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Benefits of Using Precast - Sustainability

Precast concrete's inherent properties make it a natural choice for achieving sustainability with today's modern buildings. Locally manufactured using local products (lower transport costs) in reusable moulds, precast produces minimal waste and most manufacturing waste is recycled. Recycled materials can be included in the concrete mix, such as slag, fly ash, aggregate, steel and water. Exact elements are delivered to site meaning fast construction, less site trades on site (OHS benefits) and less

waste on site (less transportation and disposal of waste). When incorporated into passive solar design, the high thermal mass of precast concrete can provide effective use of daylight to reduce heating and cooling costs. Precast concrete's low water-cement ratio means precast is extremely durable. Its long life offers minimal maintenance and reusable, recyclable structures which contain less concrete and steel and absorb CO2. Structures are also fire resistant and perform well acoustically.

Why Precast is Sustainable

Energy Efficient: thermal mass benefits

- High thermal mass of precast concrete enables it to absorb, store and later radiate heat.

- Using insulated precast (such as sandwich panels) in passive solar designs allows natural heating in winter and cooling in summer, thereby reducing the need to rely on artificial heating and cooling.

Improved internal building amenity

- Using insulated precast (such as sandwich panels) can even out internal diurnal building temperatures.

- Some precast systems (such as TermoDeck®) can improve indoor air quality, providing fresh air inside the home.

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Durable, long life, reusable, low maintenance structures

- With a long life expectancy of up to 100 years, precast structures are durable.
- Precast structures can be reused, extended and refitted internally. Structures do not need to be demolished and can simply be renovated internally conserving resources, reducing waste and landfill.
- Precast is easy to keep clean, requiring minimal maintenance.
- Precast is tough and can withstand wear and tear, requiring minimal repairs.
- Precast concrete can be moulded into almost any form and finish. Careful design of precast concrete buildings increases the likelihood of reusing the building over again.
- Precast concrete gains strength as it ages, won't shrink, distort or move and will not deteriorate with exposure to climatic change.
- Being flood resistant, precast concrete does not erode or rot therefore is suitable for river and coastal barriers to protect against high tides and storms.
- As a hardy waterproof construction method, precast concrete underground pipes transport sewerage and clean water across the country.
- Precast concrete is impact resistant and hard to cut, offering security and protection against terrorist acts.

Locally supplied

- Materials used by precast manufacturers are usually supplied locally. This reduces haulage and fuel costs and also diverts resources from landfill.
- Precast elements are usually locally manufactured and supplied to sites meaning reduced haulage and fuel costs.
- Local highly skilled erection crews erect precast concrete elements safely on site.

Uses less concrete, cement and steel

- Less concrete and steel are required for precast concrete because of its higher quality.
- Less concrete is used in precast flooring systems such as hollowcore, bubbledeck and Ultrafloor.
- Precast allows reduced levels of cement in the concrete mix due to higher quality manufacturing processes.
- Long spans of precast flooring mean reduced material use for supporting columns. Minimises waste during manufacture and on site
- Precast is manufactured in reusable moulds.
- Most waste during manufacture is recycled.
- Exact elements are delivered to site.
- Less site air pollution, noise and debris.

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Reuses waste resources and recycled materials

- Waste materials (such as slag and fly ash) which would otherwise be used in landfill can be incorporated into the precast mix design.
- Recycled aggregate can be incorporated into the precast mix design.
- Recycled steel can be used in the manufacture of precast elements.
- Grey water and stormwater runoff can be used in the precast concrete mix design, thereby reducing mains water consumption.

Recyclable precast elements

- Precast concrete elements can be crushed and reused as aggregate for road bases or construction fill, providing economic and environmental savings.
- Some elements can be reused.

Faster construction

- Precast concrete allows other trades to begin work more quickly, speeding the construction time and saving costs.
- Fast construction on site means less disturbance for surrounding properties.
- Precast elements can be delivered just in time for erection, reducing unnecessary handling and equipment use.

Acoustic performance

- The high thermal mass of precast concrete assists with sound insulation to reduce noise and absorb noise impact.
- Noise walls provide an effective sound barrier between roads and urban noises, and outdoor and indoor spaces and provide more aesthetically pleasing and comfortable living environments.

Fire resistant

- Precast concrete is non-combustible, does not melt and therefore does not require additional fire-proofing applications.
- Precast concrete does not emit toxic fumes under fire and can limit smoke spreading in buildings.

Environmental benefits

- Precast concrete is an inert substance which does not emit or give off gases or compounds. This is a huge relief to allergy sufferers.
- Precast does not attract mould or mildew.
- Precast concrete absorbs CO2.
- Being termite proof means the unlikelihood of requiring chemical spray to reduce termites and vermin which is safer for the environment.

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- As landscaping and street furniture features, planters increase biodiversity by providing a green environment for birds and a pleasant communal meeting place.

OHS benefits

- Less trades on site means safer sites with less equipment, workers and materials.
- Reduced congestion - construction sites are cleaner and tidier, with minimal waste on site.
- Precast floors can provide a safe immediate working platform for the erection crew.

Sustainable Design Solutions

Specific examples where sustainable designs using precast construction can make a considerable environmental impact:

Design Strategy	Sustainability Benefits
Use hollowcore floor planks as ducting systems to even out nternal temperatures and channel air around the building.	The longitudinal ducts in the floor/ceiling increase the effectiveness of the building mass as an energy store and serve as hear exchangers between rooms and spaces having different temperatures.
Use prestressed concrete design for structural elements.	Prestressed precast concrete allows the designer to create longer spans, using less material which may use less concrete than conventional design.
Use thermal mass in combination with appropriate insulation levels in walls.	Thermal mass with insulation provides energy benefis that exceed the benefits of mass or insulation alone in most climates.
Use insulated precast sand wich panels for walls.	Durable exterior and energy benefits from insulated internal thermal mass.
Use precast as sustainable design for fire resistance.	Precast concrete is non-combustible and does not require additional fire-proofing applications.

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Re-use of intact precast concrete elements for building function changes or relocation of building.	Wall panels can be designed to be disassembled, saving materials and extending service life of panels.
Maximise the benefit of re-use of moulds.	Steel moulds have long life spans providing thousands of re-uses and also reduces waste.
Use load bearing precast.	Efficient use of materials due to combining structural, thermal and acoustic functions.
Use colouring oxides, staining or polished finishes for precast elements.	Minimal ongoing maintenance of the structure's exterior.
Use self-shading precast wall elements.	Reduces heat transfer to the structure's interior.
Use self-compacting concrete.	Reduces need for vibration thereby minimising energy used to place concrete.

Source: Precast Concrete Handbook, Edition 2, 2009. The Precast Concrete Handbook is available from SAI Global, phone 131 242.