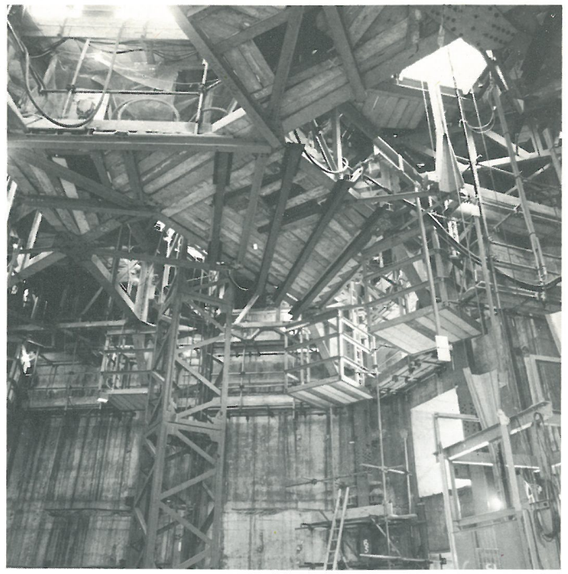
Special Climbing Platform for the Construction of Head Office Tower Block for National Westminster Bank



STRUCTURAL ENGINEERS
Braithwaite & Company Structural Ltd
STEELWORK CONTRACTOR
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Judges Comments

An ingenious structure designed to overcome complicated erection problems and one where steel was the only suitable material which could be used to give an economical solution.

The new National Westminster Bank Head Office tower of 190m height is shaped like a clover leaf in plan similar to the logo used by the Bank. The construction is based on a reinforced concrete core of unusual shape, the construction of which presented a number of technical problems.
Discussions about the construction of the concrete core using slipform techniques took place for a period of several years between John Mowlem & Co. Limited (main contractor) and British Lift Slab Limited (specialist sub-contractor). Because of the complexity of the requirements it was not practicable to use standard slipform equipment and Braithwaite & Co. (Structural) Limited were invited to join the development team to produce a steel spaceframe rig to support the slipform shutters and act as a construction platform. This work was undertaken to an outline specification produced by British Lift Slab Limited.
The rig was developed to perform the following functions:

1. *Support the inner and outer slipforming shutters set to the unusual three lobe plan profile of the wall the outer shutters to be capable of being moved inwards to suit different wall thicknesses.*
2. *Be jacked upwards at its fifteen corner points by means of automatically synchronised Lift Slab hydraulic jacks operated off temporary steel jacking columns positioned near the inside face of the wall.*
3. *Support three cable guided hoists for lifting personnel and materials from ground level.*
4. *Provide lateral restraint under operating and wind conditions to three climbing tower cranes with masts passing up through the rig.*
5. *Act as a temporary diaphragm to the top of the core wall being constructed.*
6. *Support other items of plant, men and materials with access walkways at different heights both inside and outside the wall profile for fixing reinforcement.*
7. *Maintaining in its upward travel an accurate plumb for the wall being constructed.*

The maximum imposed load on the rig is 220 tonnes when parked and 215 tonnes when sliding, the latter including shutter drag, and the former some element of stacked reinforcement not present during sliding. All imposed loadings were carefully analysed and continuously monitored during operation. The weight of the rig itself is 250 tonnes. The maximum jacking load was computed at 45 tonnes under normal operating conditions, rising to a maximum of 60 tonnes, assuming collapse of one jacking point. In subsequent operation it has been found that the jacking loads are more equalised than anticipated, and at a lower maximum figure.
Site erection took place over the allotted period and was completed at the same time as the construction of the first 40m height of the core. To avoid extensive falsework, the internal structure of the rig was erected 'in the air' by building out from the cantilevering jacking columns and spanning across. The yokes were then cantilevered out and the external box ring completed from the yoke hangers. Erection was carried out using the 6-tonne tower cranes already on site.
On completion of erection a survey of the rig accuracy was carried out to ensure plumbness of lift and operational fitness. From the nature of the construction it can be seen that little, if any, corrective action can be taken once jacking has commenced. In the event, the built-in adjustments and tolerances proved adequate, a surprising degree of dimensional accuracy being achieved in the space frame body. As had been anticipated, it was not possible to position the jacking columns accurately but this was absorbed by displacement of some jacks on the column caps within the eccentricities allowed in the design.
By April 1976 British Lift Slab, working with John Mowlem, had lifted the rig through some 55m and were approaching the half-way mark in the total height to which the rig is to be taken.