

1.0 The Litecrete Residential Wall System

1.0 General

1.1 Litecrete wall panels: steel reinforcing bars fully embedded in the specified Litecrete lightweight precast concrete. Conduits for services can be set into the panel during the casting process, or trenched into the surface on site, using a diamond-tipped router. Paint or plaster finishes can be applied, if required to the exterior face and a variety of render-set finishes/paint systems are available for internal walls. These exterior and interior finishing systems must be vapour-permeable. Natural ("clear") concrete finish is optional. Houses designed with Litecrete panels are subject to specific engineering design and for the purposes of the Building Code the design will be classed as an "Alternative Solution".

1.2 Fire/acoustic inter-tenancy walls for apartment and other residential buildings, eg hospitals, hotels, etc. Litecrete @ 150 mm thick achieves a 240-minute fire resistance rating (refer BRANZ Fire Resistance Test FR 3524) and offers acoustic systems which achieve up to STC 60.

2.0 Supply of Litecrete Panels

2.1 Following is a typical order-to-delivery scenario for the supply of Litecrete panels:

- Litecrete liaises with owner/architect/engineer, at the design stage, and offers advice and assistance.
- Litecrete provides initial estimate from early concept drawings and/or a firm quotation based on the drawings provided for the building consent application.
- We will liaise with the territorial authority, if necessary, to expedite the building consent.
- Customer supplies us with a written order; we supply customer with Application for Credit form and then open trading account. A 20% deposit is required at this stage.
- Customer supplies us with a set of the "For Construction" architectural and structural drawings for us to start on our shop drawings. We check the drawings supplied to us to ensure they are as we originally quoted. Any changes may alter the contract price.
- Shop drawings are produced and are signed off by engineer/customer prior to start of panel manufacture.
- Any changes made after the panel manufacturing has begun will be accommodated, however increased costs will be treated as a variation and charged accordingly.
- Panels are manufactured and held to cure for two weeks prior to shipping.
- Delivery date is negotiated with builder/project manager. Delivery cost is included in the contract price.
- Customer is invoiced.
- Any remedial work (chips in edges, etc) required to be remedied which are OUR faults will be completed at OUR expense.
- Litecrete provides a PS3 manufacturer's producer statement, which the Council will require from all suppliers, at the conclusion of the contract.

2.2 Contractors Required to Install Litecrete panels:

- Crane company. At the time of quotation Litecrete will supply the builder/project manager with a panel schedule showing weights and sizes and the type of lifting eyes being used in the edges of the panels for handling. This info should be passed on the crane company so that they can scope the job and supply an installation price. It has been known for the crane company to arrive on site without the correct clutches to fit into our lifting eyes, so ongoing communication is important.
- Panel installers. Most reputable mobile crane companies have installation staff. Props are required to temporarily support the panels once installed and the crane companies will arrange these as well.
- Grout Sleeve Filling. If Drossbach tubes are being used to attach panels to the foundations (see our detail D3(2)) they will require grouting with a cementitious/epoxy grout. This procedure can be carried out by the builder or by specialist companies.
- Panel Joint Sealing. Vertical and horizontal panel joints require sealing both sides, using a PEF backing rod and concrete panel sealant such as "Sika Construction AP" or Sika Facade. Again, this can be carried out by the builder but they usually employ a specialist joint-sealing company.

The client, his project manager or builder can arrange for any of these services.

3.0 Durability

Litecrete does not rot, or harbour mould or mildew. When used and installed in accordance with the limitations and instructions of the manufacturer, the specifically designed components of the Litecrete wall panel system can be expected to meet the New Zealand Building Code durability requirement of 50 years, provided the Litecrete wall panels are installed and finished as recommended and all protective linings and coating systems, associated sealants and flashing systems are required to have 15 years durability.

4.0 Thermal Properties

Litecrete wall have a thermal resistance of 0.12 +/- 0.6 m²KW⁻¹. Refer to NZBC, Building Code Requirements, Section 3, Clause H1 Energy Efficiency & Internal Moisture.

