Beyond Cad:
Collaborative Modeling *and the* Sprinkler Industry

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Imagine a CAD system which displays three-dimensional (3D) solid model drawings that can be accessed by dozens of designers, engineers, plan reviewers and parts suppliers located all over the world. Imagine also that they can all view and make changes to the drawings simultaneously and in real time over the Internet. That's collaborative CAD and it is being touted as a new engineering paradigm. So what would this mean for the design of fire sprinkler systems? It could give designers a better chance to actively participate in the design of buildings requiring sprinklers and could have a significant impact on how companies approach the design of sprinkler systems. There are definitely many promises and challenges offered by this latest addition to the CAD armory. What about the hundreds of talks, meetings, discussions, arguments, compromises and exchanges that are part of engineering design and construction? A sophisticated Collaborative CAD system should host a "virtual arena" that provides participants with access to collaborative tools such as an Electronic Mail and Massaging system for the rapid exchange of all information pertaining to project design and installation. Collaborative CAD would thus provide an electronic platform for the collection, processing analysis and distribution of information critical to the process of design and construction.

Hosting Collaborative CAD — Three dimensional solid modeling within a Collaborative CAD framework is a computation intensive process that calls for tremendous amounts of computing power as well as ample Internet bandwidth. It would require DSL or Cable Internet to connect each participating contractor to a host server with fast parallel processors. When you rotate a CAD model, for instance, you want to see it move smoothly and quickly.

CAD modeling packages generate graphic data files that come in all kinds of formats. Those designing with AutoCAD are most familiar with AutoDesk's proprietary .dwg vectorized graphic format which can be translated into the more ubiquitous .dxf or drawing exchange format. Unfortunately the exported graphics are not always perfect and tend to lose important graphic data. The picture gets more complicated when there are a multitude of different formats and some do not have any included translating capability. This is where the host server becomes very important.

A good host server must be licensed to process drawings in their native formats i.e. AutoCAD drawings in .dwg format and MicroStation drawings in their original format. Host server companies such as ALIBRE DESIGN have recommended the use of their STEP native file format for collaboration. This puts the responsibility for file integrity in the package that creates it rather than in the package that reads it. ALIBRE DESIGN includes a full-featured 3D solid modeler with parametric associativity between 3D designs and 2D drawings.

The host server must also provide virtual channels for activities that would have required a seemingly endless stream of phone calls, faxes and jobsite meetings. These virtual systems would address the various human-human collaborative transactions that are an integral part of design and construction for any engineering project. A Group Calendaring and Scheduling system to implement critical path analysis and minimize conflicts in scheduling. An Electronic Meeting System for interested parties to participate in the real-time exchange of information via chat forums or an instant messenger. A Desktop Video and Real-time Data Conferencing (Synchronous) for one-on-one virtual meetings between project participants. Non Real-time Data Conferencing (Asynchronous). A Group Document Handling system to manage project workflow. Workgroup Utilities and Development Tools, Groupware Frameworks, Groupware Services and Groupware Applications.

The Pharaohs Tomb and Building Design — Like an Egyptian pyramid, the building that requires sprinklers often looms as an immutable fact. Sprinkler contractors must show that they can run their pipes through all the spaces without waking the mummies. One of the central problems that has confounded fire sprinkler contractors and designers springs

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from the fact that they have little or no control in designing the buildings that require sprinklers. In spite of all their sophisticated estimating and drafting packages these companies have watched their frustrations mount and their profit margins dwindle. The construction industry, which is dominated by architects and engineers, has evolved a technocratic caste structure that always relegates fire sprinkler companies to the pariah podium. Fire sprinklers are rarely ever considered an integral part of building design. So after they get the job, fire sprinkler contractors must spend time and money trying to figure out how they are going to run all that piping through the limited volume of precious real estate already colonized by structural framing, air conditioning ducts, water pipes, sewer piping and electrical conduits. There is little or no real collaboration between sprinkler contractors and the other participants involved in building construction. Nothing seems to have changed from the old days except that today drawings are rendered on AutoCAD before being sent back up the hierarchy for reference and approval.

Collaborative CAD could play a useful role by offering a fully interactive environment for designing buildings in a manner that responds to the unique requirements and problems faced by all the trades involved in the construction project. The technology for this partnering already exists but it calls for a toppling of the existing class structure which is dominated by close minded technocrats. Fire sprinkler contractors could then become equal partners in all the phases of building design and construction.

Sprinkler Systems by Collaborative CAD — Engineering design is an information-intensive process that produces and consumes very large quantities of data in numerical and textual formats. Collaborative CAD databases can store project specifications, building codes and fire codes. The special requirements and idiosyncrasies of local jurisdictions, plan checkers and local fire chiefs can be noted and made available to the entire project design team in real time. This data can be easily modified and made instantly available to the design team by electronic mail and massaging.

Sprinkler companies have traditionally used in-house design teams to layout their shop drawings. This can be a problem if there is a shortage of company expertise to analyze and solve complex engineering and design problems. A Collaborative CAD system would allow the company to outsource the design and take advantage of a larger or cheaper source of manpower outside the company. This would allow the company to bid for projects it would likely have avoided due to a lack of internal expertise and manpower. It could also be beneficial during periods of heavy workload.

Problems and Solutions — There are social, cultural, security and economic barriers to the universal adoption of the Collaborative CAD paradigm. While Collaborative CAD offers the technology required to bring all the various parties to the virtual table it is by no means without problems.

On the international level language can pose a significant barrier to the smooth implementation of a Collaborative CAD system. Lotus Sametime is an application that allows users to find each other online and offers conversational language support including bi-directional, real-time translation for Chinese, English, French, German, Italian, Japanese, Korean and Spanish.

The precise time frames and schedules maintained in the Western world may seem rigid or threatening to individuals in developing nations. This issue must be thoroughly researched and clarified to avoid conflicts and minimize the type of frustrations that arise from unrealized expectations.

Collaboration involves a tradeoff between communication and security. The host server must establish rules for authenticating and verifying users that are authorized to access the various databases. This may call for various levels of encryption in email exchanges. There must be tight control on individuals and groups that are authorized to alter the graphic 3D modeling data. To avoid security breaches it may be necessary to host some applications outside the host company's firewall or to maintain separate and parallel servers as a backup.

Where projects require secrecy the need for security is extremely critical. It may be necessary to encrypt all data transmissions that occur over the Internet or use a separate Wide Area Network(WAN) that does not rely on the Internet TCP/IP communication system for transmitting project data.

Vendors — [Editor's note: This paragraph was edited for space.] The list inlcudes: AutoDesk's AutoCAD 2002; 3Ga Corp; Cimmetry Systems, Inc.; Actify and Alibre.

Summary — CAD technologies as used today are of limited value unless they can effectively include all building contractors in an integrated virtual arena. Sprinkler contractors and designers must be fully involved in building design and in all phases of construction rather than being treated like interior decorators. A Collaborative CAD system can make this possible. It saves time and money when conflicts are resolved before the building design is completed. A collaborative CAD system would help all parties realize substantial savings by reducing the volume of phone calls, faxes and meetings that characterize construction projects. Travel expenses are minimized since participants need not be in direct physical contact. There are social, cultural, security and economic issues that must be resolved before Collaborative CAD systems can be successfully implemented.

About the Author:

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