THINKING PRECAST?
THINK FP MCCANN

SUSTAINABLE PERFORMANCE

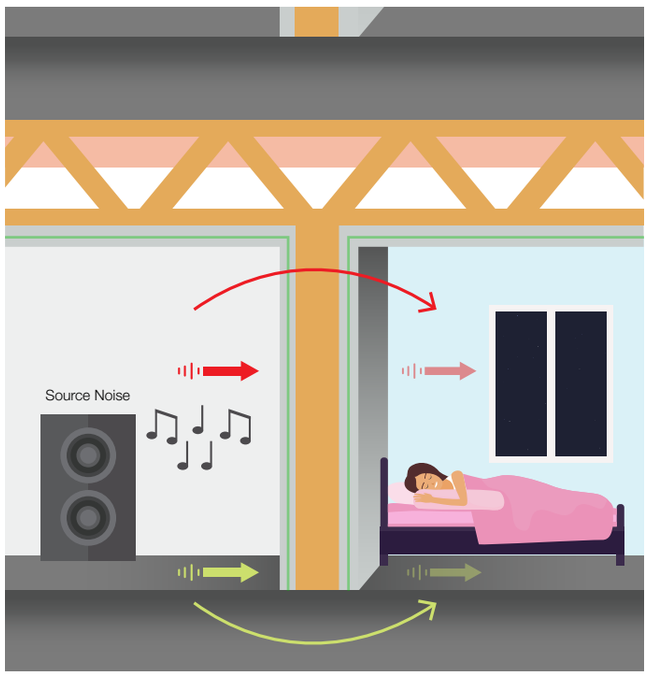
BENEFITS OF PRECAST CONCRETE

ACOUSTIC INSULATION PERFORMANCE

The sound insulation and acoustic performance of buildings has grown in importance over the past decades due to the trend for inner-city apartment living and multi-unit housing complexes. The proliferation of high-powered entertainment systems has also placed unprecedented demands on housing in terms of its acoustic performance.

Precast concrete has excellent acoustic performance. It has the inherent mass, stiffness, and damping properties necessary to effectively reduce the transmission of both airborne and impact sound. In fact, concrete has the highest damping properties of any structural material, reducing the reliance on additional finishes and simplifies design and detailing. This leads to a reduction in the labour, time and costs associated with these finishes and detailing.

The overall sustainability implications of concrete's acoustic absorption properties lie in the potential to enhance building occupants' productivity, health, and well-being.



HILTON HOTELS ACOUSTIC TESTING

FP McCann designed, manufactured, and erected the precast concrete crosswall frame, which consisted of 236 external and 432 internal panels, each 150mm thick. In addition, approximately 761 floor and roof units.

24 Acoustics Ltd were requested to produce a summary information sheet to assist with the design of Hilton branded hotels. A matrix was developed which details various construction types against the sound insulation criteria for both the Building Regulations and Hilton Hotels' own requirements.

MINIMUM SOUND INSULATION CRITERIA – HAMPTON BY HILTON

INTERFACE	BUILDING REGULATIONS PART E	HAMPTON BY HILTON
Airborne		
Bedroom to Bedroom (wall - airborne)	43 dB $D_{nTw}+C_{tr}$	50 dB STC
Bedroom to Lift, Plantroom etc (wall - airborne)	43 dB $D_{nTw}+C_{tr}$	54 dB STC
Bedroom to Bedroom (floor - airborne)	45 dB $D_{nTw}+C_{tr}$	50 dB STC
Bedroom to Lift, Plantroom etc (floor - airborne)	45 dB $D_{nTw}+C_{tr}$	54 dB STC
Impact		
Bedroom to Bedroom (floor - impact)	62 dB L_{nTw}	55 dB IIC
Bedroom to Lift, Plantroom etc (floor - impact)	62 dB L_{nTw}	55 dB IIC

