Total Precast Solutions for Large Villa Developments in the UAE - A Case Study

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In the United Arab Emirates, Precast is the construction technology of choice for many large development projects that include Airports, Schools and Universities, Shopping Centres and Commercial Buildings. However, over the past few years it has been observed that the biggest demand for Precast Technology has been coming from the housing sector, which caters to the needs of UAE Nationals as well as the growing expatriate population. In order to meet this huge demand a large number of villa developments were planned for which, execution Time, Quality and Cost saving are critical factors that can only be met through the use of Precast Technology.

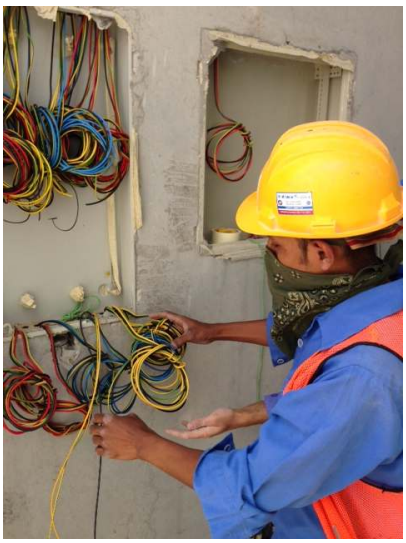
The United Arab Emirates is one of the world's leading countries for Precast Manufacturing, with a recognised expertise over decades. Gulf Precast, the national Leader for Precast, has produced, erected and executed more than 3,000 large villas since 2011 at different locations in the UAE. Gulf Precast is also actively expending abroad including prospecting the Asian market. Of late It is not only the

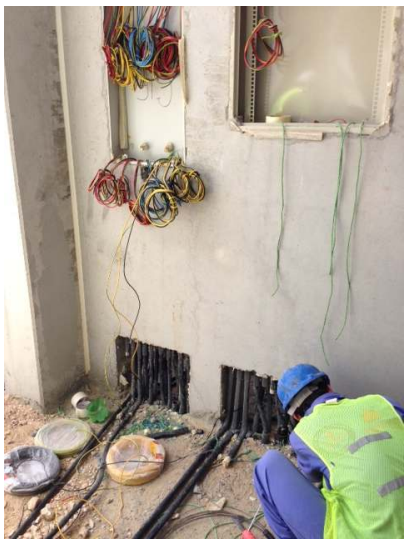
Precast Site Installation for the Al Falah Housing Complex

developers and main contractors who are recognising the critical advantages of the Precast Technology to successfully answer the housing needs, but it is also the policy makers who are waking up to the many benefits of Precast and actively encouraging the construction industry to maximize the use of the Technology.

On the 26th of May 2015, the Federal Demographic Structure Council of UAE issued a report stating that it "encourage(s) the use of modern methods of construction using prefabricated components manufactured in modern factories and then assembling these components at the construction site using a minimum number of laborers and with a high level of quality." It added that "prefabricated building components are manufactured in a perfect environment and using advanced methods and modern devices with easily controlled high quality specifications. Studies also revealed that adopting the standards proposed in the 'Building Design Efficiency Index' contribute to reducing cost by 10% and increasing the speed of delivery. It is also expected to save almost 30% construction time compared with the traditional methods, in addition to reducing the number of workers at construction sites."

Through the vast experience of Gulf Precast in executing large villa complexes, this paper based on three case studies, will explore the reasons for such a unanimous perception that Precast Technology is the best solution for such projects and will highlight the benefits that can be expected by both the developer and the community at large.





MEP inserts imbedded in the Precast Elements in Al Ain Emirati housing complex

In 2011, Gulf Precast was requested to design, manufacture, install and hand over 2,069 villas comprising of Insulated Precast Walls, Hollows Slabs and GRC Decoration Elements, as well as 310 kilometres of Boundary Walls, 45 Electrical Substation and 1 Mosque in the Al Falah Community housing complex, to cater for the housing needs of UAE Nationals. In 2014, Gulf Precast executed the construction of 850 villas and 100 kilometres of Boundary Walls in the Al Ain Emirati housing complex, as well as 510 villas in the Meydan Heights housing complex in Dubai. Currently, Gulf Precast is in the initial stage of construction of 400 villas in Ruwais in the western region of the UAE, to cater for the housing needs of Oil and Gas employees.

