

TECH NOTE

PMC Technology Update

What is terrestrial Laser Scanning?

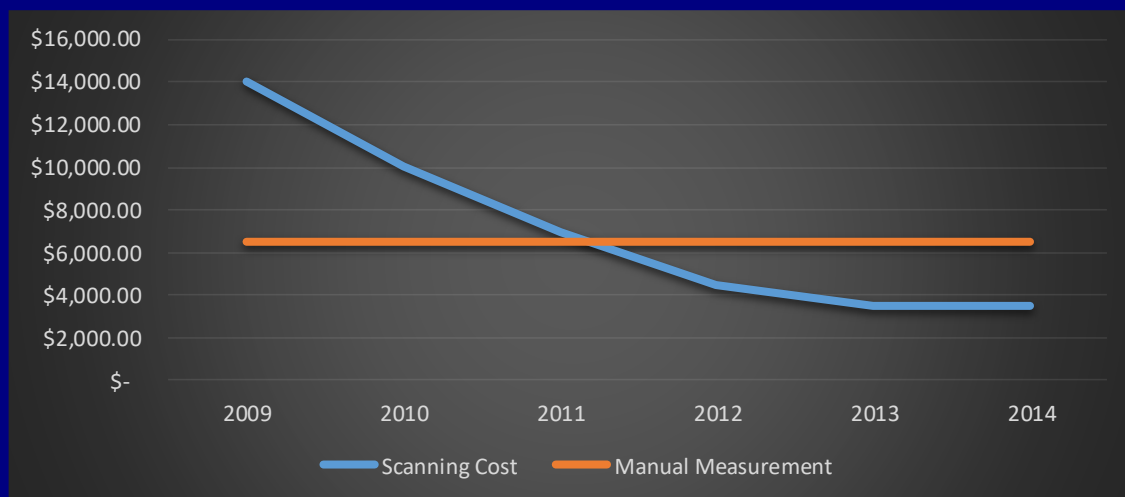
3D Laser Scanning is a non-contact, non-destructive technology that digitally captures the shape of physical objects using laser light. 3D laser scanners create “point clouds” of data by scanning over them with laser light. In other words, 3D laser scanning is a way to capture a physical object’s exact size and shape into the computer world as a digital 3-dimensional representation.

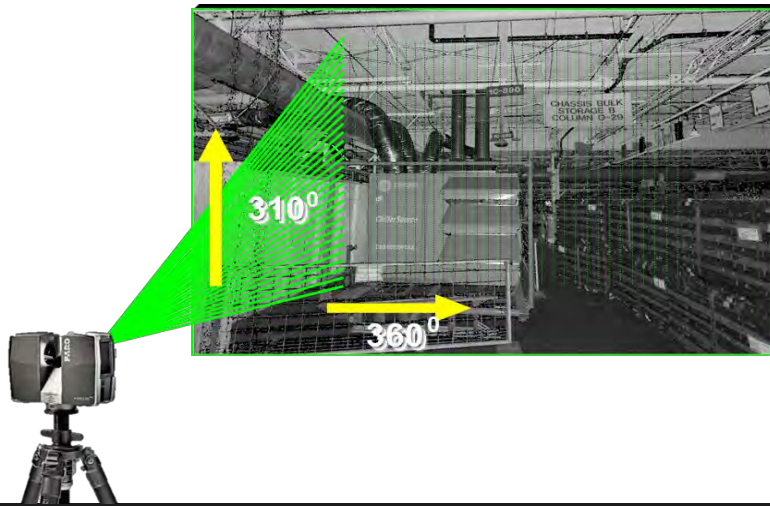


Getting the 3D Data

The first step in getting a 3D building is gathering the 3D information. Traditionally this was done using manual measurement techniques. More recently this work has been almost entirely replaced by laser scanning. The reason for this shift is twofold; first the cost per square foot has dramatically reduced while the quality of the data has increased by over 10x. These two factors have lead to a dramatic shift in data acquisition since 2010.

COST TO SCAN VS. MANUAL CHECK OF 100K SQ. FT.