BENEFITS OF PRECAST CONCRETE

THERMAL MASS

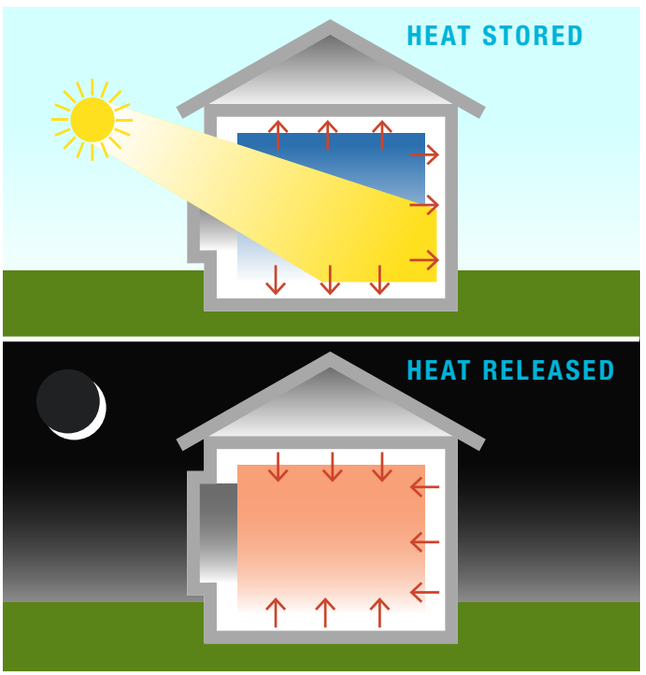
Thermal mass is a concept in building design that describes how the mass of the building provides inertia against internal temperature fluctuations.

This is typically achieved through its ability to absorb unwanted heat during the day and then release it at night with the help of ventilation from cool night air. For a material to provide a useful level of thermal mass, a combination of three basic characteristics is required:

1. A high specific heat capacity: so the heat squeezed into every kilogramme is maximised.

2. A high density: the heavier the material, the more heat it can store by volume.

3. Moderate thermal conductivity – so the rate heat flows in and out of the material is roughly in step with the daily heating and cooling cycle of the building.



Heavyweight construction materials such as masonry and concrete have these characteristics. They combine a high storage capacity with moderate thermal conductivity. This means that heat moves between the material's surface and its interior at a rate that roughly matches the building's daily heating and cooling cycle.

Some materials, like wood, have a high heat capacity, but their thermal conductivity is relatively low, limiting the rate at which heat can be absorbed during the day and released at night. Steel can a store a lot of heat, but conducts it too rapidly to be particularly useful, plus comparatively little is used in buildings. However, a modest amount of thermal mass may still be provided if concrete floors are used in steel frame construction, although these are usually limited to a depth of only 100mm and are usually covered by a false ceiling, limiting their ability to absorb and release heat.

CONCRETE IN MODERN CONSTRUCTION

Ideally modern buildings should be constructed in such a manner as to minimise temperature build up in the room space during warm weather and yet prevent the loss of this excess heat in cold periods. To achieve this, a combination of insulation to exterior walls is required for colder weather and a high thermal mass to act as a heat sink for hot weather. Concrete has a high thermal mass with properties like brick and stone. It is possible to absorb heat from the atmosphere in warm weather and release it during cooler periods, e.g., overnight. This is known as the 'thermal flywheel' effect. In a passive concrete design, the cooling capacity of concrete can be up to 25W/m^2 and with an active system, e.g. by ducting of air through a concrete slab, up to 40W/m^2 can be absorbed.

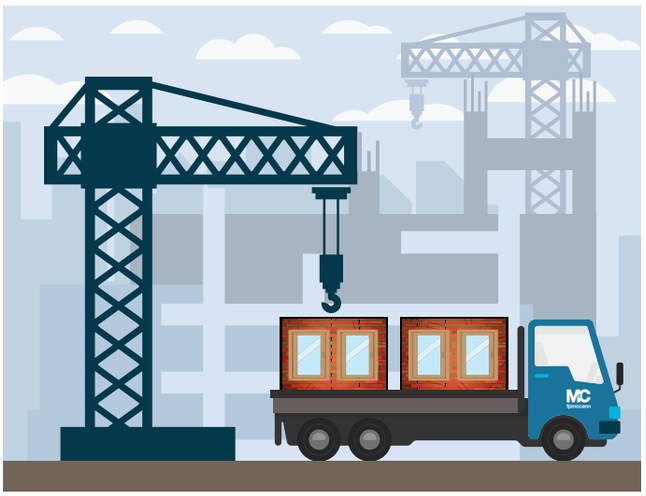
As well as being able to act as a passive air conditioning system for buildings, concrete and cementitious-based products have good sound insulation and deadening properties.

