SMART System for Automated Building Assembly

The NOVA Award was presented to the SMART System for inNOVAtion in construction of high-rise buildings.

Building construction is the assembly of a multitude of small components in the field, with manpower and material handling being the largest constraints.

The SMART System is a self-elevating assembly factory for high-rise building construction which demonstrates that automated building assembly using both technical and logistical inNOVAtions can streamline the construction process.

In SMART Construction, the building core and shell are assembled floor-by-floor from a covered, self-elevating construction platform that provides safety screens, scaffolding, and weather protection. As each floor is completed, computer controlled jacks lift the work platform to the elevation of the next story in about 90 minutes. Even at the 20th floor, construction workers operate in a "ground-floor" environment of improved safety, accessibility, and efficiency.
A central control room is housed above the traveling work platform where a highly integrated system for scheduling and ordering all major subassemblies of the building is operated. Documents, CAD drawings, and delivery information are communicated via high-speed network links with all members of the building team: owner, designer, contractors, and suppliers.

In the SMART System, just-in-time scheduling and communications have eliminated the need for on-site laydown areas - all material is moved from the truckbed directly to the point of installation with remote-controlled overhead cranes, operated by video camera from the central control room.

Structural components are specially designed and fabricated for ease of placement and alignment. Once placed by the overhead crane, columns are self-supporting. After laser alignment, column connections are made by automated welding robots.

The 20-story Nagoya Juroku Bank, Nagoya, Japan, was constructed using the SMART System. On-site management man hours were greatly reduced during this project, labor manpower was reduced by 30%, and 70% of construction waste was eliminated.

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