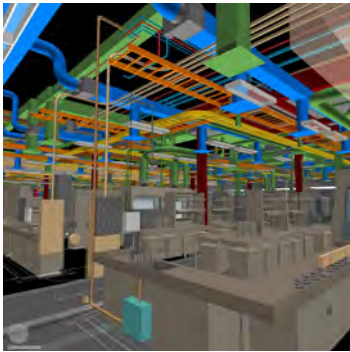




Scanners capture data in 310° vertical and 360° horizontal

Data Acquisition

For most projects a single scanner is used. A modern scanner is a small piece of equipment that sits on top of a standard camera tripod. The scanner will be setup multiple times throughout the building or facility to be scanned. Depending on the project size you should expect to see anywhere from 20 to over 1000 individual setups. Each time the scanner is run it will take from 2 to 10 minutes depending on the settings used.



Scanning Output

The shape of objects appear as millions, or even billions, of points called a "point cloud". The point cloud is viewed on and processed on standard workstation class computers. The process is very fast, gathering up to 1,000,000 points per second and very precise over large areas (to $\pm 0.12"$).

Scan data is commonly used in most major CAD applications including all Autodesk and Bentley products. The scan is used as a reference to

create model geometry for use in project planning or sometimes just on it's own as an accurate record of as-built conditions.

Laser Scanning Process ROI

- Accurate and exact measurements
- All data is captured
- Advanced decision making
- Data is quickly available to entire team
- Clash detection
- Reduce costs and schedule savings
- Safety
- Reduce job site interruption

Safe?



Modern laser scanners use a very low powered laser light. In fact most units now feature what is known as a class 1 laser. This is the lowest risk level a laser can have. To put this in perspective most hand held office laser pointers are class 3 or higher.

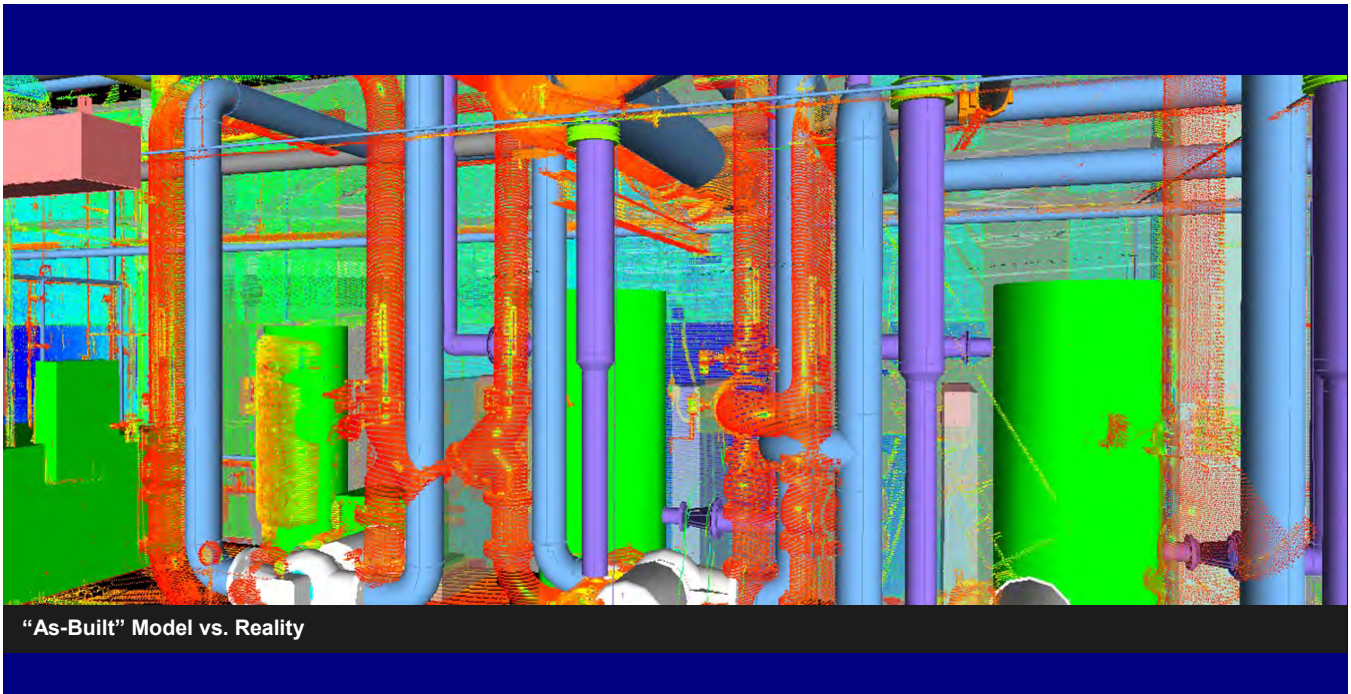
A Class 1 laser is safe under all conditions of normal use. This means the maximum permissible exposure (MPE) cannot be exceeded when viewing a laser with the naked eye or with the aid of typical magnifying optics (e.g. telescope or microscope).

