1.0 Commercial Cladding

For many years, architects have chosen to specify precast concrete cladding because it offers exceptional versatility, speed of enclosure and durability. Litecrete lightweight precast concrete, from Wilco Precast, has further extended the boundaries. No other material provides the combination of textures, shapes, surface details, fire resistance, acoustic values, insulation, low maintenance and accelerated construction schedules. But the key benefit is that Litecrete can also offer solutions for designers and engineers when developing a building's steel or concrete superstructure – especially in poor soil, high seismic or re-cladding applications. The structural capabilities of all precast components offered by Litecrete should be verified by the project structural engineers. Litecrete does not, therefore, offer to provide structural certification.

Litecrete cladding panels are 40% lighter than normal precast cladding panels and offer insulation and fire-resistance standards that exceed the Building Code requirements. Higher strength/denser panels (16 to 20 MPa) are available; please enquire.

Clip-on cladding panels with vertical rebates – University of Waikato Law Building

Litecrete is manufactured with pumice aggregate, which reduces the weight of the concrete yet provides its unique strength-to-weight ratio. The air cells in the pumice provide insulating properties and light weight. The combination of pumice and cement, together with steel reinforcing systems and polypropylene fibre reinforcement, gives Litecrete its exceptional durability. Engineers and architects have depended upon the strength, durability and design possibilities of precast concrete to achieve a variety of outcomes:

- Design freedom: unlimited aesthetic options; excellent plan flexibility
- Outstanding durability, including fire and acoustics
- Fast-track construction: faster to erect; unaffected by inclement weather
- Low maintenance and life-cycle costs
- Fewer truck movement
- Environmentally friendly; less embedded energy; recyclable
- Peace of mind: quality-assured, consistent factory manufacture enables greater quality control and consistency of finish

Litecrete's in-built R-value will improve the thermal efficiency of the structure leading to corresponding reductions in HVAC demand.

In Climate Zone 1, for example, NZS4243 Part 1:2007, states an R-value for walls in commercial applications of R0.3. Litecrete, at 150 mm thick, offers R0.6, whereas normal precast concrete is R0.124. Using Litecrete removes the requirement to strap and line the internal face of the panels.

Litecrete is vapour-permeable; it allows water vapour (condensation) to move through the panel to the exterior of the building. When the weight of structural components is reduced a multitude of benefits follow, such as: lighter (and less costly) foundations, reduced seismic loads, fewer connectors, cheaper shipping costs, smaller cranes.

11.1 Panel types

There are generally three types of concrete panels used as part of commercial building envelopes:

1. Cladding or curtain walls
2. Load-bearing/shear wall units
3. Cast-in-place concrete

Precast cladding or curtain walls are the most common use of precast concrete for building envelopes. Litecrete precast panels do not transfer vertical loads but simply enclose the space. They are only designed to resist wind, seismic forces generated by their own weight and forces required to transfer the weight of the panel to the support. Common Litecrete applications include wall panels, wall window units, spandrels, mullions, column covers, sun shades/fins, balustrades and planter boxes.

Load-bearing wall units resist and transfer loads from other elements and cannot be removed without affecting the strength or stability of the building. Shear wall panels are used to provide a lateral load resisting system when combined with diaphragm action of the floor construction. Litecrete panels are not recommended for load-bearing or shear wall applications.

11.2 Support and Anchorage Systems

The connections for Litecrete panels are an important component of the facade envelope. Structural design engineers utilise various types of anchors but they are often characterised as gravity and lateral types of connections.
The primary purposes of the connections are to transfer load to the supporting structure and provide stability. The criteria used to design precast connections including but not limited to:

- Strength
- Ductility
- Volume change accommodations
- Durability
- Fire resistance
- Constructability

* Hilti supply chemical anchors (such as HY-200 with HIT-V rods and RE-500 with HIT-V rods) which are suitable for use with lightweight concrete with a compressive strength of 10-12 MPa. In order to find load values for different concrete strengths the appropriate reductions factors have to be applied. These vary depending on the failure mode. Hilti also have free PROFIS anchor software which conduct the calculations and run reports which can be used for submittal documentation: www.hilti.co.nz/holnz/page/module/home/browse_main.jsf?lang=en&nodeId=-324368

11.3 Joints and Joint Treatments

The numerous joints in a precast concrete envelope are an important aspect of the facade design. The joints between Litecrete units or between Litecrete and other building components must be maintained to prevent leakage through the wall system. Joint design should consider the structural, thermal, and all other factors that affect the performance and movement of a joint. The joint seal should of course be adequately designed to withstand the movement of the joint (seismic movement, etc). All horizontal panel-to-panel joints should be a staggered weather joint (see detail *B20 Horizontal panel joint*).

