

# Construction QA Survey of Phelps Dodge Tower, Phoenix, AZ

## DEI uses Cyrax® to solve tough survey problem with faster, better results

Scope	QA survey of elevator core exterior and steel alignment during construction of 21-story office tower.
Contractor	Ryan Companies US, Inc.
Date	2001



*"The sooner you catch dimensional construction errors, the better. The last thing you want to see toward the end of a project is some guy up on the 22nd floor with a welding torch. DEI's use of Cyrax for construction QA gave us a lot of valuable geometry information, which in turn helped us to reduce risk on the project and meet schedule without any fit-up problems."*

Rob Hudson, Senior Superintendent of Construction, Ryan Companies US, Inc

### Project Facts

**Field:** 4 days; 2-person crew;  
2 scans per floor (for core)

**Office:** 45 hrs; one person

**Deliverables:** AutoCAD plan drawings;  
table of QA results

### Customer Benefits

- Better quality, more complete QA results
- QA results caught early trend in concrete core thickness that avoided potentially costly rework
- 50% labor savings for QA surveys
- Data collection did not interfere with ongoing construction activities
- Enabled DEI to provide additional, value-added services to client

**Background:** DEI Professional Services (Phoenix, AZ) had a contract for survey work to support construction of a 21-story, downtown office tower. Part of the contract called for DEI to monitor verticality of the concrete elevator core, floor-by-floor, after it was poured and set. The core rises several floors ahead of the steel during construction. DEI's service contract was expanded to also monitor the core thickness/position in order to avoid fit-up problems with horizontal structural steel at higher floors. DEI started monitoring external core geometry with total stations, measuring each corner of the rectangular two-foot thick core after it was poured and set; however, this method couldn't catch variations in the concrete geometry over its full surface/thickness. Plus, it was time-consuming and hazardous. To solve these problems, DEI switched to Cyrax 3D laser scanning - starting at the 7th floor.

Once the first 3D laser scans of the core were shown to the client, the client quickly understood how much additional, valuable QA information DEI could gather with Cyrax. Following a cost proposal, the client requested the use of Cyrax for additional QA on other key construction elements.

**Project Workflow:** Ultimately, there were three applications, all for construction as-built QA: (1) core thickness/position (to 1/2") from the 7th floor to the 21st floor, (2) locations of tie-plates embedded on the core's outside face (to 1/2") at the 11th and 17th floors, and (3) actual alignment/locations of steel members on the 6th floor - used as input for fabrication of windows and girders (to 1/8").

DEI used scan targets to register scans together accurately and tie scans to the building grid. The scanner was set up on a lower tower floor during construction; it was also set up on the roof of a building across the street to collect geometry for the highest floors. To determine core thickness, outside core geometry was compared with internal geometry from an independent survey. Thickness variations along the core surface were examined visually for significant warping of the surface. Tie plate locations and steel members were directly modeled in Cyclone™ from scans of these objects.

QA checks with Cyrax found that core thickness was starting to run toward the thin side of the spec at the

11th floor. This input was provided to the contractor, who triggered a minor modification to the pre-form. No other noticeable deviations were observed. All tie-plate locations were within spec, although again, some were reaching tolerance limits. All checks of steel member alignments/locations were within plan. The net incremental cost to the contractor on site for applying Cyrax for additional QA was only about 15% of the original survey contract.

*"The client doesn't just look at surveyors anymore. Now they look at us as project consultants."*

Jack Kack, RLS, VP Surveying, DEI Professional Services



**CYRA**

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