Some older units may feature lasers that have a slightly higher laser class but still pose no threat to humans due to the continuous nature of the machine.

CLASS 1 LASER PRODUCT



Data Capture with a Faro Focus3D

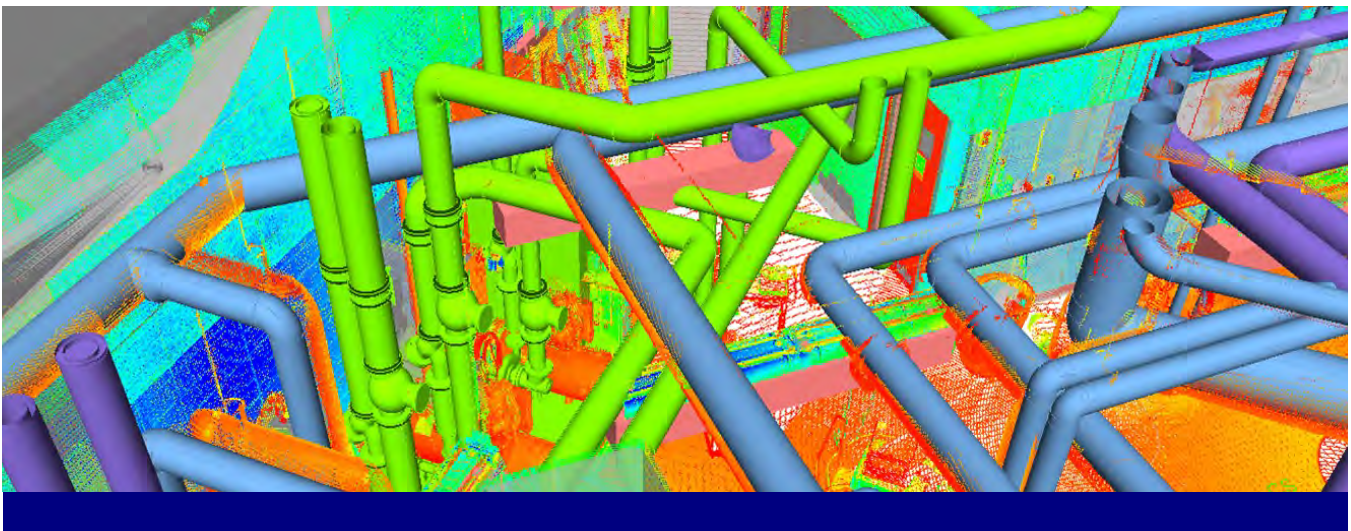


More than a planning tool

One common use within the AEC industry is to ensure that what was promised is what was delivered. This can be used at a various stages of construction to accomplish different goals. It is often used as a quality check to ensure that installers are meeting their obligations to 'build to the model'. Another great use is to capture conditions before they are enclosed. Having a 3D scan of piping before it is encased in concrete can be a great asset for a building owner to possess.

In practice

The image above shows the results of scanning a utility room in which the installer of the MEP equipment had contractually agreed to install to the model. The purple piping shows what was planned within the CAD design environment while the orange shows the as-built scan data. Although painful at first this process benefits for all involved. See the power of scanning technology gave the contractor the confidence to begin off site fabrication of the remainder of the project making more profitable for not only them but their client as well.



About PMC

PMC is the largest independent industrial engineering & simulation services firm in North America. For over 30 years PMC has been leveraging the latest in advanced technology to improve our Client's processes.

Established in 1979, PMC has grown to have offices around the world. With over 700 clients, 7000 completed projects, and over 150 employees PMC can work with you to find the right data-driven productivity solutions for your needs.

About the author

Our Laser Scanning/CAD Team is managed by Chris Mounts, a scanning veteran who has scanned over 100 million square feet of buildings and facilities. Chris continues to be a technology leader within the industry writing multiple regional and national CAD and BIM standards. He has presented at multiple industry conferences, and has been twice recognized by the American Institute of Architects (AIA) receiving the Technology in Architectural Practice (TAP) award in two consecutive years.

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