5.0 External Moisture

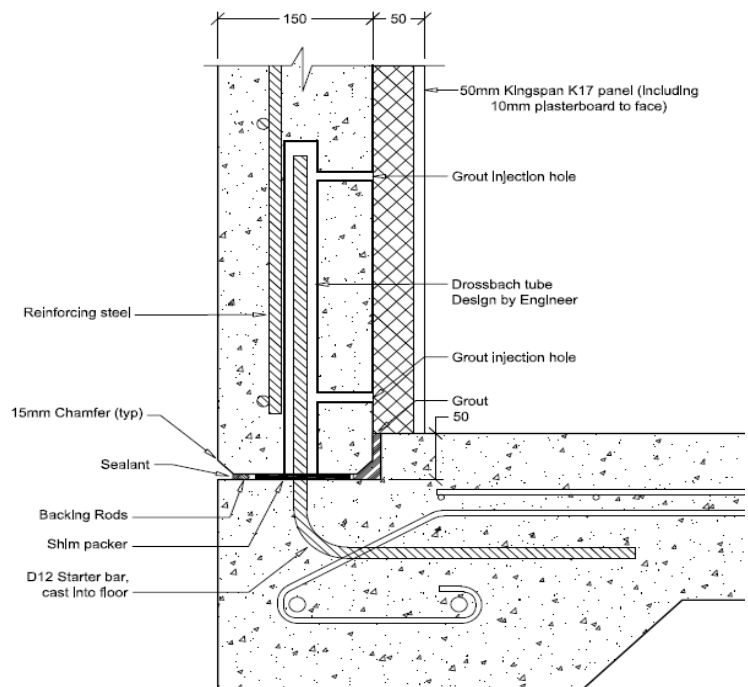
Auckland Uniservices test report (to ASTM C1585-04) dated 30 October 2006 shows that Litecrete has proven to have a superior secondary water absorption rate compared to 30 MPa normal precast concrete. However, to further enhance durability Litecrete with a natural concrete external finish should have a clear matt finish sealer applied after installation.

6.0 Internal Moisture

The excellent thermal insulation properties of the Litecrete wall panel system ensures that when used with both an adequate level of ventilation and an appropriate level of ceiling/roof insulation, Litecrete will satisfy the internal moisture provisions of NZBC Clause E3.3.1. Appropriate or adequate levels of ventilation and insulation are provided in the NZBC Acceptable Solution E3/AS1.

7.0 Energy Efficiency

Buildings constructed using the Litecrete lightweight precast concrete system can meet the performance requirements for energy efficiency as required by NZBC Clause H1.3.1 and H1.3.2. Litecrete 150 mm panels comply with this Code when a 50 mm thick sheet of Kingspan K17 phenolic insulation board is glued to the internal face of the Litecrete. Many other factors resulting from the design of the building can affect the energy efficiency of a building. See diagram (at right) of a typical Litecrete external wall.



8.0 Retaining Walls

Typical precast concrete retaining walls have minimum strength of 25 MPa. However, 12 MPa Litecrete can be designed by the structural engineer for minimal retaining purposes but must be appropriately tanked

9.0 Fire Resistance

9.1 General Properties

Litecrete is fire-resistant to 240/240/240 (refer BRANZ Report FR 3524).

9.2 Control of Internal Fire and Smoke Spread

Internal surface finish requirements are as per Table 6.2 of NZBC Acceptable Solution C/AS1.

9.3 Control of External Fire Spread

External walls that comply with the external wall provisions of Clause 7.11 of NZBC Acceptable Solutions C/AS1 will meet the performance provision of NZBC Clause C3.3.5. Litecrete lightweight precast wall panels will meet the requirements for a type A Heat Release rate in applications covered by Table 7.5 of NZBC Acceptable Solutions C/AS1. Litecrete 150 wall panels will meet the performance provision of NZBC Clause C3.3.5 when restricted to:

- Single storey buildings 1m or more from the boundary for all purpose groups.
- Buildings up to 7m high, 1m or more from the boundary, for all-purpose groups other than SC and SD.
- Fully sprinkled buildings up to 25m high, 1m or more from the boundary for all-purpose groups other than SC, SD, SA and SR.
- Buildings containing purpose group SH, and with a building height less than 10m and located 1m or more from the boundary.