The first critical factor for selecting Precast Technology is certainly the speed of construction. In the Al Falah Community development, Gulf Precast alone was handing over 5 large villas every day. Other Precast manufacturers were also involved in the development, increasing furthermore the speed of construction. Interestingly, part of the overall 5,000 Villas development was awarded to contractors using traditional methods of construction, and part to Precast manufacturers. During a presentation made in 2013, the Project Management consultant of the developer stated that the Cast-

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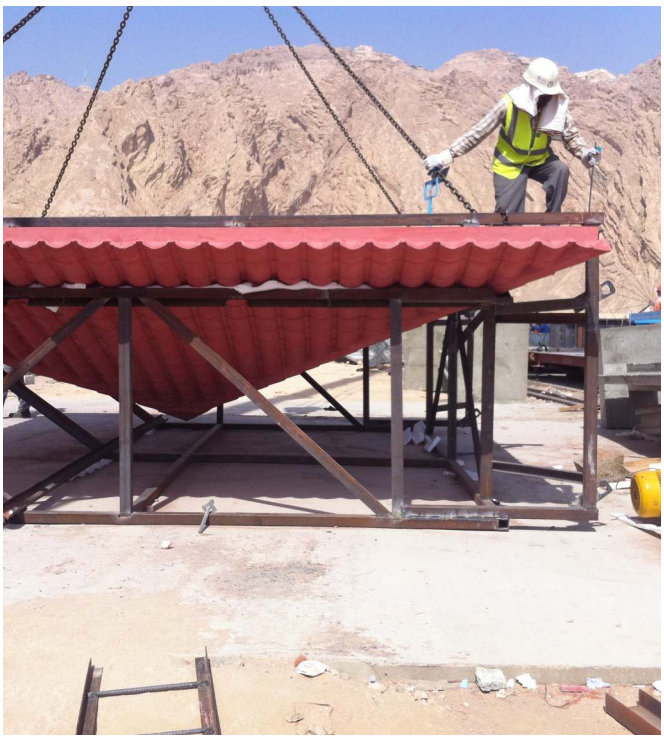
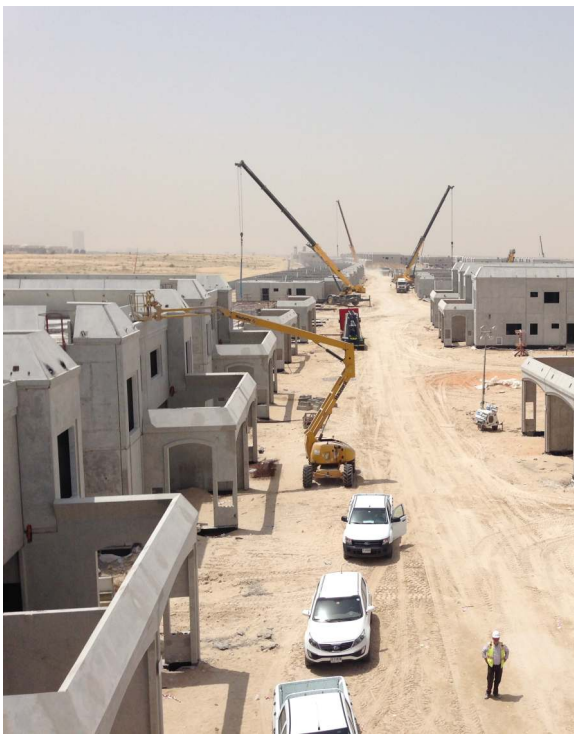
> **Federal Demographic Structure Council, UAE**

On-Site Semi-mobile production plant in Al Falah community development, producing columns for Boundary Walls



On-Site Semi-mobile production plant in Al Ain Emirati housing complex, producing GRC slopped roof too large to transport by roads