BENEFITS OF PRECAST CONCRETE

SPEED OF CONSTRUCTION

The nature of off-site construction methods ensures buildings can be erected quickly, even in adverse weather conditions, drastically reducing construction time and associated costs.

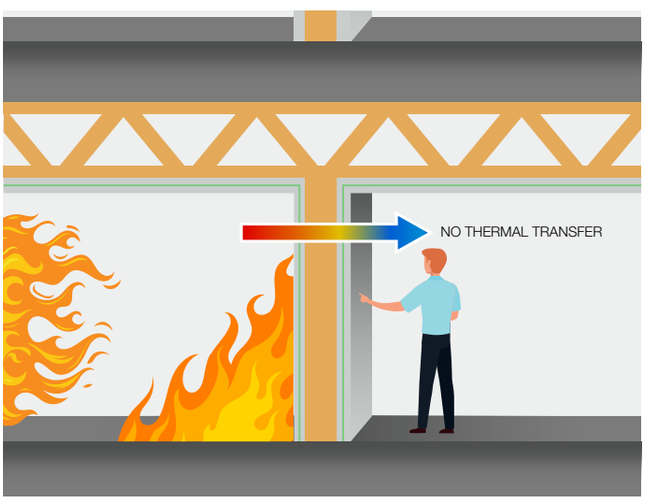
Precast elements are designed by specialists with experience in ensuring that the structure can be erected quickly and efficiently, often using standard lifting equipment. These offsite manufactured elements can be delivered with integrated services, ready clad, insulated and glazed if required, to save time on site and reduce further the number of following trades and save costs. Speed of construction and tight construction programmes are primary considerations in most building projects.



FIRE RESISTANCE

Concrete structural elements are known to have good inherent fire performance. Concrete is non-flammable, non-combustible, and more robust in fire than other structural systems as it can absorb a greater amount of heat before reaching critical overload.

Concrete simply cannot be set on fire. As it does not burn, concrete does not emit any environmentally hazardous smoke, gases, or toxic fumes. In addition, unlike some plastics and metals, concrete will not drip dangerous molten particles. Concrete also acts as an effective fire shield as its mass confers a high heat storage capacity while its porous structure provides a low rate of temperature rise.



ROBUSTNESS / SECURITY

The use of precast concrete creates a robust structure that reduces the risk of damage to finishes and gives a sense of security not necessarily felt in a lightweight building. Couple this with the reduced use of plaster board, we create a living space that can resist the wear and tear of everyday life, keeping repair and maintenance costs down, year after year.

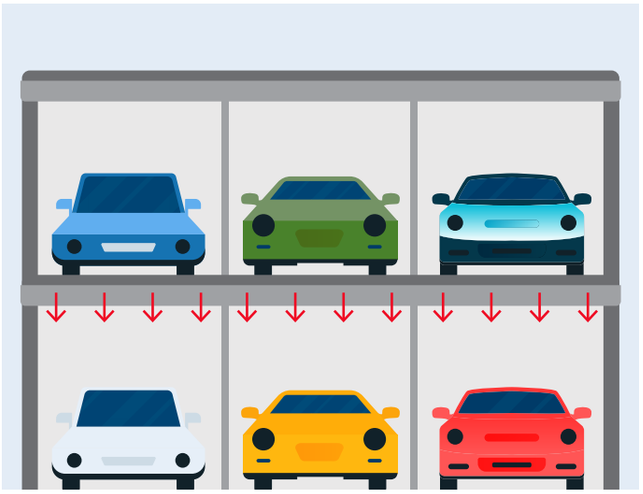
In the path of unpredictable and violent climatic conditions, concrete buildings offer their inhabitants added security from debris. Concrete's virtual impenetrability also contributes to community and personal safety, as it can withstand wilful damage and resist arson.