10.0 Acoustics

Litecrete wall panels provide excellent sound insulation and meet the performance requirements of NZBC G6.3.1 for inter-tenancy walls. The approved acoustic system achieved Sound Transmission Class (STC) 60 when constructed in accordance with the method described in Litecrete Acoustic Systems. See *details IW1 (STC47), IW2 (STC55) and IW3 STC 60*.

11.0 Cast-in Surface Textures

Litecrete can offer cast-in surface textures and rebates similar to standard precast concrete. These can range from simple diagonal and vertical lines up to intricate patterns using rubber formliners. Rough-sawn and band-sawn timber textures are common these days.

12.0 Light Reflectance

Some territorial authorities may request the light reflectance values (LRV) for Litecrete precast panels. There is no New Zealand Standard for light reflectance for any type of precast concrete. However, reflectance for a typical Litecrete panel using Portland cement with smooth (F5) finish is between 30 and 40 %, but will lessen with age. An exact reading could be provided using a spectrophotometer. US Standard ASTM C609:07 provides an acceptable standard test method.

13.0 Electrical Cabling/Conduits

Conduits for electrical and other cable services can be cast-in during panel manufacture. However, it is relatively simple to cut a 40 mm deep chase into the Litecrete wall panels to provide extra plumbing/electrical channels. This can be achieved using an electrical router with a masonry cutter or a diamond-tipped tile saw. Note that the plasticiser in PVC-sheathed electrical cables can migrate over time causing deterioration, therefore cables must be contained within a plastic conduit if embedded in the Litecrete wall. The conduit must be fixed at regular centres to the bottom of the chase before being plastered over.

14.0 External & Internal Finishing

14.1 External plaster and coatings

The smooth exterior surface of the panel (F5) is produced off a steel casting bed. This means that once installed the panels are ready to be painted. In this instance the V-joints between the panels are “expressed” and become a feature. If a plaster finish is specified to hide the joints, they would be filled in and treated as “control joints” - to cope with any seismic movement - (see *detail D18*). However, any paint or plaster system should be of the vapour-permeable variety. We recommend systems that have been BRANZ appraised and/or meet the NZBC requirements. In all cases the manufacturers’ application and maintenance instructions must be followed, with particular attention given to the following areas:

- Weathering, flashing and sealing systems at door and window openings, junctions with other materials and any other penetrations of the exterior envelope. The ground/foundation/floor/wall interface. Particular care needs to be given to ensure that minimum distances between ground and floor level, as stated in NZS 3604:2011, are met.
- If external plaster systems are required they must be applied and cured within the temperature limitations, climatic and curing conditions set by the manufacturer. The finished external plaster system is sealed and protected from the weather with a vapour-permeable coating system.

14.2 Natural (Clear) Concrete Surface

Where a clear natural concrete look is specified for Litecrete panels we recommend the application of a matt finish clear sealer after installation; eg: Markham NZ’s “Aquron 2000” or STO NZ’s “Sto Pur”, both of which comply with *CCANZ CP 01:2014 – Code of Practice for Weathertight Concrete and Concrete Masonry Construction, Section 4.4 Clear Coating System, when tested in accordance with AS/NZS 4456.16:2003*. The following aspects should also be considered:

- The pumice aggregate contains minerals which can sometimes cause yellowing and result in heavier surface figuring than is the case with normal precast. On rare occasions mafic (iron-bearing) particles can also occur. This can present as small rust spots on the panel surface. It does not have any effect on the structural integrity of the panels and is not considered a defect.
- As with any type of concrete, the mix can vary in colour from batch to batch. If a consistent, blemish-free surface is required, then a vapour-permeable masonry paint or concrete stain should be considered. We strongly recommend that designers and their clients visit the Wilco factory and view typical Litecrete panel surfaces prior to the start of manufacture.
- Any transit or site damage (chips) to panels can be repaired but the remedial material, being of a different composition, usually apparent, particularly if a clear sealer is being used.
- There is the propensity for hairline cracking to occur from the corners of any openings in ALL precast concrete when the panels are stressed during craneage in the plant, transportation to or during installation on site. Even when temporary steel bracing is installed in panels with large openings prior to leaving the factory, surface cracks from corners of openings may occur despite all precautions being taken to prevent them. While these cracks do not affect the structural integrity - typically not more than 1 mm deep - they are often a concern to the client and remedial work will in most cases be visible.

