

Fifty foot-high wall placements save time and cost

Job accomplished with stiff, lightweight forms and concrete pumped to bottom of form for racquet and swim club building

Exterior walls up to 50 feet^{(1)*} high were cast in-place to their full height with single placements during construction of an unusual sculptured building for the 98th Street Racquet and Swim Club in Bloomington, Minnesota. This is one of the nation's largest such facilities with 18 indoor-outdoor tennis courts and 14 racquetball courts.

Tilt-up construction had been studied but wall sections were considered to be too large to make tilt-up practical. Tilt-up walls would also have required frequent vertical joints; continuous casting saved fussing with joints between placements of separate sections of wall.

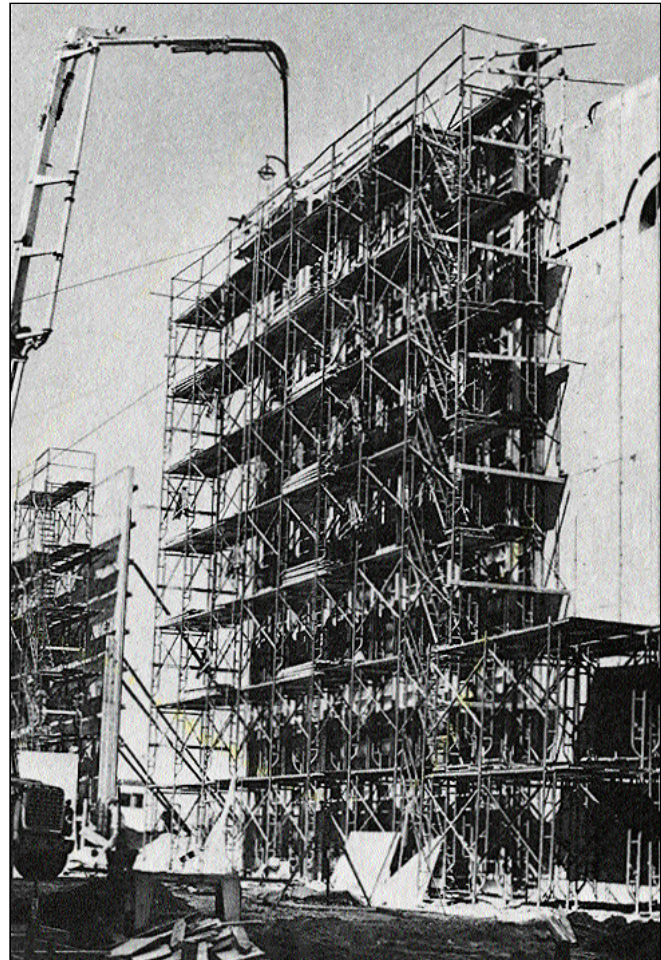
An aluminum forming system was chosen which had rigid components that required a minimum amount of splicing and ensured that the walls would be produced straight and plumb. The system provided the form design strength needed while keeping the forms light for easy handling.

The series of large single placements used produced the best construction sequencing and minimized the re-bracing task. Each long side wall—one of which is 332 feet⁽²⁾—couldn't tie into perpendicular walls, interior slabs or decks until later in the work sequence. Thus the forms, and later the walls, needed bracing until additional construction was completed.

Three-foot-wide⁽³⁾ footings and concrete deadmen for brace support were placed in the fall of 1977. The contractor built ganged forms for the outside surface using three 16-foot-wide⁽⁴⁾ sections which were either 46⁽⁵⁾ or 36 feet⁽⁶⁾ high. He used filler panels at four sections where the walls exceeded 46 feet.⁽⁵⁾ For maximum strength, aluminum beams were run vertically, braced with horizontal aluminum wales.

These forms were first lifted into place and braced. Carpenters working on aluminum planks suspended on overhang brackets of multideck scaffolding then applied the lumber for architectural features. Ironworkers used these same platforms to attach rebars. After the overhang brackets were removed, ganged forms for the inside wall surface could be flown in.