BENEFITS OF PRECAST CONCRETE

DURABILITY

Precast concrete offers exceptional durability and long life in any structure. Concrete structures built over 100 years ago are still in active service today, which results in the timescale for replacing a precast concrete building being up to twice that of other forms of construction; this durability, coupled with the energy efficiencies that thermal mass brings, means that pre-cast concrete has low whole-life cycle costs when compared to other forms of construction.

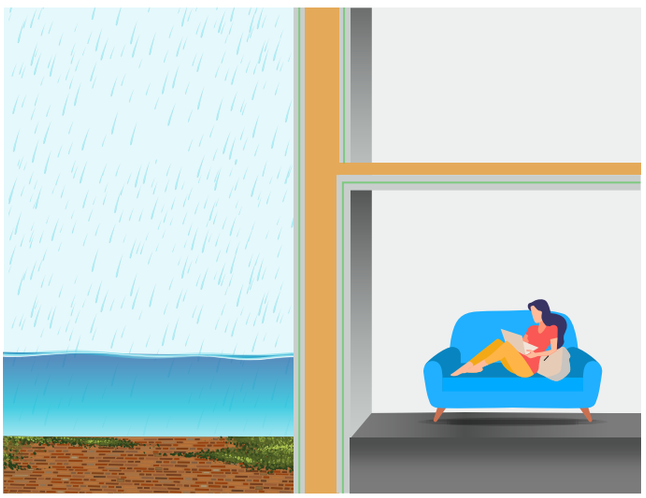
This longevity reduces disruption to the occupants and minimises breaks in any rental income stream for the building owners.



FLOOD RESILIENCE

Precast concrete has excellent flood resilience, maintaining its structural integrity during a flood event. Its density resists water penetration, reducing the impact of a flood on the fabric of the building, providing building owners and insurance companies with reduced repair time and costs associated with repairing flood damage.

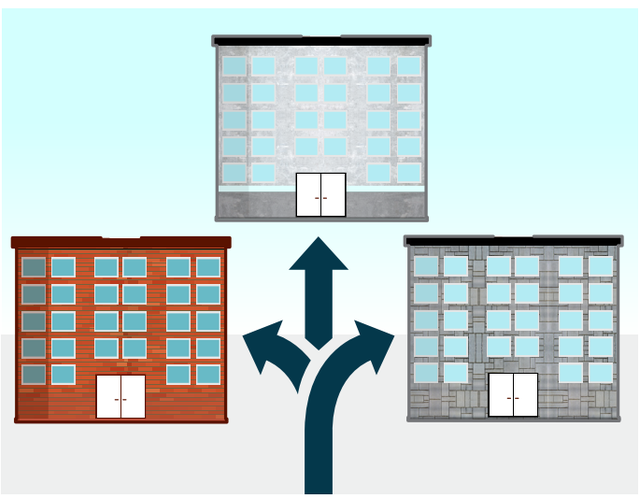
For occupiers, time away from the property is reduced. Precast concrete is the ideal solution when building in areas identified as being at risk from flooding.



FLEXIBILITY OF DESIGN

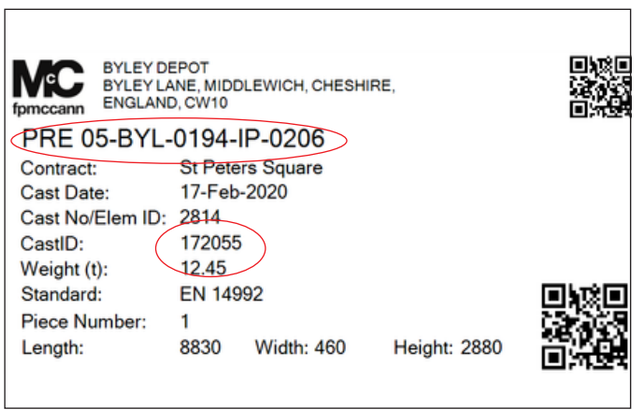
Architectural precast offers a wide range of colours and textures, often with mixes developed to resemble stone – hence the term “reconstituted stone” or “recon”. Specialist manufacturers offer samples for reference, using a wide range of combinations of aggregates, pigments and finishing techniques (such as acid-etched, grit-blasted, polished etc) as well as embedded surface materials such as stone, terracotta/ceramic tiles and brick.

