



White Paper

How to Successfully Implement Autodesk® Building Systems

This paper discusses the implementation and deployment of Autodesk® Building Systems, an object CAD technology for the MEP (mechanical, electrical, plumbing, and fire protection) engineering industry. Most organizations do not have a comprehensive or effective approach to applying new technology to existing processes. This paper explores the considerations necessary to make informed decisions, and presents strategic approaches to achieving the most effective implementation of Autodesk Building Systems for your organization.

Changing the Process

An increasing number of engineers are making the switch from the traditional 2D drafting software to 3D object-based design software. However, with this switch comes the realization that existing processes themselves must be examined, adjusted, and refined, or perhaps, fundamentally redesigned in order to realize continuing gains in effectiveness and stay competitive in the industry. The challenge for most organizations in doing so is that day-to-day productivity must be maintained on projects in progress, affording little opportunity for the fundamental consideration of such process issues and no margin for error.

In order to successfully implement any new technology, one must begin by identifying and defining the underlying processes necessary to produce their designs. In the case of engineering design, specifically building systems design, we have to look at both the design itself as well as the construction documents produced. For the design, consider issues such as project type, size, schedule and deliverable, functional requirements such as team make up and production constraints, as well as the actual design workflow and team responsibilities. There are similar issues for the construction documents produced. Do your engineers work on projects in teams, or do they work individually? Do you have CAD standards that must be adhered to? How proficient are your engineers today in the use of your current technologies? Besides these common issues, you will have many unique to your organization that must also be identified early on.

Object CAD Technology

Object CAD technology has changed the way industry professionals think about how technology can be applied to engineering design. Instead of working with traditional lines, arcs, and circles, you work with 3D geometry, or "objects", like equipment, ducts, and pipes that are representations of real-world objects. The objects know how to interact with other objects. For instance, a 12-inch duct knows that only 12-inch duct components can connect to it. By working with objects you create a complete model of your design and then through the use of automated tools generate conventional 2D construction documents. And because the model carries rich data about the design in the objects, design data can easily be extracted from the model to carry information downstream in the design process.

Improving the Process

Engineers who are reluctant to switch to an object CAD technology should ask themselves what their objective is – to make a drawing or to produce a design that can be effectively communicated for construction. Although the choice to make the switch may make sense and seem fundamental, all too often the barriers of implementation and deployment overwhelm organizations resulting in the continued use of outdated or inefficient technologies. With a clear understanding of existing processes, and an equal understanding of the capabilities of Autodesk Building Systems and how they can be applied to your processes, planning a successful implementation can become clear and less daunting.

All design and construction projects follow a general process that proceeds through certain phases from inception to completion, with minor variations depending on the requirements of the project. The phases in the process that are most common to engineering design and construction projects are:

