

In-Process Construction Verification of New Lab

"Cyra and Cyra's software tools provided an easy way to accurately identify differences between actual construction and our design model of this complex, exacting facility. Using these tools, the client successfully avoided significant field-related construction conflicts that would otherwise have led to schedule extensions and additional project costs."

Randy Carbone, Senior Supervising Designer, Parsons Corp.

Scope Compare construction with design for piping, support structures, electrical, HVAC facilities incritical areas for new \$1.2 billion, 7-story lab. Update MicroStation and PDS as-built models. Accuracy requirement for piping and structures: 2mm-6mm.

Owner Government Research Agency

Date 2001-2003

Background: Parsons Corp., which provided project Design and Construction Management services, used MicroStation and PDS software to design a grassroots, high-energy research facility that included high-density areas for equipment/facilities. The complex project posed a construction challenge, so to minimize project risk the facility owner elected to use *Cyra*[®] laser scanning during the construction phase. The goal was to quickly and accurately catch construction deviations

as-designed plans were done by processing point clouds into 3D models within CAD. These models were also used as a lifecycle tool for the facility. Parsons registered the point clouds and then thinned them out (removing all points except for piping, steel and electrical) before importing them into CAD to create the as-built models. When CloudWorx™ for MicroStation software was introduced, the workflow was simplified. First, Parsons eliminated the process of removing points before modeling, as CloudWorx allows large scan files to be readily accessed in MicroStation and PDS. This reduced data preparation time 75%. Secondly, CloudWorx allowed staff to compare the as-built condition to the design model by using registered point clouds *directly* as a backdrop reference in MicroStation and PDS, *without having to first process scan data into an as-built model*. Likewise, Parsons' designers began using point clouds as a reference within MicroStation and PDS for final designs of new equipment locations and tie-ins. Lastly, when cloud-to-cloud registration was introduced, field and office times were significantly reduced.

To minimize project costs, when differences were identified between the "as-constructed" condition and the "as-designed" model, new component designs were usually modified to accommodate the actual as-built condition. Using *Cyra*, several construction errors were detected early, avoiding subsequent construction problems and saving many weeks of schedule. Cost savings from avoiding field construction interferences more than paid for *Cyra* and its deployment.



before they led to clashes during subsequent construction in the same area. In addition, as the project neared completion, project designers used updated as-built information for finalizing equipment and tie-in designs.

Project Workflow: Facility staff engineers performed scanning as needed. A local services company provided a second scanner & operator to meet schedule demands during a critical 4-week period. All scans were tied to 1.5" spherical targets for site control. Full scans were performed at <12mm point-to-point spacing and target scans at 1mm spacing.

During the project, staff took advantage of point cloud software advances to improve productivity. Initially, comparisons of as-built construction with

Project Facts

Field: 1 or 2-person crew depending on task; >550 scans from 2001-2003

Office: Construction verification: 0.5 person-day per scan-day; As-built 3D model creation: 6 hrs/scan, typ.

Deliverable: Specific measurements requested by Project Engineers; registered point clouds used for construction verification & update of facility models

Benefits

- Early detection of construction errors avoided significant project delays and cost adders
- Construction savings more than paid for *Cyra* and its deployment
- Construction cost and schedule risks were reduced
- Construction verification enabled timely updates of the as-built models
- Up-to-date as-builts allowed project staff to create accurate final-stage equipment and tie-in designs based on the as-constructed condition

Case Studies Plant & Facilities

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