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CASE STUDY

Overview

What is Concrete Jacketing & Why is it used.

Jacketing is a technique used to increase the strength of existing structural members (Columns, beams etc.) by providing a “Jacket” of additional material around the existing member.

This additional material in this project was shrinkage controlled, polymer modified, fluid micro concrete. A steel reinforcement cage was constructed around the damaged section onto which cast-in-place micro concrete was placed.

Concrete jacketing is needed to increase bearing load capacity following a modification of the structural design or to restore structural design integrity due to a failure or expected failure in a structural member. This technique is used on vertical surfaces such as walls, columns and other combinations such as beam sides and bottoms.

Project Details

Jacketing & Strengthening of control building columns / foundation at Lekhwair & Khulud for Petroleum Development of Oman.

Client : Petroleum Development of Oman

Contractor: M/s Arabian Industries Projects LLC

Consultant : M/s Triad Oman Engineering Consultants

Product : Fosroc – Rendroc Laxtra
Fosroc – Lockfix
Fosroc – Nitobond EP

Concrete Repair / Jacketing

Strengthening of Control Building, Columns / Foundation at Lekhwair and Khulud.

The construction of the Foundation and Columns had been completed. After the concrete was cast, the compressive strength of the concrete was found to be not up to the required level. M/s Arabian Industries Projects LLC appointed M/s Triad Oman Engineering Consultants (TOCI) to check the strength and serviceability of the existing structure.

After a series of testing and analysing M/s Triad Oman Engineering Consultancy recommended Reinforces Concrete Jacketing(RCJ). RCJ has been considered as one of the important methods for strengthening and repairing of RC beams. Jacketing of RC beams is done by enlarging the existing cross section with a new layer of concrete that is reinforced with both longitudinal and transverse reinforcement.

Reinforced concrete jacketing is constructed with cast-in-place micro concrete. The method involves the addition of a layer of reinforced concrete in the form of the jacket using longitudinal steel reinforcement and transverse steel ties outside the perimeter of the existing member. The jacketing with cast-in-place concrete demands the installation of formwork around the existing column, on which the formwork is tied so that to withstand the poured concrete.

The preparation of the surface of the existing member is critical with jacketing. It is essential that the existing member has a clean, sound concrete base, in order to achieve good bonding conditions with the jacket. The connection of the new and the existing concrete is further enhanced with the roughening of the surface and the introduction of steel dowels. Resin bonding agent was also recommended in certain conditions.

The new vertical steel bars and stirrups of the jacket were then installed according to the designed dimensions and diameters, paying particular attention to the good closing of the hoops. Because of the significant increase in the stiffness of the new member with respect to the existing one, and in order to avoid stiffness discontinuities, the jackets need to cover the entire length of the member. This means that at the ground story the column jackets should not stop at the ground floor level, but rather they should be extended until the upper surface of the footing, where the longitudinal rebars are anchored inside the existing footing with epoxy resins.

Material approved and used for jacketing

The structural consultant M/s Triad Oman Engineering Consultants proposed the use of construction chemicals from Fosroc (construction chemical manufacturer). All information with regards to the product properties, third party test reports and performance reports were provided by Fosroc to get approvals.

Micro Concrete for Jacketing

Approved product was Fosroc – **Rendroc LA Extra**

Shrinkage controlled, polymer modified, fluid micro concrete for structural repairs of all types. Renderoc LAXtra is suitable for mass infill to structural repairs in all types of load bearing situation. Repairs soffit where heavy load bearing is required, Repairs to restricted access areas, where use of hand applied mortars would prove impractical, Repairs requiring high fluidity, Any repairs requiring significant levels of loadbearing.

Epoxy Anchoring of Rebars

Approved product was Fosroc – **Lockfix**

Mix and place polyester resin anchoring grouts. High strength corrosion resistant heavy-duty anchoring. These anchors include bolts, tendons or dowels in drilled or formed holes located in concrete masonry, brickwork or natural rock. Permanent installation of reinforcement starter bars, foundation bolts, barriers and safety fences, railway tracks, ground anchors for towers, cranes, dock sills etc.

Epoxy Bonding Agent (where required)

Approved product was Fosroc – **Nitobond EP**

For bonding fresh wet cementitious materials to existing cementitious surfaces. For use on horizontal surfaces or on vertical surfaces where mortar or concrete can be supported by formwork. The long ‘open’ life makes it suitable for use with formwork or where additional steel reinforcement has to be fitted.

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Surface preparation was done mechanically and chemically to clear the surface of pre-existing coatings, residue, surface imperfections and provide a good bond to the micro concrete. Mechanical abrasion was done with scarifier and to ensure additional bond epoxy bonding agent was used.

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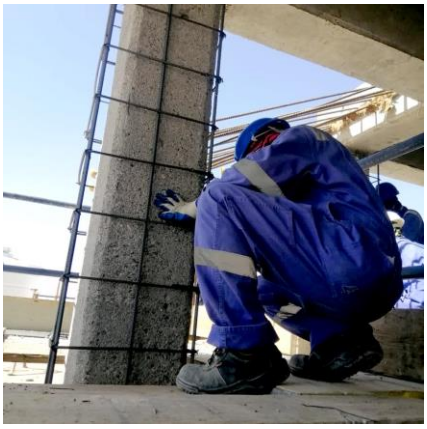




Dowell bars were anchored with epoxy anchor grout and steel reinforcement and transverse steel ties outside the perimeter of the existing structure were provided as per the structural consultant's requirement and drawings. Special care was taken in fixing the shutters as it needed to be watertight to avoid grout loss. Specialized mechanical mixers were used to mix the micro concrete. Pouring and curing the micro concrete were done as per the manufacturer's recommendations.

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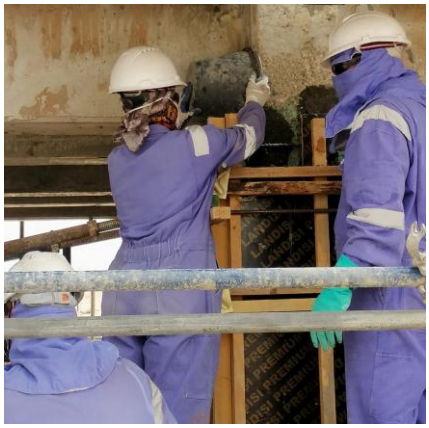
Lakhwair – Site Photos









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Khalud – Site Photos









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Khalud – Site Photos

To ensure the quality of the micro concrete used the Client and consultant requested for block to be made for testing. For every batch of micro concrete block were made cured and labeled for testing.

Challenges

The project was in the interior parts of Oman under PDO and was 450 Km away from the capital. All personals mobilized for this work needed to have a PDO passport (training certificate) and all required HSE certifications. The heat in the desert made it difficult to maintain work progress. Due to this the works schedule had to be regularly updates and milestone shifted.

Manufacturers Support

Fosroc through their Oman distributor Al Amana provided all the necessary support right from planning to site visits during execution of works. The material supply as regular and any urgent material or support requirement was delt with high level of efficiency.

The Client, Consultant and Contractor were please with the way the project was executed by us.

Specialized Application

Abu Anas LLC is specialized in flooring, Waterproofing, Concrete Repairs, Thermal Insulation, and Decorative flooring application in Oman. Our team is regularly trained by leading manufacturers on existing and new systems.

Contact us at www.abuanas.om or mail us at info@abuanas.om, call 00968 91145302