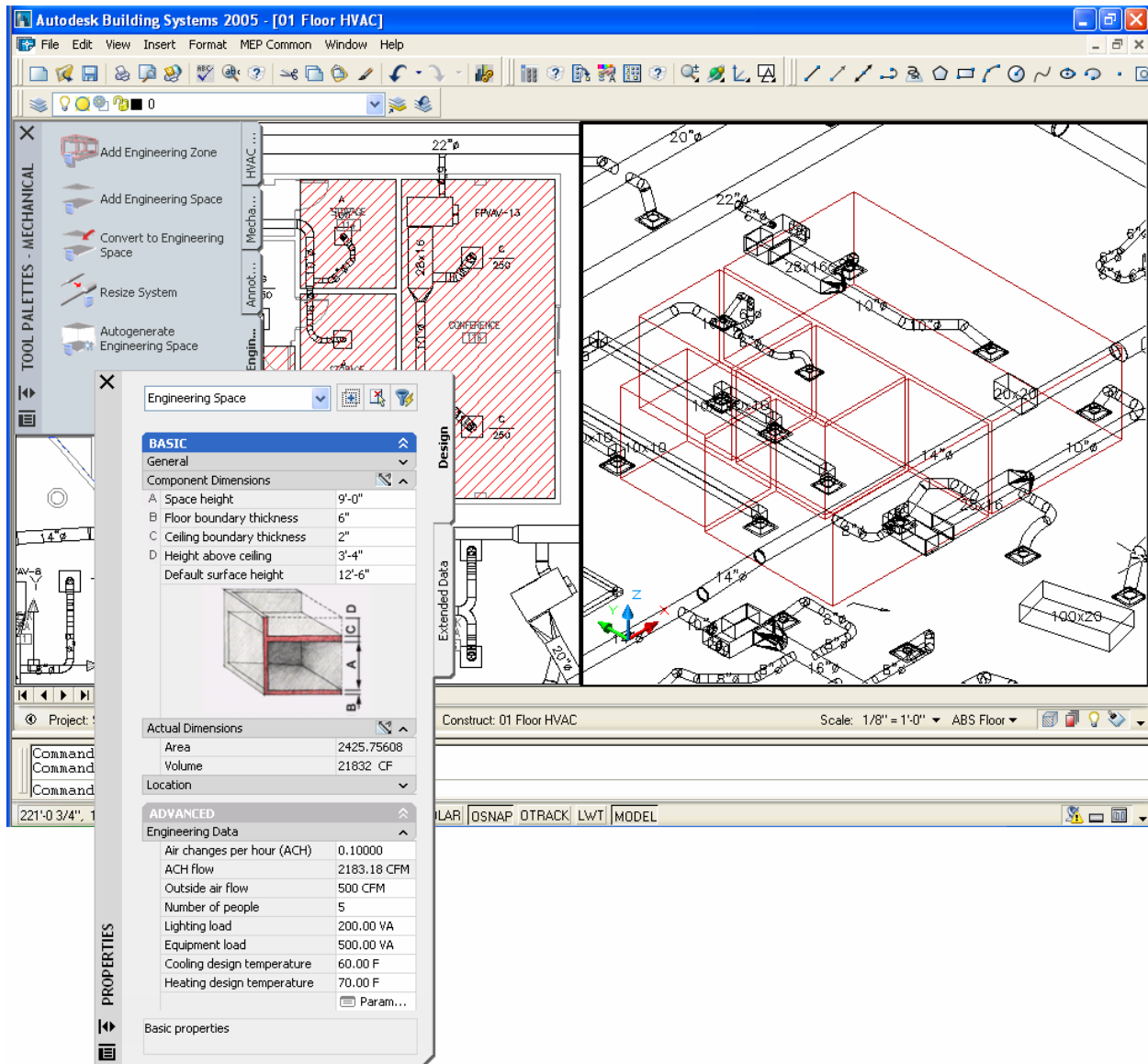
- Preliminary Design
- Design Development
- Construction Documents

To improve the process using Autodesk Building Systems, you need to look at each phase and determine specifically how this new technology can benefit your organization.

Improvements in the Preliminary Design Phase

All projects begin with an idea or a need that is analyzed to determine feasibility of the project. Alternative approaches to the design and construction are discussed, which typically results in conceptual drawings that engineers then use to design systems that will best fit the building and maximize the amount of space. Using traditional methods, developing preliminary design documents can be a very manual process; conceptualizing system designs from preliminary sketches, defining general size and area requirements by approximating the architecture of the building, identifying design criteria through time-consuming analyses and detailed calculations.

With Autodesk Building Systems you can reduce manual tasks throughout the preliminary design phase by producing a preliminary model of the spaces intended to be serviced. Through the massing of building elements like spaces, doors, and windows in an object-based CAD environment, much of the conceptual information required can be automatically generated for you. Benefit from calculated values for space dimensions, square footages and volumes, and estimated loads and quantities. Take advantage of this information by directly accessing the data for use in determining design criteria, such as area requirements, the use of multi-zones, and even preliminary costs.