Concrete can be formed into almost any shape. Precast concrete offers great scope for design, creativity, and material efficiency. Repetition of elements can make even complex shapes more affordable



PRODUCT TRACEABILITY APP

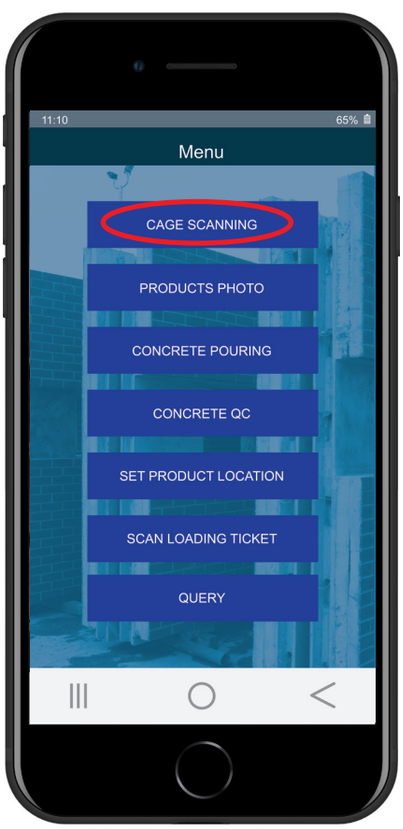
FP McCann's product traceability app is seamlessly embedded into our core manufacturing and quality systems enabling us to verify quality adherence live in the process. This enables us to provide our customers with electronic copies of all quality documentation. The foundation of the FP McCann product traceability app is a unique serial number for every piece cast: (Cast No/Element ID and computer generated 6-digit Cast ID).



Every product has its own totally unique serial number, and all quality and production records are captured at this unique serial number as it progresses through the business.

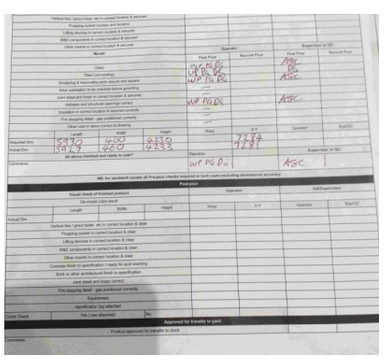
- The required documents are validated to have been uploaded daily at our morning meetings.
- Customer Packs are run straight from our main database containing all quality records captured from live electronic records as the product has moved through production - including pre-pour photographs.
- We record the batch(s) of concrete used in every product which link to the exact materials used and relevant concrete tests.

PRODUCT DOCUMENTS AND PHOTOS AUTOMATICALLY NAMED AND FILED ON NETWORK DRIVE

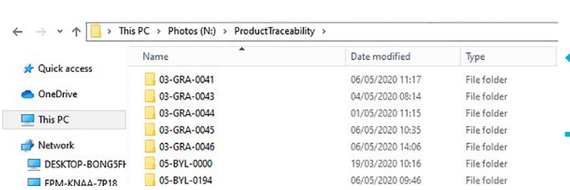


E.G. PRE-POUR PHOTOS

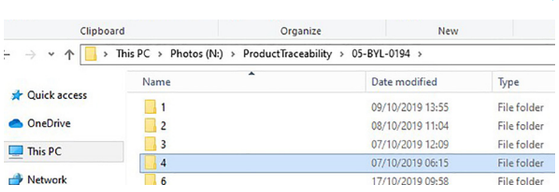
E.G. CHECK SHEETS



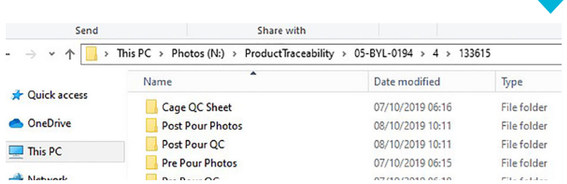
BY CONTRACT



BY ELEMENT



BY DOCUMENT CATEGORY



PRODUCT TRACEABILITY APP

Every serialised item is scanned onto the loading ticket to verify that only quality approved product and the correct quantity of product is scanned. Only then can the dispatch ticket be printed.