11.4 Common Backup Wall Elements

In commercial construction, the most common back-up wall element for (typically 150 mm thick) Litecrete wall systems is an insulated, metal stud back-up wall assembly. Alternatively, for apartment buildings, 220 mm thick Litecrete can be used as the total external wall assembly, offering an in-built insulation which complies with the Building Code requirements. A backup airseal, such as a neoprene gasket, can be installed on the vertical and horizontal internal joints (see detail *C1 High-rise Construction Joint*). Plasterboard can be direct fixed to the internal face, if required, or the surface can be skim-coated and painted. This can save costs and construction time.

11.5 Structural Aspects of Design

Litecrete wall systems are most often constructed as a curtain wall or veneer, in which no building loads are transferred to the concrete panels. Most typically the wall system must resist lateral loads directly imparted on it, such as from wind and earthquake, as well as vertical loads resulting from the self-weight of the precast wall system itself. These loads must be transmitted through the wall system and secondary structural elements to the building's structure. Other loads such as erection, impact, construction related, and transportation must also be considered in the design. It is important to evaluate the design, detailing and erection of precast panels, in order to avoid imposing unwanted loads onto the panels. The panels are designed in accordance New Zealand Standards. Joints between panels must be wide enough to accommodate thermal expansion and differential movements between panels. Joints between panels are most commonly sealed with proprietary sealant to prevent water penetration in the wall cavity. The wall cavity space and backup wall which is usually covered with a water-resistant membrane provide a secondary line of protection against water penetration into the building.

Pixelated formliner design on Westpac Bank, Tauranga

11.5.1 Deadload Reduction

As well as offering an immediate deadload reduction when compared with standard precast, Litecrete can also be used in conjunction with standard precast where the structure's deadload is critical. Specific Litecrete components such as eyebrows installed above windows, balcony floors, balustrades, parapet panels, spandrels, etc, when considered within the total structural design, can make a surprising contribution to deadload reduction, compared to using standard precast concrete.

11.6 Performance Issues

11.6.1 Thermal Performance

Despite 150 mm thick Litecrete precast panels having an in-built R-value of R0.6, the thermal mass benefits offered by the Litecrete is negated by, and the wall panels derive their thermal performance characteristics primarily from, the amount of insulation placed in the cavity or within the backup wall. However, 220 mm thick Litecrete cladding panels, with an in-built R0.8 R-value, comply with the insulation requirements of the residential Building Code H1 Energy Efficiency (Concrete & Masonry). Consequently, no backup wall is required.

11.6.2 Moisture Protection

The most common moisture protection system used with precast concrete wall systems is a barrier system incorporating a durable joint seal. Where the Litecrete panels are to be left in their natural concrete (raw) state, we recommend the application of a clear matt finish sealer to the external surface after installation. EG: Markham's Aquron 2000 or STO NZ's "STO PUR" which complies with *CCANZ CP 01:2014 – Code of Practice for Weathertight Concrete and Concrete Masonry Construction.* Such sealers will allow seasonal precipitation to wash the panels down and help to prevent a build-up of grime on the surface. Because the air-entrainer incorporated into the Litecrete mix removes any air pockets, which are prevalent in all concrete mixes, the use of proprietary water excluding agents -- such as Xypex -- do not add any benefit and increase the density of the concrete, thus compromising the insulation value.

11.6.3 Fire Protection

Pumice concrete is well known for its superior fire resistant properties compared to standard concrete, standard precast and cast-in-place concrete. The inclusion of the polypropylene fibres in the mix assists in fire prevention on the basis that, as the concrete is heated by fire, the fibres melt, creating conduits along which water vapour can dissipate, so avoiding a build-up of pressure and preventing spalling from occurring. In BRANZ test report *FR3524 - Fire resistance of a lightweight concrete panel load bearing wall*; the 150 mm thick Litecrete wall achieved a 240-minute fire resistance rating.