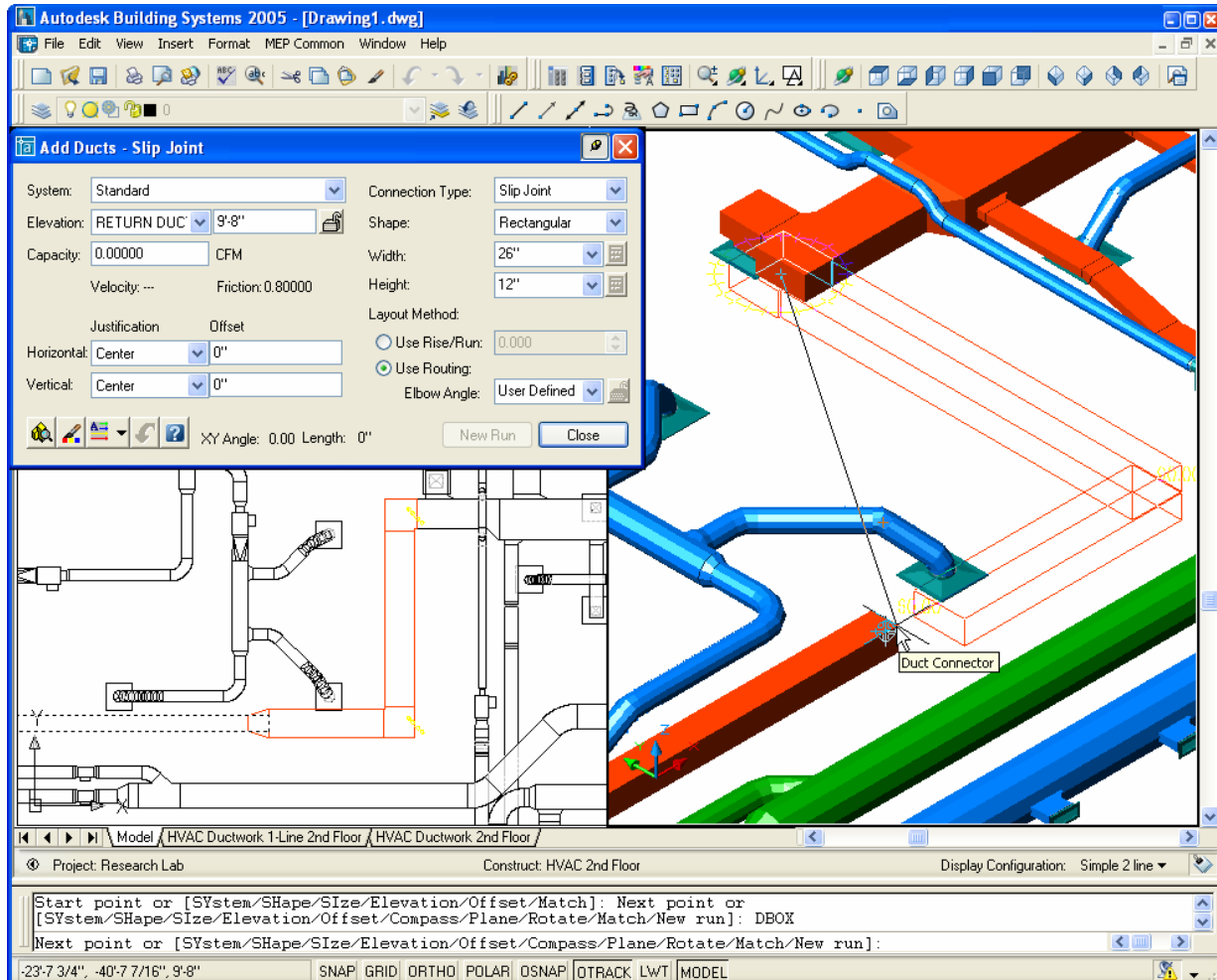


Take advantage of the design data automatically generated to determine design criteria.

Improvements in the Design Development Phase

During the development of a building project, changes are constantly made to fine tune the design based on the design criteria established during the preliminary design phase. Changes can cost time and money and negatively affect the project from staying on schedule and within budget. Traditional methods typically do not facilitate change effectively. The creation of design documents can be laborious and require a vast amount of low-value drafting tasks including manual checking of work. Additionally, access to design information can be fairly inconsistent due to the time and effort necessary to create, organize and manage the data.