14.3 Exterior Maintenance

External coating systems must be maintained in accordance with the respective manufacturer's instructions and all damage repaired promptly to ensure the ongoing weathertight properties of the coating system and thermal performance of the Litecrete wall. In addition to these system-specific requirements, the following general maintenance procedures must also be implemented:

- Any dirt accumulation or organic growth that may occur should be regularly removed from the external surface by cleaning with warm water and detergent and a soft bristled broom. Solvent-based cleaners must not be used.
- The external cladding system should be checked yearly for damage to the system itself, deterioration of seals and possible water entry at junctions and joints.
- Any damage to the coatings which does occur must be repaired in accordance with the manufacturer's instructions.
- Where exterior plaster finish systems are used, it may be necessary to recoat the top paint coating, after 8-15 years, in accordance with the manufacturer's instructions, to restore the visual appearance.

14.4 Internal Surface finishing

Some designers specify Litecrete panels in their natural (raw) state as the finished interior wall surface, to achieve an "industrial" or "honest" ambience. Be aware that the interior face of the panel has a rougher, trowelled finish (U3) as opposed to the exterior face, which is off a smooth steel mould. Because Litecrete is manufactured from natural materials no one panel is exactly the same colour and variations must be accepted from one batch of concrete to another. We recommend that the trowelled interior panel surface has a 1-2 mm thick skim coat (eg Mapei *Planitop* 200) applied, which can then be finished with paint or plaster systems. If the panels are to be plastered, control joints should be installed over each vertical panel joint so that they can cope with any seismic or structural movements without fracturing the plaster (see *detail D18*). We strongly recommend that designers and their clients visit the Wilco factory and view typical Litecrete panel surface finishes prior to the start of panel manufacture. If the Litecrete panels are to be left exposed on the internal face a clear matt finish sealer (Aquron 1000) should be applied to prevent dusting of the surface and stop grime build-up, particularly around light switches, etc.

14.5 Weld Plates

Often weld plates will be specified by the engineer to connect panels at corners or to attach suspended panels, such as garage door lintels, between walls. They are installed on the internal face of the panels and in most cases are hidden by the Kingspan K17 insulation board, or ceilings etc. See detail *R21 Typical Cast-in Weld Plates*.

14.6 Internal Lining

Plasterboard

Plasterboard can be either glue-fixed direct to Litecrete internal walls panels, or attached to timber battens fixed to the walls. Use Sikacil C or Selleys Liquid Nails (or similar) adhesive in beads at 250mm centres. Lining materials can be screw fixed into 40 x 20 mm vertical timber battens attached to Litecrete panels at 600 mm centres. Coarse thread screws 32mm x 6mm are required at max 300mm centres around the sheet edges and at max 450mm centres horizontally and vertically within the body of the sheet, or as recommended by the manufacturer. The sheet/edge distance is usually a minimum of 12mm.

Adhesive used for the fixing of internal linings must be appropriate for use on lightweight concrete surfaces. Suitable products are:

Sikacil C, Fullers Maxbond, Gib® Allbond, Holdfast Gorilla Glue and Selleys Liquid Nails.

Ceramic tiles

Litecrete provides an excellent surface for the direct fix of ceramic tiles for wet areas, etc.

Attaching Fittings/Cabinets to Walls

When attaching such items as mirrors, towel rails, picture supports, shelves or light fittings to any Litecrete wall, mechanical fasteners should be used. Do not use nails. We suggest fasteners such as Mungo brand (or similar) MN10 x 50 mm long metric screw, from Powers Fasteners Ltd. For mounting timber framing, or heavier objects such as kitchen cabinets, use Wurth timber anchor screw AW40 with 21 mm head. These fixings should be installed strictly in accordance with their respective manufacturers' recommendations. Wurth anchor screws shown at right are 90/100 mm long (www.wurth.co.nz). Alternatively, rawl plugs or timber plugs can be installed after drilling into the panel.