Customer
RUSSELLS - ST PETERS SQUARE DESIGN
05BYL 0194

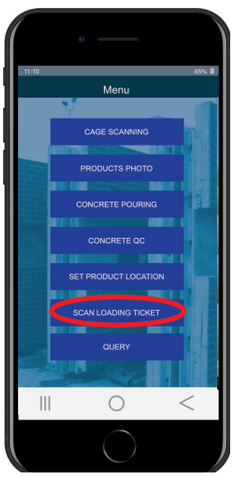
Customer Delivery Site
3 St Peters Square
3 St Peters Square

M2 3DF

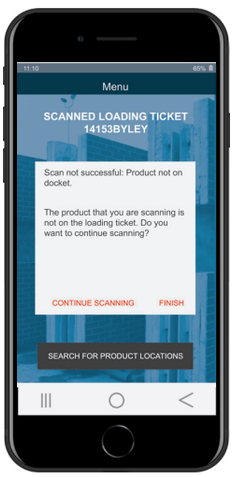
Despatch Depot
BYLEY DEPOT
BYLEY LANE
MIDDLEWICH
CHESHIRE
ENGLAND
CW10
016 06843500

Docket No. 14153/BYLEY
Cust Ord No. 16709/8020
FP Ord No. 269/BYLEY
Date 23-Jan-2020
Site Code
USED FOR AUTO DOCKET SCANNING KEEP CLEAR
DK: 14153BYLEY

Quantity	Product	Quality	Weight	
1	PRE 05-BYL-0194-IW-0284 Internal Wall 1080 x 250 x 2880	1 st	1.76	Loaded
	Special Product Notes:			
1	PRE 05-BYL-0194-IW-0283 Internal Wall 1250 x 250 x 2880	1 st	2.06	Loaded
	Special Product Notes:			
1	PRE 05-BYL-0194-IW-0275 Internal Wall 5420 x 250 x 2880	1 st	9.04	Loaded
	Special Product Notes:			



Scan loading ticket. Select "Search for Product Locations" (Can see location and QC Status)



Will not allow you to scan Products that are not in "Finished Goods", wrong Products or too many of a product.

fpmccann.co.uk

Delivery Ticket
Page 1 of 1

Customer
RUSSELLS - ST PETERS SQUARE DESIGN
05BYL 0194

Customer Delivery Site
3 St Peters Square
3 St Peters Square

MANCHESTER
GREATER MANCHESTER
M2 3DF
Contact :
-

Despatch Depot
BYLEY DEPOT
BYLEY LANE
MIDDLEWICH
CHESHIRE
ENGLAND
CW10
016 06843500

Docket No. 14153/BYLEY
Cust Ord No. 16709/8020
FP Ord No. 269/BYLEY
Date 23-Jan-2020

USED FOR AUTO DOCKET SCANNING KEEP CLEAR
DK: 14153BYLEY

Quantity	Product	Weight	CE Cat. No.	Always Ensure Your Load Is Secure
1	PRE 05-BYL-0194-IW-0284 Internal Wall 1080 x 250 x 2880 Elem ID: 2775 *EN 14992			
1	PRE 05-BYL-0194-IW-0283 Internal Wall 1250 x 250 x 2880 Elem ID: 115 *EN 14992			

Unique element ID's captured on the Dispatch ticket. Cannot print Dispatch ticket until all the products are scanned onto it.

REAL LIFE FIRE TESTING

Real life scenario fire tests conducted by Ulster University and FP McCann documenting the robustness, Sustainability, and fire resisting qualities of precast concrete sandwich panels as a construction method. FP McCann's Insulated Precast Sandwich Panels are a fire-resistant non-combustible solution for robust and sustainable external Facades.

FIRE PERFORMANCE & FUTURE WORK

The insulated precast sandwich panels contained the fire while maintaining their structural integrity despite being exposed to multiple fire scenarios. Although explosive spalling on the exposed surface of concrete was observed during the tests, this spalling was relatively small and would have required limited remedial work. During the tests, the PIR insulation core of the sandwich panels remained encased within the layers of the precast concrete. The outer concrete layers, due to their low thermal conductivity, protected the PIR insulation core from direct exposure to heat and flames.