Autodesk Building Systems allows a project team to make changes to the project at any time during the design process more quickly and effectively. With design data readily accessible in the model, critical design information, such as design geometry, part specifications and scheduling information, is immediately available so that project-related decisions can be made efficiently. Through the use of intuitive design tools that automate much of the design development process, a more accurate design that models a real-world installation can be developed, helping reduce errors and minimize project design time. This gives the project team more time to focus on the actual design itself.



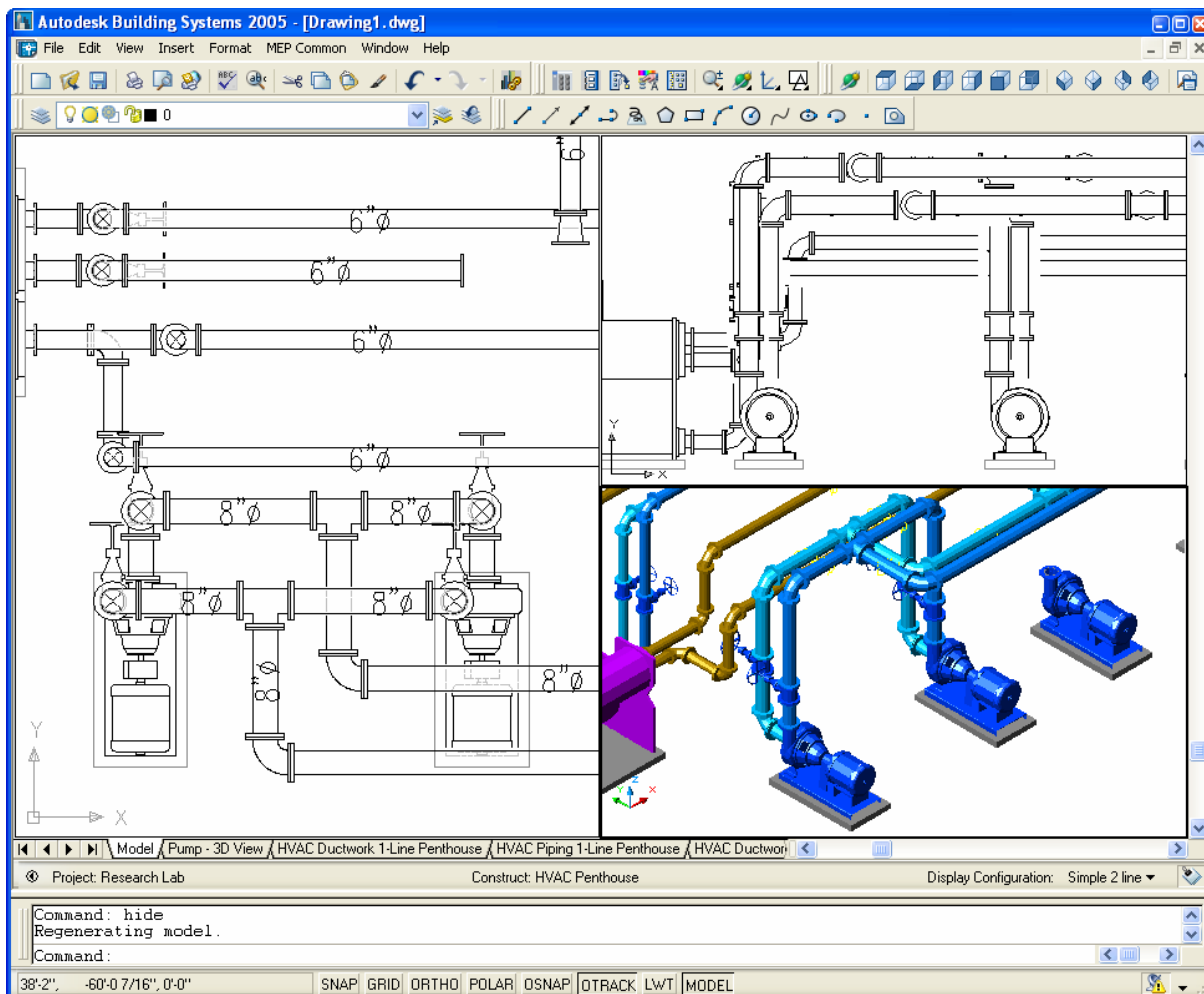
Take advantage of intuitive design tools to automate laborious and low-value design tasks and to help you in developing accurate designs.