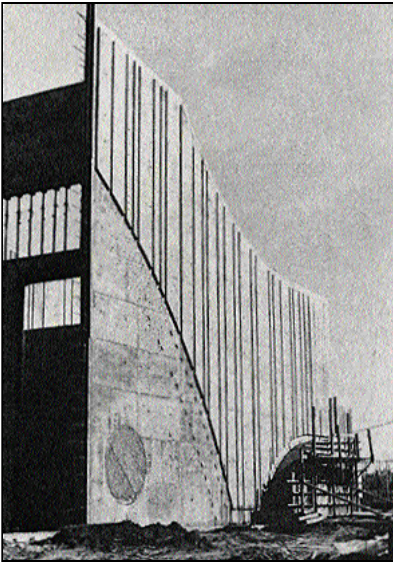
Men worked from the scaffold decks to install coil ties spaced 4 feet⁽⁷⁾ on centers both vertically and hori-



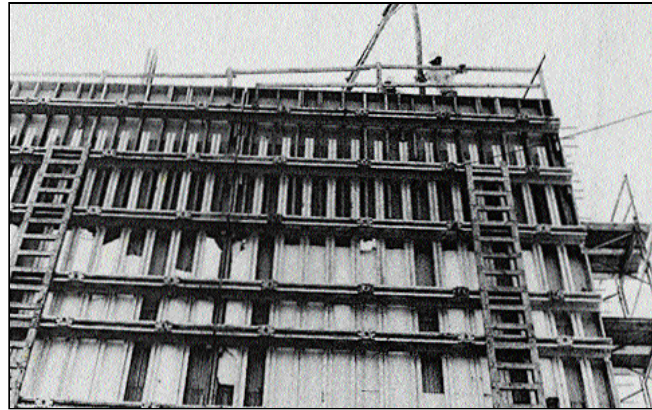
Men on the top scaffold deck work vibrators during continuous casting of a 47-foot-wide⁽¹⁴⁾ wall section. The rustication detail can be seen on the completed portion of this wall.

zontally. Later the top decks served as a concrete placing platform. After stripping, the contractor lifted scaffolding assemblies to the location of the next placement. Using this flying scaffold system with overhang brackets proved highly efficient because work for each section of wall could proceed from only a single scaffold placement.

The interior-surface forms had wood studs running horizontally, braced with vertical aluminum strong-backs. Sections 24 feet⁽⁸⁾ high were prepared for erection by attaching joist bearing plates, inserts and anchor slots for interior masonry surfaces. After these sections were set in place, forms for upper portions of the walls were



The complexity of form facing work can be seen here, where the free-form wall will interface with air structures that will cover tennis courts.



Vertical aluminum beams, braced by aluminum wales, provided all the necessary support for single-form sections 36 feet⁽⁶⁾ and 46 feet⁽⁶⁾ high. The rigid insulation which has not yet been removed from between some of the beams is a reminder that work progressed on the project throughout the winter of 1977-78.

installed. These upper forms had to be stepped back to accommodate 4-inch⁽⁹⁾ rustication strips.

The top edges of the walls on this project rise on an angle from a height of about 30 feet⁽¹⁰⁾ to the maximum height of 50 feet⁽¹¹⁾ above the footings. The contractor started placing concrete at a low end so crews could fine-tune their techniques before getting to the highest placements. In the high monolithic pours two critical factors were of special concern. First, form pressures were closely calculated to avoid exceeding the design load of the forms. Then, special care was needed in pumping and vibrating to minimize honeycombing and bugholes.

Concrete crews used a large truck-mounted concrete pump, hydraulic boom and concrete hose to deliver the mix all the way into the bottom of the wall forms. The structural wall thickness is 12 inches,⁽¹¹⁾ plus 2 $\frac{3}{8}$ inches⁽¹²⁾ on each side for areas between rustications. Concrete was placed continuously in 2-foot⁽¹³⁾ lifts at a carefully controlled rate and thoroughly vibrated with a high-cycle internal vibrator.

Using the tall forms and monolithic placement saved time, labor and form reanchoring costs. Crews averaged one placement a week for the 47-foot-wide⁽¹⁴⁾ wall sections. The contractor could concrete a section in one day. The job was planned for stripping and moving both forms and scaffolding in a single day; thus a crane and the concrete pump unit were tied up only one day per week.

The racquet and swim club facility was completed in the fall of 1978.

Credits

Architect: H. W. Fridlund Architects-Planners Inc., Minneapolis, Minnesota

Consulting engineer: Carl Walker and Associates Inc., Minneapolis

Owner/General contractor: Northwest Unit Investment Inc., Minneapolis

Concrete and masonry contractor: Kraus Anderson of Minneapolis Inc.

Subcontractor/Supplier of aluminum forming system. FormAll Company, Minneapolis

Metric equivalents

- | | |
|-------------------------|----------------------|
| (1) 15 meters | (9) 100 millimeters |
| (2) 101 meters | (10) 9.1 meters |
| (3) 910-millimeter-wide | (11) 300-millimeters |
| (4) 4.9-meter-wide | (12) 60 millimeters |
| (5) 14 meters | (13) 600 millimeters |
| (6) 11 meters | (14) 14-meter-wide |
| (7) 1.2 meters | (15) 15-meter-high |
| (8) 7.3 meters | |

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