11.6.4 Acoustics

A precast concrete wall system and cast-in-place facade will provide similar performance regarding sound transmission from the exterior to the interior of the building. See Section 12: Acoustic Design. However, distressed and open joints between panels can provide a condition in which sound transmission to the interior may be increased. Fire/acoustic inter-tenancy walls for apartment and other residential buildings, eg hospitals, hotels, etc. Litecrete 150 mm achieves a 240-minute fire resistance rating (refer BRANZ Fire Resistance Test FR 3524) and offers acoustic systems that achieves up to STC 60.

11.6.5 Material/Finish Durability

Litecrete precast panels used in wall systems are available in various finishes and shapes. A Litecrete panel with a highly detailed architectural surface will present challenges in achieving workability of the concrete mix and better consolidation. Litecrete panels with differing depths of surface profiling also require more care in maintaining the required 50 mm concrete cover over the embedded reinforcing steel. In summary, the more complicated the appearance of a precast concrete panel, the more challenging and important the review and approval process and quality control program. Panel cracking, displacements, or other distress conditions can occur at locations where anchors are inadequately or improperly connected. Poor construction is often the result of poor quality control and out of tolerance fabrication or erection of the panels.

11.6.6 Maintenance

When properly constructed, Litecrete panels require minimal maintenance. The most important maintenance item is the sealant in joints and protection system (plaster/paint/stain/clear sealant). Where a natural concrete surface is required we recommend that a clear, matt finish sealer is applied after installation. Raw concrete is prone to picking up airborne grime, so the sealer (EG: Aquron 2000) will prevent the build-up and keep the surface in pristine condition. A good hose down once or twice a year also helps, particularly on the south side of the building which misses out on the sun. If a paint, plaster or staining system has been used the coating will require reapplication. The time frame for the various systems varies widely but usually ranges from every 7 to 20 years, depending upon the quality of the product specified.

For instance, mineral silicate-based paint systems, which fuse to the minerals in the concrete, are going to prove more durable than acrylics, which sit on the surface. All systems should be vapour permeable. Litecrete precast concrete wall systems allow for a wide variety of colours, finishes and architectural shapes. As Litecrete is made in a controlled factory environment it can be erected in an environment that would not allow for site casting of concrete.

LITE CRETE®
LIGHTWEIGHT PRECAST CONCRETE

Shape, size and finish options – appearance and cost guide

	Appearance Uniformity	relative cost
SHAPES		
Perimeter 4-sides	■	$
Perimeter 5 or more sides	■	$$$$$$
Non-rectangular	■	$$$$$
Curved shapes/surfaces	■	$$$$$
Punched shapes (openings)	■	$$
Returns	■	$$$
SIZES		
Small panels	■	$$$$
Large panels	■	$
Thicker panels (>180 mm)	■	$$
ACCENTS		
Plain (no reveals)	■	$
Shallow reveals (<15 mm)	■	$$
Deep reveals	■	$$$
Reliefs (repetitive)	■	$$$
Precast trims and projections	■	$$$
COLOURS		
Grey cement	■	$
White cement	■	$$$$
Black cement	■	$$$
FINISHES		
Form finish (F5)	■	$
Coatings (paint)	■	$
Plaster systems	■	$$
Formliner (custom, low repetition)	■	$$$$$
Formliner (high repetition)	■	$$$
Stone/brick veneer (on site by others)	■	$$$$$$

■ low ■ medium ■ high

Concrete is made from natural materials which vary in the colours they yield over time. Samples will represent one colour in the range of colours produced by a mix design. Older samples should only be used as a guide for initial colour and finish selection. Fresh 300 x 300 mm samples should always be used to make final colour and finish selections. As with natural stone, mock-ups produced near to the time of actual production should be used to confirm final colour and finish selections.

Oxides used for colouring the concrete are expensive and due to the nature of the minerals contained within pumice aggregate, colour variation is difficult to control. A more cost-effective method of achieving a durable colour to the surface is by the using concrete stains. Such systems offer a broad colour spectrum and offer a 20-year colour-fast warranty. The stain is applied after installation of the panels.

Formliners are being used more regularly, however they are only cost-effective where the cost can be amortised over a quantity of panels rather than a one-off. Simple surface rebates can be applied at minimal cost.

Litecrete sills attached to Litecrete panels–Countdown Orewa

Oaks Retirement Village, Warkworth

Because of the poor ground conditions - colluvial and alluvial soil on top of shattered rock, with an abundance of water as well - Litecrete clip-on cladding panels were specified for two buildings in this 7-storey apartment complex. This resulted in a dead-load reduction of 480 tonnes, when compared to using standard precast, with cost savings in also being able to reduce the steel structure member sizes.