In addition, Autodesk Building Systems streamlines processes, such as part selection and system sizing, by offering intuitive tools that assist you in developing an accurate design. Parts can be selected directly from catalogs that provide an extensive collection of industry-standard parts, or from manufacturers' websites. Systems can be sized based on the design data embedded in the model that was captured at the point of creation. This allows the project team to deliver better work faster, because it means that their design requires less time and effort.

Improvements in the Construction Documents Phase

The intent of a building systems design project is to create a building that will run efficiently. Conveying that intent through construction documents is the key to being able to erect the systems during construction accurately. Using traditional methods, coordination between all the different disciplines is usually the biggest problem. If the design intent is not clearly understood from the construction documents untimely design changes occur that most often are handled in the field. When ever a change is made to the design capturing that change throughout the construction documents many times does not happen because of the time and effort required. The result is lack of coordination that ultimately can have significant impacts on the construction of the project.

Autodesk Building Systems helps to ensure design coordination by allowing you to take advantage of the design data captured in the model. With the use of automated tools, you can quickly produce many views of your model including sections, elevations and 3D representations, and gain feedback about your design by generating schedules and detecting spatial interferences. Whenever a change is made to the design, all the consequences of that change are automatically coordinated throughout the project ensuring that the change is reflected in all of your construction documents. The automated design coordination provided by Autodesk Building Systems helps to eliminate coordination mistakes and improve the overall quality of your work.



Take advantage of automated design coordination to eliminate untimely design changes.

Assessment

Once you have determined that Autodesk Building Systems is a viable solution based on the benefits your organization can gain from process improvements, you must take a realistic look at the situation in your organization. The key to any successful software implementation is assessment. Many organizations are in the habit of looking at new technology to make their jobs easier and remain competitive. However, all too often the decision to adopt a new technology is made with the wrong expectations. In order to eliminate unrealistic expectations, maximize the value of your investment, and minimize implementation risks, it is imperative that you take a closer look at the more tangible issues surrounding implementing Autodesk Building Systems:

- Hardware Requirements
- Optimization and Configuration
- Installation and Deployment
- Training
- Support

No organization can afford a failed implementation, so be thorough. Leave nothing to chance. Look at every possible aspect from the standpoint of implementing Autodesk Building Systems successfully, and begin to develop goals based on the process improvements you previously identified. Establish realistic goals that are specific, quantifiable, and above all attainable. The success of your implementation will ultimately be judged on whether or not your goals are achieved. Your assessment should result in an implementation plan that defines the tasks to be performed, how and when they will be performed, required skills, project duration, risks, and cost estimates for the deployment.

Hardware Requirements

The system requirements for Autodesk Building Systems are as follows:

Minimum	Recommended
Intel® Pentium® 4 with 1.4 GHz processor, or AMD-K7® with 1.4 GHz processor	Pentium 4 with 1.7 GHz processor, or AMD-K7 with 1.7 GHz processor, or better
512 MB RAM	1 GB Ram
1.5 GB free disk space	2 GB free disk space
Microsoft® Windows® XP Professional or Home Edition (SP1 or later), or Windows 2000 (SP3 or later) operating system*	Windows XP Professional (SP1 or later), or Windows 2000 (SP3 or later) operating system*
1024x768 VGA video display	1280x1024 VGA video display
Windows video display driver with 16 MB RAM	Windows video display driver with 64 MB RAM
CD/DVD-ROM drive	CD/DVD-ROM drive

* Windows 95, Windows 98, and Windows NT® are no longer supported

Take inventory of workstations and PCs and identify any potential problems that would impact a successful implementation. Hardware upgrades may be beneficial for achieving high performance, but be sure to keep any hardware investments both scaleable and upgradeable for the future. Evaluate networking capabilities. Even the most basic advantages of networks, like centralized file sharing and shared software licenses, can have tremendous returns on investment.

