

Spotland Pinpoints Problems in Roof Installation by Finding Out-of-Tolerance Steel Beams with Verity



Verity Identified Deviations in 70% of Beams in One Building

Spotland helped to eliminate additional delays in the installation of prefabricated roof segments on a new health care facility in Denmark by finding defects in the structural steel framework. The firm used ClearEdge3D's Verity construction verification software to digitally compare the as-built steel structure with the design model. The results showed unplanned twists and bends in the structure's upper beams that likely were preventing the roof sections from fitting correctly.

The Project: Multi-Building Health Care Facility in Ballerup, Denmark

The Ballerup design plan included five structural steel buildings that would comprise a new state-of-the-art health care facility. None of the buildings would be identical, varying in size, shape and height and having several curved walls. The major similarity among them was the steeply sloped wooden roof covering each structure. Each roof would be comprised of multiple prefabricated wood, trapezoidal plates at the bottom of the roof and corrugated sheet metal segments bolted to the top of each building's steel-beam framework.

The Problem:

On the First Building, Installation of Each Roof Section Took Hours Instead of Minutes

The General Contractor called on Spotland, an engineering construction services company

specializing in 3D scanning and BIM modeling, to pinpoint the roofing problem. The general contractor theorized the difficulties in placing the roof segments were likely related to inaccurate installation of the steel beams to which the sections were to be attached. If the first structure deviated from the design model, the other four buildings probably did as well. Construction was halted while the situation was studied.

The Solution:

Verity Automated QA Software

Spotland learned about the new Verity automated construction verification software at a trade show and volunteered as a beta tester. Spotland considered the software ideal for Ballerup because it analyzes laser scan point clouds of

*"Verity was intuitive to learn...
and the processing was very fast.
It shows the deviations in a way
that everyone can understand.
A tool that can be used to avoid
quarrels with your subcontractors
is impossible to set a price for."*

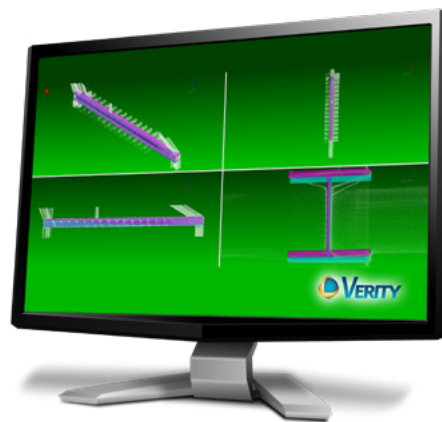
- Martin Matti, BIM Engineer
Spotland A/S

recently constructed work and compares them against the design or fabrication models to determine the accuracy of the constructed elements. Out-of-tolerance work is highlighted including specific measurement details on installation variances, rotation errors, twist and sag.

The Workflow:

Scanning the Steel Framework

The Spotland crew used a FARO laser scanner to collect scans from inside, outside and above each of the four remaining building structures. The scans were processed into a separate point cloud for each building and imported into Autodesk Navisworks where Verity had been integrated into the workflow via plugin. Spotland obtained a CAD model of the steel structure design for comparison with the as-built point clouds. A 10-mm tolerance was selected in Verity, which then analyzed



each individual beam to see if it deviated more than that distance from its designed position along the x, y or z axis. The software even checked for unplanned twists, bends and sags in the members.

The Results:

70% of Steel Members Were Installed Out of Tolerance—A Third of Which Required Further Evaluation

Verity generated a tabular report showing its analysis of each beam, which could be queried to see detailed measurements of how far each OOT element deviated from its design location along each axis. Spotland provided this information to

the General Contractor for evaluation of which deviations were acceptable and which weren't. About eight beams in the roofing trusses of the first building scanned were found to have bends and twists that probably were preventing the prefab roof segments from being installed properly.

The Conclusion:

Verity Found Beam Deviations that Could be Corrected before the Roofing Crews Returned and Faced Further Delays

Similar bends and sags were found in roof beams with Verity in the second of the four unfinished buildings, prompting the General Contractor to call a meeting with the steel installer to decide how best to fix the problems before bringing the roof installers back onsite. The General Contractor knew it was less expensive to delay construction before the expensive roofing crew arrived. Potentially major cost overruns were avoided using Verity.

To learn more or request a software demonstration, visit clearedge3d.com or contact us at sales@clearedge3d.com or at +1 (571) 364.8597.