltd direct on 1800 669 696. Email eco-block@eco-blockaustralia.com.au. Web address, www.eco-blockaustralia.com.au.

1.18 Health and Safety

- When cutting Eco-Block™ it is recommended that you wear an appropriate dust mask.
- Safety goggles to AS 1337 should be worn.
- We recommend that you always seek advice for recommended handling, health and safety requirements for products or components supplied by other suppliers and manufacturers. Consult your local Work Place Health and Safety Officer for specific advice.

1.19 Environmental Protection

- We recommend that when using an electric bench saw to cut the Eco-Block™ blocks that vacuum extraction device is fitted to the bench saw to pick up the saw waste.

1.20 Concrete Mixture / Slump

- The concrete mixture slump should be between 100 to 120 and no more. **(Never ask for block fill)**. Plasticizers and additives can be added to increase the concrete flow.
- Mpa of the concrete should be between 20 and 25 or, as specified by the Engineer.
- The recommended aggregate size should be between 7 to 10mm depending on the wall thickness.
- Vibrating the forms will also increase the pressure approximately 1.5 times. By using a smaller diameter vibrator of 18 – 25mm, can significantly reduce this pressure.

1.21 Storage and Handling

Care should be taken in handling Eco-Block™ walling system to avoid damage to the edges and ends. Panels should be stacked flat and off the ground and supported on a level platform. The plastic packaging is UV resistant. We recommend the product should not be removed from the packaging unless it is to be used.

Corner blocks should not be laid flat. They should be stacked up right in packs to avoid breakage.

1.22 Eco-Block™ (ICF) Installers

- Eco-Block™ (Aust) Pty Ltd has trained and certified installers that will be able to quote to install the Eco-Block™ walls and retaining walls.
- Our installers can install the footings, ground slabs and walls. This means that only one trade is required. Your construction time is quicker and you will have the best possible result.
- Please call **Eco-Block™ Aust Pty Ltd. 1800-669-699** for our installers to provide you with a quote in Queensland. In the other States, please call your local Agent listed below.
- In order to provide the most accurate quote it is preferable that your plans have been drawn to Eco-Block™ specification and that all the Engineering requirements has been certified.



(8) A home being built by Steve Fava (Eco Block builder & Distributor) in Canberra



(9) Apartments being built by Andrew Polydorou (Eco Block builder & Distributor) in Victoria



(10) Eco Block wall bracing system

1.23 Owner Builder

- If you are or want to be an owner builder you will be trained at the beginning of your building and at each stage of the Eco Block construction process. The Eco Block agent must ensure that product has been assembled and constructed in accordance with the Eco Block training manual. Before concrete can be placed the Eco Block Agent must check the structure to ensure it meets Eco Block guidelines.
- The system can be used by an inexperienced builder with training and guidance.

Disclaimer

Eco-Block™ (Aust) Pty Ltd provides the information in this manual in good faith and to the best of its knowledge the information is correct and covers most situations where its products may be used. However it is acknowledged that not every possible application of Eco-Block™ could be covered with in this manual, therefore, specific design and detailing must be undertaken by an architect or designer. The Specifier, Designer, Architect and Engineer for the project are responsible to ensure that the information and details in this manual are suitable for any intended application or specific design.