Optimization and Configuration

Out of the box Autodesk Building Systems is set up for designing systems based on common industry standards. You can get up and running quickly using basic model and sheet templates that include generic layout tabs and borders; lay out systems based on AIA layer standards using predefined layer keys for layer assignment, color, linetype, and line weight, work with default part catalogs to generate designs based on common off-the-shelf parts, and use standard profiles to set up your workspace with general menus, tool palettes and tool bars.

Even though Autodesk Building Systems provides generalized configuration out of the box, additional set up is almost always necessary. Most organizations have CAD standards that must be adhered to, work on projects that require unique parts or equipment, and have established practices that demand custom workspaces and default settings. For an implementation of Autodesk Building Systems to be successful it is crucial that day-to-day production is maintained. Through optimization and configuration you can provide users with a level of familiarity that helps to ease the transition to a new technology.

The following is a list of what you should consider optimizing and configuring prior to any deployment of Autodesk Building Systems in your organization:

- Styles and style-based definitions for systems, part groups, rise drop symbology, object symbology such as panels, devices, fittings, wire, schematic pipe, and schematic symbols and lines, labels, property sets and schedules tables, pipe sizing tables, and demand factors.
- Layer standards, including layer keys
- Templates predefined with layout tabs and sheet borders
- Sample projects predefined with project settings, drawing file structure, and sheets
- Profiles based on default settings and workspace preferences
- User interface including tool palettes, tools, menus, and toolbars
- Plot settings including page setups
- Part catalogs

No two organizations will have the same issues regarding optimization and configuration. You may find that your organization can effectively use Autodesk Building Systems right out of the box, or that additional set up is an absolute necessity. Whatever the case, be sure to take into account your return on investment when deciding on what to optimize. Start by identifying what requires optimization in order for the software to be used effectively in your organization. Then, if time and budgets permit, provide additional customization in those areas where you will reap the most benefits. The goal here is to keep your level of optimization in line with the process improvement goals you previously defined, while minimizing customization to decrease upgrade and migration efforts.

Installation and Deployment

Installation and deployment of a new technology depends heavily on your organizational structure. Determine how many users will be affected. What kind of time constraints do you have? What directory structure will be used? Are components being loaded locally or on a network? Your goal here is to leave nothing to chance. Failure to do so may result in production slow downs, or worse, broken systems.

Determine the actual deployment process. Each step in the process should be looked at in detail, documented and tested. This will help to ensure that each deployment will be done identically. Evaluate available tools that could assist in the installation and deployment process like network deployment options or license management systems. Take advantage of the Network Installation wizard in Autodesk Building Systems that gives you the flexibility of pointing content and support files to a centralized location, for both network and single-user installations, making it easier to control and manage content. Or consider creating additional desktop shortcuts during installation like an AutoCAD-only shortcut for those users wanting to launch Autodesk Building Systems as basic AutoCAD to remain productive until they receive training.

Don't forget to plan for problems. As much as we plan for things to go smoothly, more often than none unforeseen issues arise. Perform backups of all systems in order to be prepared to revert to the old system if needed. Create a contingency plan if your implementation schedule is interrupted like staggering deployments to individuals or groups, or leveraging nights and weekends for the actual installations to minimize down time.

Training

Training requirements significantly increase the implementation time and cost. First and foremost you will need a training budget. In order to establish a training budget you need to ask yourself two important questions:

1. How will Autodesk Building Systems be used in your organization?
2. What is the proficiency level of your users?

The answers to these questions will help you determine the type of training needed as well as how MUCH training will be required. When it comes to CAD software, one can never have enough training. However no organization can afford to provide the wrong training. Providing training is always a touchy issue in most organizations. It is not uncommon for organizations to provide one or two days of training and expect their CAD users to be up and running on the new technology within weeks. Unfortunately, the reality of implementing Autodesk Building Systems is not that simple.

