

Buildability review of LadderBlock system

1) Scope of review

Overall review of the buildability and advantages of using the proposed LadderBlock building platform system, using locally available manpower and resources for future building projects in the Middle East environment.

This brief review and report will focus on the practical advantages of using LadderBlock for the construction of typical building projects with the assumption made that the design and economic benefits of using LadderBlock have already previously been taken into account under separate reviews.

2) Building System

LadderBlock is a proprietary building system which uses pre-engineered and pre-manufactured standard typical pre-cast components manufactured with reinforced concrete, that are easily transported, erected by crane and cleanly fixed together by “through bolt” connections, all assembled and erected during a short period of time using a relatively small team of personnel on the construction site.

3) Safety

In general safety risks could be significantly reduced due to the absence of any labour intensive work activities on site.

Less congestion on site with Plant and equipment would provide a cleaner and safer site environment. The absence of construction debris on site will result in reduced safety risk of trips and falls.

Using a pre cast system such as LadderBlock minimises risk of accidents often associated with temporary works support failures such as decking and propping used on traditional types of insitu construction

The method of erection and the secured LadderBlock components that form the modules, would allow early safe stability of placed elements. Therefore minimising risk of collapse during construction due to possible inadequate propping and bracing.

When erecting and constructing the LadderBlock system vertically, the sculpted floor panels may be laid on the previously completed floor below to ensure safer working environment, protection to floor level further below and safer access to working areas.

4) Quality control

Site could be guaranteed that quality controlled LadderBlock component products are delivered to site, and therefore there would be less risk of quality control issues with concrete quality.

Delivered components to site would be expected to be already QA/QC inspected, therefore both Consultant and third party QA/QC inspections not required on site.

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4) Quality control continued

High impact risks of possible setting out / layout errors by Surveying Engineers often experienced during construction are theoretically eliminated, due to repetitive interlocking modular design philosophy.

Sample concrete cube testing within pre cast factory establishment (or by third party) should guarantee quality of component products delivered to site

Low risk of manufacturing and erection work errors on site when using unskilled manpower and labour that could be trained on site within a relatively short period.

The erected Ladderblock modules would be considered durable finished products, without requirements for any protective coatings to achieve protection against weathering or risk of accidental fire damage.

Manufacturing of LadderBlock components within pre cast yard facility has the advantage of uninterrupted casting and production unaffected by adverse weather conditions such as rain or fog.

On security sensitive projects surveillance monitoring of concrete works (to avoid introduction of non approved objects) can be done within one location in the pre-cast yard rather than on multiple locations on site.

5) Environment.

There could be potential to have a positive impact on the environment due to saving on wasted materials such as concrete and reinforcement steel – as the Ladder block components will be manufactured under factory controlled conditions with theoretically zero wastage.

Noise pollution would probably be strictly limited, due to the noiseless and vibrationless erection method of assembly of the LadderBlock components. Therefore could be particularly suited to noise restricted areas adjacent occupied buildings.

Proprietary steel moulds will be used in the pre cast factory so no timber or wood materials will be used.

The LadderBlock structure is completely demountable and therefore re-usable of the building is required for a short life span or if design changes dictate removal of modules at certain locations.

Environmental impact of pollution may perhaps be minimised on site due to requirement for less pneumatic operated tools or electric equipment powered by fuel consuming generators.

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6) Buildability using LadderBlock system

Simplicity of design and very basic assembly techniques would guarantee speed of erection and construction on site.

Construction productivity planning increases in accuracy due to the repetitive nature of the module erection works.

With only six components of LadderBlock elements and the simplicity of assembly minimises unforeseen risk of errors during construction activity on site.

Claimed construction outputs of 500 m² of completed Ladder block system structural platform frame on one floor level in one day, by a five man team appear achievable.

On fast track projects with evolving late design, an early start to construction could be achieved by allowing the basic structural frame of LadderBlock erection to progress perhaps in parallel with design progress for non critical path follow on construction activities such as internal partitioning or curtain wall envelope.

The open framework and interlocking floor system allows continuous access to each of the floor levels during fast track construction cycles.

The LadderBlock system is flexible enough to allow placement and location of ground floor module on various types of foundation designs, and would be suitable for erecting on top of individual pad foundations or pile cap heads, as pre constructed floor slabs are not a pre-requisite.

Provided that adequate lighting and craneage is provided LadderBlock may also be assembled at night, therefore allowing uninterrupted continuous erection on a non-stop 24 hour basis.

Complete elimination of risk of time delays due to erratic or non supply of ready mixed concrete deliveries to site.

Preparation and provision of a perfect level base prior to commencement appears to be critical, to ensure that the LadderBlock system maintains the benefit of being a “self plumbing” system – especially with high rise construction.

Time delays minimised due to reduction in errors on site or mismatching of material components due to design interface issues between construction materials.

Precision casting off site in controlled conditions will allow proper fit during erection of LadderBlock (provided that initial setting out surveying checks are completed) and therefore has potential to minimise risk of correction re works on site.

After the LadderBlock modules are erected vertically, the available construction area on each floor level would remain free of any propping or support work which would allow early access to follow on trades and construction activities.

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6) Buildability using LadderBlock system ... continued

Significant time saving could be expected by eliminating both Consultant and third party QA/QC inspections on site usually associated with in-situ construction

Subject to safe wind speed for erection by crane, all ladder block components can be erected on site, irrespective of ambient temperatures, therefore eliminating quality issue restrictions associated with concreting in extreme high or low temperatures.

Due to the noiseless and vibrationless erection method, LadderBlock can be erected within areas where there are periodic noise restrictions on construction sites located within inner city areas.

Increased control, reliability and certainty of deliveries would be possible provided regular and efficient transportation is arranged from factory to site. Therefore avoiding lost production due to non delivery of material components if planned and managed correctly.

Sculpted floor block panels could be loaded with live loads such as materials or equipment immediately after installation without waiting for curing periods of slab to gain design strength.

Options are available to vary the surface finish of the sculpted floor block panels to suit the design requirements – such as powerfloat smooth for floor paint or rough surface ready to receive floor screed.

It is understood that service hole openings could also be provided in the sculpted floor block panels to allow adequate provision for M+E services penetrations through floor levels.

Non skilled operatives and teams could be trained on site within a relatively short period due to the simplicity and repetition of the LadderBlock design.

Minimal literacy and numeracy skills required by the erection team operatives. Therefore LadderBlock suitable in overseas locations where language and communication difficulties are issues.

7) Craneage and lifting requirements

Due to the speed of erection and the early stability of the structure after completing the first module, there could be a considerable crane hook time saving as the crane will be released for the next work task immediately after placing a secured element.

All pre cast LadderBlock elements are limited to six (6) tons in weight, therefore within the safe lifting capacity of the entire length of a 40 m crane jib of a 12 ton static Tower crane, and minimising the requirement for larger more expensive mobile cranes.

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7) Craneage and lifting requirements... continued

Use of mobile “cherry picker” plant most suitable, for external access of low level erection of LadderBlock system, minimising time consuming labour intensive and costly fixed scaffolding

For repetitive and vertical erection of LadderBlock modules, access could be provided by proprietary mechanical vertical climbing platforms on the external elevation face of the structure while being fixed onto the frame elements below.

Note:

The above review and report has been made on the assumption that Ladder Block has satisfied all structural design suitability requirements after separate reviews by DFC, to re-confirm that the LadderBlock system has the requisite structural integrity.

In addition it has been assumed that the LadderBlock manufacturing accuracy of components are within the allowable construction tolerances and limits required for trouble free erection and assembly works on site.

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5th December 2007