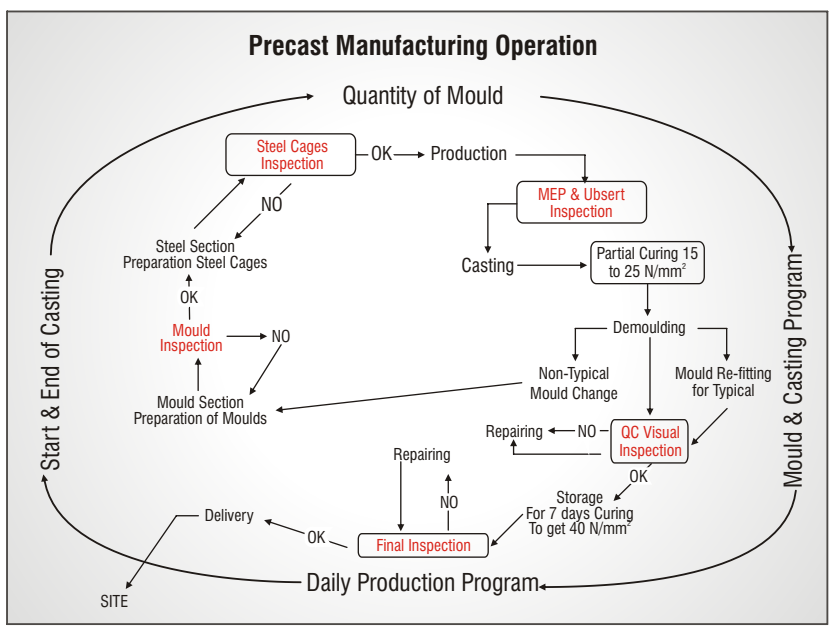
Site Erection works on the Meydan Heights housing complex

in-situ contractors executed 730 villas in 20 months, while the Precast contractors executed 4,126 villas in 24 months. He added that Precast companies used one fourth of the onsite manpower per villa when compared with Cast-in-place construction and that on-site Precast works was much more clean and without the requirement of lifts and scaffoldings.

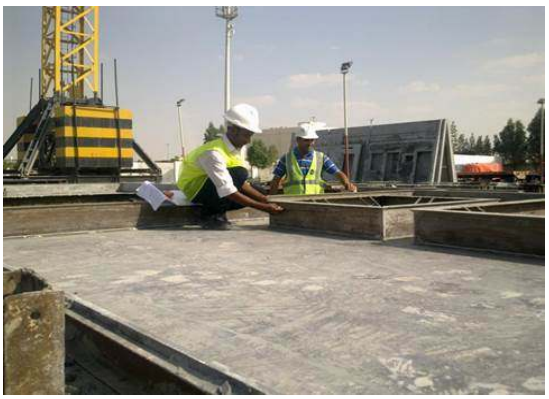
On the Meydan Heights housing Complex, Gulf Precast was asked to participate in the development while another Precast manufacturer was already on board, which limited the design work to the verification and fine-tuning of the shop drawings. We signed the Letter of Intent on the 10th of June 2014; we started the erection works on the 23th of June, reached 1 floor per day on 14th of July, 2 floors per day on the 23rd of July, 2 villas per day on the 16th of August and 3 villas per day on the 31rd of August 2014.

The additional progress speed noticed in developments using Precast Technology is not only limited to the speed of the Precast Erection process, it also generates valuable time saving for subsequent trades. As the production is standardized and controlled in a factory environment, the time required for doors and windows installation is minimised as opening sizes are consistent throughout the development. In addition, precast shop drawings are fully coordinated with MEP drawings which are incorporated within our design. The MEP contractor delegates his team in the Precast factories and places the MEP inserts in the Precast Moulds prior to casting. Therefore the MEP works on site are limited to plugging in equipment into the inserts available in the Precast elements, ensuring fast and reliable on-site work.

The speed in which a Precast manufacturer can deliver a project is linked to its production capacity. With 7 fixed production plants in the UAE, including a specialised Plant for Hollowcore slabs production and one for GRC production, Gulf Precast has the largest production capacity in the country and is able to cater for very large developments. In addition, if the project size requires it and if the space

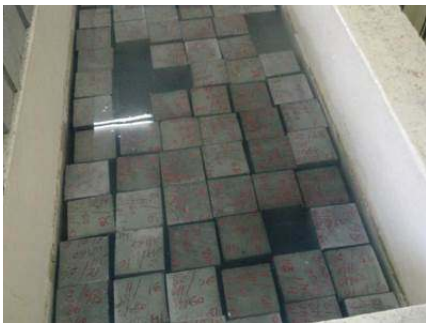


Precast manufacturing cycle and Quality Inspections



Mould Inspection

Inspection before Casting



Cubes Curing

Cube Crushing

Final Inspection

on-site is sufficient, we routinely set-up a semi-mobile plant directly on site to further increase our capacity and reduce transport costs. These on-site semi mobile plants produce Precast elements which are comparatively easy to produce, such are columns and panels for Boundary Walls or utilities which do not require embedded insulation, or which would be too large to transport through roads.

