#05
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iNFORMER

YOUR QUARTERLY FRC NEWS & TECHNICAL UPDATE FROM iNFORCE

THIS ISSUE

THOMAS BROTHERS PACKHOUSE AND COOL STORE PROJECT

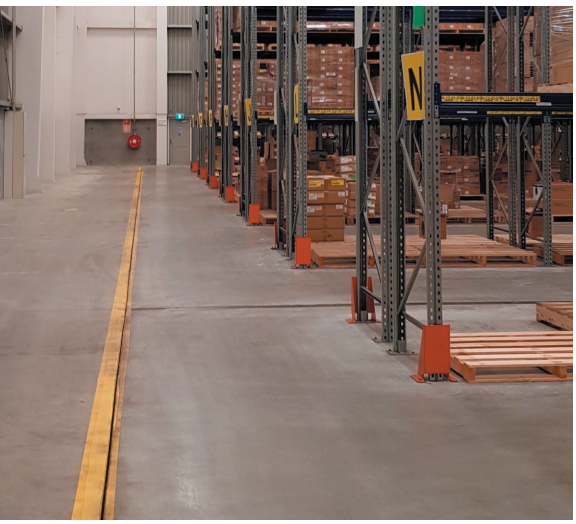
Early in 2019, the team at Inforce were engaged by Tuatara Structures to design and optimise the floor slabs for 5500m2+ of pack house and cool storage in Riwika, Motueka. Facilities like this provide some interesting design considerations from temperature differential of the slab, high repetition of forklifts and intensive pallet racking. We worked with the team at Tuatara to provide a full design service for both internal and external slabs. This facility had two separate structures, (cool storage and packhouse) connected by a large canopy and bin storage area.

The scope in this project was to provide an optimised slab design that provided benefits during construction like speeding up the build programme and reducing slab reinforcement costs. Our final slab design consisted of a steel fibre reinforced floor slab (no steel mesh reinforcing) for the Packhouse and Cool Store internal slabs and a structural synthetic reinforced slabs for the canopy and yard slabs.

TAUPO LAKEFRONT PATHWAYS

Inforce were pleased to provide the design for the footpaths around the Taupo lake front. We designed this using our Radforce structural synthetic fibre reinforcement to replace the steel mesh, lowering costs and speeding up construction.

FIBRE ONLY JOINTLESS FLOOR SLAB



Utilising fibre reinforced concrete concrete provides the opportunity to remove all sawn joints from the internal floor slabs and creating jointless floor panels as large as 30x30m (900m²) interconnected with steel joints while being as cost effective as a conventionally reinforced slab yet with much higher performance.

Our design team can optimize your slab designs providing sign off and onsite support as required.

THE WAREHOUSE GISBORNE

With over 10 years in service, this steel fibre reinforced slab in Gisborne is still providing The Warehouse with an excellent yard slab handing shipping containers and heavy truck movements.

STRUCTURAL SYNTHETIC FIBRES IN MARINE ENVIRONMENTS

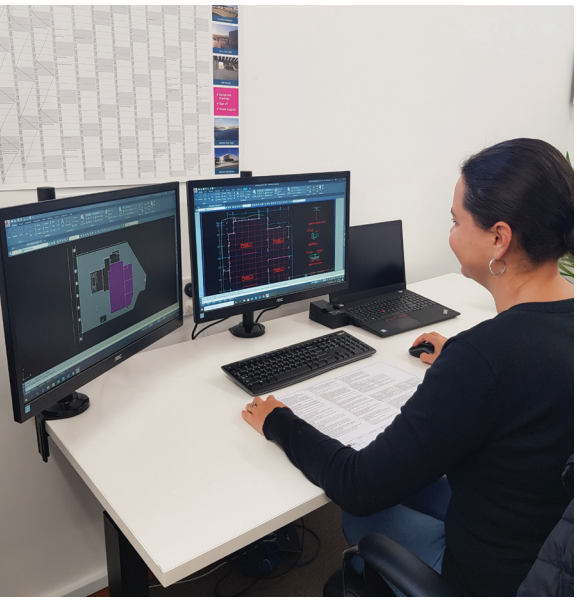
During the scoping phase of a project, we look at what type of reinforcement will be best suited for the project in question. We often turn to fibre reinforcing as it is well estab- lished that it provides superior reinforcement in a concrete slabs where there are corrosion risks with the 544th Commi -ttee of the ACI saying...

"Since the fibers are short, discontinuous, and rarely touch each other, there is no continuous conductive path for stray or induced currents or currents from electromotive potential between different areas of the concrete. Short length fibers do not debond under thermal cycling, although such debonding can occur with conventional rebar or mesh reinforcement. Since the corrosion mechanism occurs in debonded areas, [steel-fiber-reinforced concrete] has improved durability over conventional reinforced concrete...."