Remember that Autodesk Building Systems presents a change in process when implemented successfully. Therefore, training requirements must be accurately identify in order to reap the full benefits of implementing this new technology. Process changes take time; established practices must change and old habits must be broken. Be realistic about training requirements and take them into consideration when planning the implementation. Look for ways to ease the transition. Provide training during or shortly after deployment to allow users to apply what they learned in training right away. Evaluate the available training options based on issues such as quality of instruction, flexibility of curriculums, and logistics. And lastly provide enough training to offer a level of comfort to those users who are being asked to learn new technology to do their job.

Support

Even after installation, deployment, and training takes place, the implementation process is not complete. Technical support must be available and easy to access for everyone. Don't expect CAD users to attend training and return to the office knowing everything to make Autodesk Building Systems purr on their desk. There is always a learning curve for new technology and by taking the steps necessary to provide adequate technical support, users will have the help they need back on the job.

Some steps you can take to ensure adequate technical support are as follows:

- Provide an ongoing training program, like lunch and learn sessions
- Establish an in-house users group
- Give access to Autodesk Technical Support services directly to your users
- Develop an intranet site for posting CAD standards, tips and tricks, or best practices
- Train in-house trainers that can mentor and support other users
- Establish external mentors that can provide support on an as-need basis
- Encourage communication between CAD users through published documents, such as subscriptions to leading CAD magazines or access to online newsgroups

Every organization will have different ideas of how to provide ongoing technical support. Remember it is not necessarily the method of support but that support is available.

Pilot Project

Consider a pilot project. Most organizations that are talking about investing thousands of dollars in new technology want proof-of-concept. Set up a few users in a small-scale production environment to evaluate your implementation plan and to validate the results of your assessment. This will be a good indication if you identified the critical issues to be considered in your organization, accurately estimated time and costs, and set realistic goals that can successfully be attained.

A well-run pilot project may provide just the nudge required to get high-level buy-in. However, pilot projects are notoriously tricky to manage when considering that users involved are typically new to the software having received little to no training, and implementation plans are in draft form that may require significant modifications. Consider outside resources to assist with a pilot project. You don't want a pilot project to fail due to a lack of commitment to a wider implementation.

Getting Assistance

If your organization is small, implementation may not be a major concern as if you were a larger company. To help you answer those key questions and determine optimal strategic approaches that will make the difference between having your implementation be a success or a failure, look for assistance from outside resources where appropriate. Consider consulting your local Autodesk Authorized Reseller (www.autodesk.com/reseller) to facilitate the adoption of Autodesk Building Systems. Or contact Autodesk Consulting (www.autodesk.com/consulting) for assistance with project assessment, process audits, implementation services, network setup, application porting and other custom services to help you make the best use of Autodesk Building Systems.

Summary

Implementing a new technology, specifically Autodesk Building Systems, may be frustrating at times; however when all is said and done your organization can reap tremendous rewards from a successful implementation. If you have considered each of the issues previously discussed and objectively weighed the strategic approaches presented, you will have addressed the critical steps in achieving the most effective implementation of Autodesk Building Systems for your organization. Taking the time to strategize and plan for an implementation of Autodesk Building Systems will minimize the time and efforts required for a successful implementation and maximize your return on investment.

Organizations that have successfully implemented Autodesk Building Systems have this to say:

"Using Autodesk Building Solutions has allowed us to work faster and smarter. We no longer have to duplicate efforts as we go from schematic design to design development to construction documents."

Norman Kurtz, President and CEO, Flack+Kurtz

"The product's engineering-specific features allow our engineers to spend more time focused on solving our clients' building design problems, resulting in more satisfied clients and project teams."

Randall Harris, VP & Senior Mechanical Engineer, Harris Consulting Engineers

"With Autodesk Building Systems, one person can generate sections and elevations, and even create schedules. I've increased my speed in laying out drawings by up to 35%."

Armundo Darling, CAD Manager, Flack+Kurtz

"Increased efficiencies allow us to spend more time coordinating between disciplines in the 3D model rather than resolving change orders in the field."

Davis Eccleston, Applications Manager, Process Facilities Inc.

To hear more from these organizations go to www.autodesk.com/buildingsystems and click on Customer Stories.

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