The second most important factor for selecting Precast Technology is Quality. Precast is manufactured in a factory environment where quality assurance and controls are strictly implemented throughout the production cycle. An independent quality assurance and control team is incharge of double-checking the process performed by a very experienced team in line with stringent international standards. It is to be noted that for large housing developments, the consultants are generally hosted in our factory premises throughout the duration of the project, and attend the quality verification points along with our in-house quality team. In some projects the consultants are even physically signing on each Precast element before it leaves the factory ground.

This ensures the quality of the elements reaching the site, limiting additional site inspections to the erection process itself and ensuring timely handing over to the Main Contractor. In contrario, cast-in-place inspections take place mostly on-site, and may entail either time consuming rework or a trade-off on Quality against mitigated time delays to the development. The fact that the required insulation layers as well as the MEP inserts are embedded within the Precast elements themselves, also provides an added value in terms of Quality.

Just in time delivery in MeydanHeights housing complex

Quality of Precast work at site is highly dependent on the ability of the Precast contractor to deliver the just in time delivery of the Precast elements. If the logistics of loading the elements on the trailers in the factory, delivering them at site and assembling them immediately is not perfectly coordinated, Precast elements may be left lying around, creating delays to the site works, safety hazards and running the risk of these elements being hit by heavy equipment roaming the site. This is even more critical when hundreds of villas are concerned, with several dozens of them under different stages of parallel execution at any point in time.

In order to overcome the challenge of

Bar coded Hollowcore slabs leaving the factory ground

just in time delivery, Gulf Precast has implemented an ERP system covering the full cycle of its value chain. The Engineering department records the Elements to be produced against the time plan prepared by the Planning Department in agreement with the client. The elements to be produced are then assigned to one or several production plants, and daily casting is scheduled accordingly in the system. Once the elements are produced, they are bar-coded and recorded in the application. The site management consults the factory stock in the system and enters delivery requests in the application based on site requirements. Logistics arrange the required trailers accordingly and the elements are loaded and scanned before leaving the factory ground. They are then scanned again by the site crew once assembled on site.

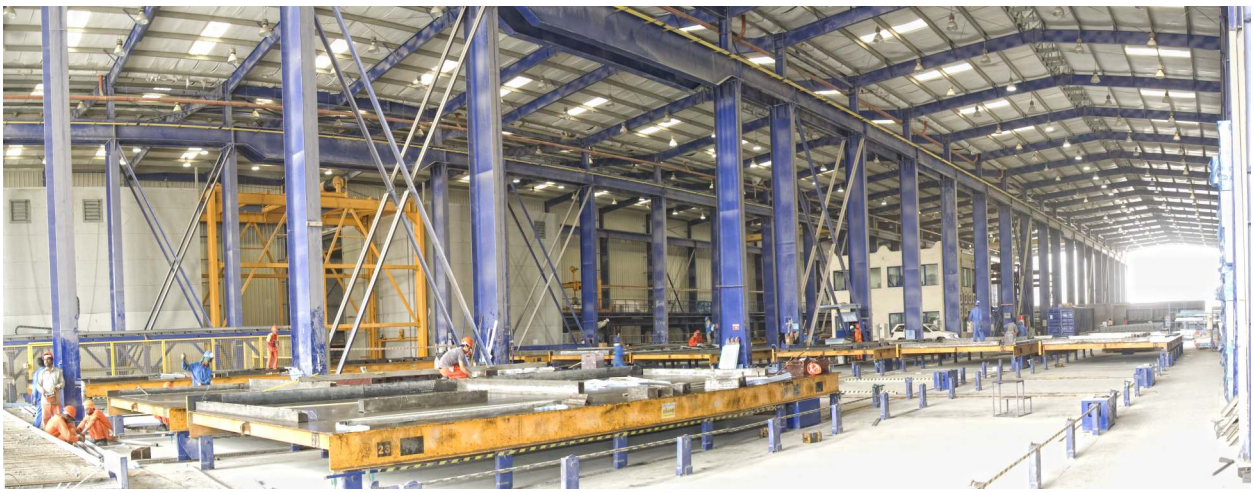
In addition to Time and Quality, an important factor for the developer is the Cost. As the cost of mould manufacturing is a large portion of the overall cost of production, Precast use can generate substantial cost saving in any project with a high number of repetitions in the type of elements. This is certainly the case for large housing complexes. However, the developer has to take a call between maximising the cost saving by limiting the different types of villas or increasing the number of types and mixing them together to avoid the "boredom" of a too monotonous development. In Al Falah Community housing complex, for example, the developer opted for less monotony by deciding on an asymmetrical layout and by mixing 18 different types of villas throughout the development. This meant that many Precast manufacturers did not have the capacity to handle all these types at the same time. Only Gulf Precast with its large capacity was able to handle 18 different sets of moulds concurrently. In Al Ain Emirati housing complex and Meydan Heights housing complex the Developer opted for a more rectilinear positioning and a limited number of villa types, maximising the opportunity of cost saving triggered by the use of Precast. Whatever the option selected, if the housing complex is large enough, Precast Technology will definitely generate cost savings if compared with traditional construction.

