

**BUILDING AND FIRE RESEARCH LABORATORY AND THE MANUFACTURING
ENGINEERING LABORATORY, NATIONAL INSTITUTE OF STANDARDS AND
TECHNOLOGY (NIST)**

**GERALDINE CHEOK, ALAN M. LYTLE, DR. KAMEL SAIDI, DR. WILLIAM STONE,
DR. CHRISTOPH WITZGALL, CHARLES FRONCZEK, DR. STEVEN PHILLIPS, DR.
W. TYLER ESTLER, DANIEL SAWYER**

**“STANDARDS FOR EMPLOYING CONSTRUCTION CONTROLS USING 3-
DIMENSIONAL IMAGING”**

Since the late 1990s, the NIST Building and Fire Research Laboratory (BFRL), working with the NIST Manufacturing Engineering Laboratory (MEL), has been researching the best approaches to apply evolving three-dimensional (3D) imaging technology to improve the productivity of various construction and manufacturing processes. This technology has evolved to the stage where the instruments are reliable and affordable. BFRL and MEL are continuing to participate in the technology's evolution through research focused on demonstrating its capability for use in construction processes such as determining as-built or existing conditions, progress tracking, and in-process control. This technology's evolution is moving toward the goal of improved construction productivity as this technology enables reduced errors (rework), schedule reduction, improved responsiveness to project changes, increased worker safety, and better quality control.

From a technology transfer perspective; enabling adoption of this technology by the construction industry is actually far more complex than the technology's progressive evolution as an imaging device. The building construction industry is heavily regulated by codes, technical standards and safety regulations. Moreover, the potential civil and criminal liabilities for architects, professional engineers and surveyors, inspectors and company owners is potentially very high for violations of codes, etc. Wide acceptance of the imaging technology by the construction industry requires the ability to evaluate the performance of 3D imaging systems and a high degree of confidence in the accuracy of the data from such systems and the derived end products (e.g., 3D model, volume calculation) from the 3D data. To achieve these goals, standard methods to enable fair comparison of the performance are required.

The NIST team under the direction of Co-Project Managers Alan M. Lytle and Geraldine Cheok, has addressed the “standards-related” issues that must be resolved if 3D imaging technology is to be adopted by the construction industry. Working collaboratively with instrument manufacturers and industry stakeholders, the team produced a first-generation of methods and artifacts for performance evaluation and computational algorithms to support the adoption of 3D imaging technology by the construction industry, its related trades, building owners e.g., GSA, and by the courts. The efforts by the NIST team were key to the establishment of an ASTM committee, Committee E57, 3D Imaging Systems in June, 2006. The knowledge developed by the NIST team has been transferred to industry through standards development in ASTM Committee E57, NIST-hosted workshops, technology guides for industry (via GSA), talks provided at industry trade organizations, trade magazine articles published, and academic publications. This effort created an “enabling” technological infrastructure that is facilitating the adoption of 3D imaging by the construction industry.