



CONSTRUCTION INDUSTRY INSTITUTE

3D CAD AND FIAPP:
THREE-DIMENSIONAL COMPUTER MODELS
AND THE FULLY INTEGRATED AND
AUTOMATED PROJECT PROCESS

Construction Industry Institute

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**3D CAD and FIAPP:
Three-Dimensional Computer Models and the
Fully Integrated and Automated Project Process**

**Prepared by
The Construction Industry Institute
3D CAD in FIAPP Research Team**

**Research Summary 152-1
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Executive Summary

The three-dimensional computer model has been a well established design engineering element for over a decade. Early 3D models justified their expense by enabling detection of model elements that showed potential for trouble in the field. These early models helped reduce field rework.

Recently, the construction industry has begun to accept 3D models as a design tool, not just a three-dimensional representation that augments traditional 2D design systems. This brings about a need to reevaluate the purpose of documents and drawings. Viewed from the perspective that 3D models enable “information extraction,” the industry has the opportunity to explore the many uses of three-dimensional models and their associated databases both in pre-planning and at the construction site.

CII wanted to evaluate the integration of 3D computer aided designs (CAD) into the construction phase. Specifically, CII wanted to provide the industry with information on how 3D CAD models could be used in achieving the fully integrated and automated project process (FIAPP). To help in accomplishing this, CII formed the 3D CAD in FIAPP Research Team to develop procedures for integrating 3D CAD into the overall integrated, automated project processes.

The research team concludes that numerous construction functions can be supported with 3D CAD models. This research summary presents a discussion of the various functions and how three-dimensional models can enhance the entire construction process. Recommendations are also offered and cover the entire spectrum of the engineering construction process, from pre-planning through start-up and commissioning.

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Introduction

CII Research Report 106-11, "An Analysis of the Impacts of Using Three-Dimensional Computer Models in the Management of Construction," illustrates that one can achieve a reduction of at least five percent in cost growth, four percent in schedule slip, and 65 percent in rework if a three-dimensional computer model is used properly in the management of construction. The research report also shows that a three-dimensional computer model used improperly results in poorer performance than using only two-dimensional drawings.

Companies in the process or industrial sector are using integrated computer databases and three-dimensional computer models for:

- Reviewing constructability
- Defining scope
- Reference during project meetings
- Planning rigging operations
- Sequencing construction activities
- Checking access and clearances
- Survey control and layout
- Managing material yards
- Accessing supplier information
- Locating installation points
- Tracking progress
- Estimating costs

- Visualizing project details or design changes
- Recording as-builts
- Training construction personnel
- Planning temporary structures
- Tracking procurement and shop drawings
- Turning over design to owner

There is a real need for a process in which the 3D CAD system is fully integrated into an overall fully integrated and automated project process (FIAPP). Achieving this process will benefit owner, engineer, construction manager, and contractor. The process will be used throughout the duration of planning, design, construction, and commissioning and can provide needed information to the operations and maintenance phase of a project as well.

Purpose, Scope, and Objectives

The purpose of this research was to evaluate the integration of 3D CAD outputs into the construction phase. The investigation evaluated the general state-of-the-art in systems integration and automation for those systems related to 3D CAD. From the state-of-the-art, the research team developed procedures and a concept for integrating 3D CAD into the overall integrated and automated project processes.

Specific Objectives. The CII 3D CAD in FIAPP Research Team (RT 152) had the following specific objectives:

1. Determine the state-of-the-art in integrating and automating project processes as they relate or could relate to 3D CAD.
2. Survey 3D CAD and other information systems relating to construction and commissioning from identified suppliers. Develop lists of inputs to and potential outputs from 3D CAD systems.