As a result, the PIR insulation core remained unharmed. FP McCann has initiated an intensive study to realise the behaviour of insulated precast sandwich panels exposed to fire. Furthermore, a successful KTP project between FP McCann and FireSERT at Ulster University provided a scientifically fire rated precast solution with the aim to ensure the safety of occupants and properties where the insulated precast sandwich panels are used for building and construction purposes. FP McCann aim to build a better, safer future and would encourage other manufacturers to follow a similar testing schedule incorporating real life scenario fire testing.

THE FIRE TEST

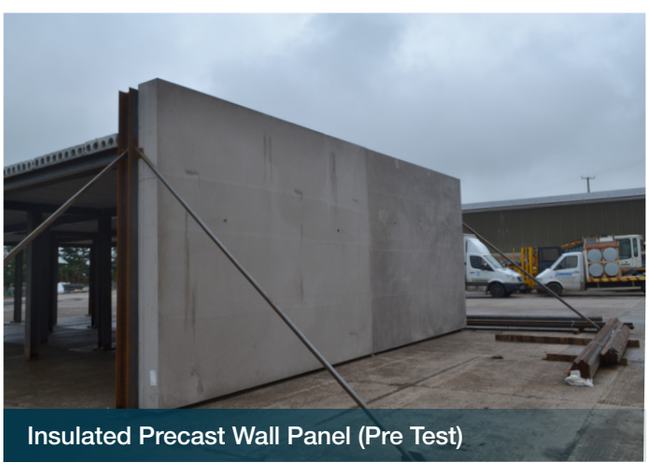
As a part of a major international research initiative dealing with the influence of travelling fire in a large open compartment, three large fire tests were conducted by Ulster University sponsored by the Research Fund for Coal and Steel (RFCS) under the TRAFIR project. In this project FP McCann was a local sponsor with a research interest to investigate the behaviour of FP McCann's insulated sandwich panels exposed to fire used as essential precast wall element in the compartment fire tests.

These panels were installed along one side of the test compartment and detailed instrumentation was applied to monitor the temperatures in the wall panels and in the test compartment. The instrumentation consisted of thermocouples, which were provided to record the temperatures in the inner and outer concrete layers as well as in the insulation layer of the precast sandwich panels.

The insulated precast sandwich panels were exposed to three fire scenarios and their behaviour was monitored. Timber was used as fuel due to its excellent combustibility. During the fire tests, temperatures in excess of 1000°C were recorded in the compartment. Also, special attention was paid to the fire resistance in terms of the fire exposure from the outside to the inside of the insulated precast wall panels. This was achieved by exposing the outer concrete layer with lower thickness to the elevated temperatures.

SCAN ME!

SCAN THE QR CODE TO VIEW OUR FIRE TEST VIDEO

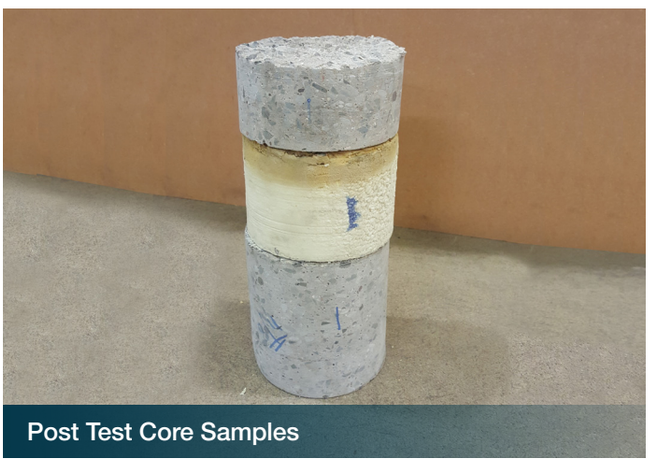


Insulated Precast Wall Panel (Pre Test)

Insulated Precast Wall Panel (Post Test)

REAL LIFE FIRE TESTING

Ulster University



Post Test Core Samples

Post Test Core Samples