

# CASE STUDIES IN BRICKWORK PRE-ASSEMBLY

## BRICKWORK BUSINESS PROCESS STANDARDISATION

The use of standardisation production processes employing pre-assembly of elements is widespread in manufacturing industry and can lead to production efficiencies, cost reduction and customer satisfaction. Such approaches are beginning to gain acceptance in some sectors of the construction industry.

Bricks may be regarded as the ultimate standardised component and are ideally suited to the production of bespoke solutions in building. Current practice in the UK relies almost totally on site based assembly. This article presents examples of how three companies in different countries have used off-site pre-assembly techniques for brickwork elements. It draws on the views of key staff involved to highlight some of the advantages of this approach.

## VET-O-VITZ<sup>INC.</sup> USA

This Ohio based masonry contractor produces pre-assembled masonry cladding panels for a wide range of commercial projects. Their system is based on a single leaf brickwork with suitable reinforcement and structural steel sections to provide fixing back to the structural frame of the building. It is illustrated in Figures 1-2. Vet-O-Vitz's Bob Heathcote project engineer explained how the strongback 'formwork free' process works. "Panalisation works due to the flexibility associated with off-site construction, and superior quality control. Consequently, the financial savings to the owner/client are the biggest attraction factors". These process savings can be quantified into: -

- Architects having the ability to do some unique detailing at a reduced cost.
- A reduction in construction time.
- Providing the opportunity to produce work that would be almost impossible in the field.

Vet-O-Vitz's plant supervisor Bill Simmons drew attention to the production speed associated with working in the factory environment. "Working in controlled conditions, bricklayers produce consistently". Building from powered access means that the work is always at

waist height reducing Repetitive Strain Injury. Using string lines, jigs and profiles reduces the plumbing work and bricklayers constantly lay to the line". The use of detailed working drawings incorporating process time and associated interface requirements assists in identifying optimum bespoke solutions from the standardised transparent processes in the factory.

## TRENT CONCRETE<sup>LTD</sup> UK

Mike Downing Managing Director of Trent Concrete explained how the critical short construction period and very high quality specification with tight tolerances drove the adoption of factory based pre-assembly for the 1,032 piers on the Inland Revenue Castle Meadows Project in Nottingham. "Many components perform several functions and there are no applied finishes. This pre-assembled approach not only influenced design but reduced overall process costs. Subsequently, the process standardisation approach to operations assisted in learning curve orientation and delivering the required product consistency in relation to the critical dimensional tolerance". Process factors involved in removing this elemental package from the critical path were: -

- Early involvement of all project parties.
- Clear process cost and risk implications.
- Production free from climatic constraint.
- Improved quality assurance procedure.
- Compression of overall project duration.
- Superior interface detailing.

Alec Langley, Trent Concrete's factory manager described the pre-assembly process as simple, transparent and fast. "Using templates and string lines to determine pier arises assisted the bricklayers in maintaining work to the correct standard and of consistent appearance". Piers ranging in weight from 4 to 8 tonnes where transported to site using standard lorries and fixed into position using mobile cranes. The project is illustrated in Figures 3-4.

## STERK BOUW ELEMENTAL NL

This Netherlands based company has developed a house construction system based on factory produced composite panels comprising brickwork with lightweight concrete backing.

Managing Director Paul Vermeulen explained how "Sterk's strategy is based upon the fact that the on-site construction process can be rationalised by moving operations into the factory environment, through the following stages: -

- Working closely with the project team from initial architectural instruction.
- Scheduling supply of materials and the production of elements to correspond with on-site activities.
- Improved working conditions combined with a ‘tilt up’ full brick sandwich panel system, ultimately compresses the construction process”.

In addition, Anthony Redhead Managing Director, Redex Export Consultancy operating in both Holland and England highlighted how pre-assembly can also add-value to UK construction projects. “Through pre-assembly, the construction process can be controlled and driven accurately regarding project time and cost, thereby reducing process bottlenecks and financial risks”. Typical house details are shown in Figures 5-6

**BRICKWORK PRE-ASSEMBLY PROCESS BENEFITS**

These case studies and the broader research project deliverables indicate the following potential benefits from the adoption of pre-assembly techniques for brickwork: -

- Closer construction team involvement.
- Clearer information exchange.
- Identifiable risk quantification.
- Process driven-costing approaches.
- Rationalisation of activity.
- Transparent process value gains.
- Optimisation of productivity.
- Improved quality and tolerance consistency.
- Buildable interface solutions.
- Consistent elemental delivery.
- Improved supply arrangements.
- Enhanced working conditions for bricklayers.
- Waste reduction.



Figure 1 Vet-O-Vitz factory-working environment  
Site visit March1999.



Figure 2 Vet-O-Vitz Strongback panel detail  
Site visit March1999.



Figure 3 Trent Concrete factory production  
Source: -Brick Bulletin Knight 1994.



Figure 4 Inland Revenue Building Nottingham  
Courtesy of Trent Concrete.



Figure 5 House panel elevation  
Courtesy of Redex Export  
Consultancy.



Figure 6 House panel interface  
detail  
Courtesy of Redex Export Consultancy.