However, the most important aspect of cost saving through Precast use is not related to the cost of construction. It is related to the additional income resulting from an early occupancy and to the reduction in the cost of operation and maintenance. As the construction time is reduced, the Developer is able to collect revenue much sooner than with traditional construction. As the Quality is higher the maintenance cost of the Precast structure is virtually inexistent and as the insulation system is embedded within the elements themselves, the energy saving has a positive impact on the operating costs.

Therefore, there are many key advantages considered by the developer when selecting Precast Technology for a large housing development. But the advantages of Precast are not limited to the developer; they also include important factors for the community.

Sustainability, defined as the ability to meet the needs of the present without compromising the ability of future generations to meet their own needs, is certainly an important one. Precast constructions are built to last. For all our projects we offer a decennial warranty. In some our projects we even provide a 100 year warranty. Over more than 30 years' of work and thousands of projects executed, Gulf Precast has been asked only once to

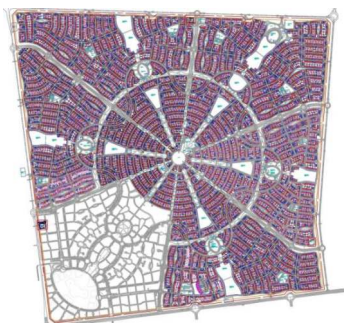
Bar coded Precast Panels after erection in Al Falah Community housing complex.



One of Gulf Precast's factories

act on that warranty and that for a very minor issue. The sustainability of Precast construction both during the construction stage and during the occupation stage is well known by the developers who can claim a high number of credits on international standards of sustainability such as LEED based on the use of Precast.

In addition, Precast is a much safer way of executing a development than traditional construction due to the fact that 70% of the work is performed in a stable factory environment and not on a construction site where the environment is forever changing. Employees have been working for years in that environment and are fully aware of its topography and its potential risks. In addition potential risks are well identified and training on accident prevention is routinely performed. In fact, many Precast manufacturers such as Gulf Precast hold international certifications for Quality, Environment as well as Safety, and regular health and safety risks assessments of the production environment are performed and fine-turned over time, with refined control measures.



Al Falah Community housing complex master plan

In addition, 70% of the work is performed in the factories, the manpower transportation to the place of work is reduced and thus reducing road accidents risks, pollution and road traffic. But the most important safety aspect is that nearly all factory work takes place on ground level and not at height, thus reducing risks of falling accidents.

Another important factor for the community is that Precast raises the qualification of the workforce. Contrary to traditional construction where workers are often hired for the duration of a specific Project and off-hired at the end of the project, employees of the Precast industry are generally retained for a long period of time. In Gulf Precast, both workers and staff are staying with us for 6 years in average. During that period, employees are trained and nurtured and are provided with opportunities of promotions based on performance.

As the potential benefits of Precast Technology for both Developers and the Community are undeniable, it still requires a high level of expertise. Over 30 years, Gulf Precast has perfected its technology and processes to meet consistently the most stringent requirements in a country where developers and community expectations in terms of performance and sustainability are continuously rising. We are currently expanding outside the United Arab Emirates and setting-up 3 factories in Saudi Arabia and soon in Algeria. In line with our expansion strategy, we are also exploring the Asian market, with the aim of utilising our expertise to set up production plants on location, while still capitalising on our UAE based knowledge and support.

For further information, consult www.gulfprecast.ae or email us at estimation@gulfprecast.ae ◆

Al Ain Emirati housing complex master plan