One of the most effective forms of corrosion prevention in a slab is through the use of a macro structural synthetic fibre (Radforce) which is designed to be a direct replacement for secondary reinforcement in a slab. Being synthetic, this fibre has zero corrosion potential and with a minimum of 550MPa tensile strength, provides improved ductility in the post-crack region and flexural toughness of concrete.

Radforce macro synthetic fibre is very commonly used in marine environments at a dose rate of 3-4kg/m3 in slab on grade ,providing exceptional results over against conventional mesh or rebar reinforcement. Tests, undertaken by various investigators, simulating sea water conditions was recently reviewed (Yin, et. al., 2015) and the following extract noted..

'When macro structural synthetic fibres were exposed to an- ionic environment of sodium and chloride ions created by salt water at different temperatures of 71 C and 7 C for six months, the tensile properties of these fibres remained unchanged. Other experiments in simulated saltwater conditions for 33 months found that the rate of stiffness reduction was only 2.34%. It was concluded that structural synthetic fibres provide better durability (compared with steel mesh or rebar) for non-structural applications in the saltwater environment'



BEAM TESTING

Our technical team have been working with WSP NZ on the testing of various fibre mixes and designs. With so many fibre types, shapes, sizes and strengths available across the world, each providing different characteristics, we gain valuable insights into the performance of a range of these fibre types in different applications. This gives us the ability to design using the best performing fibre type to suit the application.

Testing actual mix designs used in construction around NZ, provided by concrete batching plants and working with independent accredited labs, is critical in ensuring we are getting accurate data on the various reinforcement we use at iNFORCE to design and optimise our slabs and pavements.

• DESIGN
• SPECIFICATION
• CONSTRUCTION SUPPORT

Talk with the INFORCE design team to discuss how we can best optimise your slab design providing you with full design service, specification including construction drawings and onsite support for construction teams as required.

CONCRETE DELAMINATION

Delamination generally affects tightly troweled floor slabs & is manifest by the separation of a thin surface layer of concrete from the rest of the slab (typically between 2 – 5mm) resulting in blistering, surface cracking or flaky areas. The impact of delamination is ongoing deterioration, reduced serviceability & a visually impaired slab.

Delamination is generally a result of three main causes.

- Non-uniform placement, bleed rate and setting times.
- Surface Bleed Evaporation.
- Finishing process beginning too early.

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OUR SUPPORT DOESN'T STOP AT THE DESIGN PHASE

Slab pre-pour inspections and meetings with all relevant parties, well in advance to the pour date, are critical to the success of any project. The best slab design, detailing and planning can all come undone very quickly when all parties are not singing from the same song sheet when executing. That's why the project team at iNFORCE put so much emphasis on the finer details of a slab design including onsite visits and assisting in managing the project right through to completion.

CONTINUED: CONCRETE DELAMINATION

How delamination comes about: During the early stages of placing concrete, it is crucial that the areas are placed in timely order. The supply of concrete must be consistent (no long delays between concrete loads, no variance in mix design, no extra water introduced to certain loads). Consistency of supply allows for a uniform setting and bleed rate allowing the finishing to be completed in a consistent manner across the slab. The finishing process should follow the path of the concrete placement. Keeping the supply and placement consistent will prevent areas from being sealed off before the bleed process has completed.

Environmental factors can play a significant part in the cause of delamination. Extreme heat/winds, cause fast evaporation of the bleed water, deceiving the placers into thinking the surface is dry and firm enough to begin the finishing process before the bleed is complete.

Sealing the surface before the bleed has completed causes free water to be trapped within the slab. This causes a high water/cement ratio decreasing the strength of the concrete, resulting in delamination.

Delamination is generally not recognised until late in the finishing process when troweling is complete and final passes are underway. Sometimes it may take weeks to recognise. Detecting delamination is generally achieved by dragging a chain or similar tool over the surface and listening for the hollow sounding areas. A hollow sounding area signifies delamination. Delamination can cause cracking, blistering, flaky patches once under load/pressure resulting in an unserviceable and visually impaired slab.

NORWOODS SHOWROOM AND FACILITY

Our team were pleased to be involved in this awesome facility in Palmerston North. With a substantial workshop, an impressive showroom and a large yard slab for machinery this made for an exciting project to be apart of, helping our client to optimise all the concrete slabs, utilising steel and synthetic fibre reinforcing.

LOWERING REINFORCEMENT COSTS AND INCREASING SLAB STRENGTH

With the rising costs and supply challenges of steel mesh reinforcing, our team are constantly looking at how we can further help our clients reduce their slab construction cost though optimised designs.

By utilising the benefits of fibre reinforcing in our slabs, we have been able to substantially lower the costs of slab construction by as high as 30%. While increasing the load bearing capacity and flexural strength of the slab and increasing the long-term durability, we are able to reduce the over all cost, speed up the slab construction and remove the H&S issues associated with steel mesh reinforcement.
Talk with one of our design team to see how we can help you combat the ever-rising costs of steel mesh reinforcement.

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SIMPLIFY WITH CONFIDENCE.