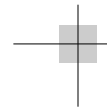


# **Bentley Expert Designer™: A New Paradigm in Ease of Use**

Vonnie Smith



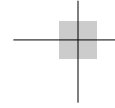


## Introduction

*What makes the typical designer's job especially difficult is having to bridge gaps between multiple task domains to assemble information that satisfies customers and construction crews as well as other business requirements. Consequently, designers are often obliged to learn and interact with multiple enterprise applications to complete the tasks essential in performing their job.*

*This paper describes the features and benefits of the Design Worksheet, the user interface paradigm that forms the foundation of Bentley's infrastructure design solution, Expert Designer. The Design Worksheet paradigm integrates tabular and spatial data with leading-edge system integration technologies to bring multiple systems together into an intuitive and efficient environment for the designer. The paradigm allows users to learn the design application quickly and use it productively. With its familiar Windows look and feel, the interface allows users to perform all their design work in a single environment, structured around design tasks that users perform on a daily basis.*

*For the utility company, this ease of use means lower training costs, more staffing flexibility (due to less reliance on highly skilled technicians), and a faster time frame for achieving results and benefits.*



## Conventional design in spatial systems

Over the past several decades, geospatial technologies have been widely adopted for planning and managing utility infrastructure. What began as a computer-based tool for eliminating the inefficiencies of paper maps has assumed an increasingly critical role in problem solving and decision-making. Due to numerous factors—the intricacies of spatially representing the relationships and behaviors of real-world things; the vast quantity of data processed by utilities; the inherently complicated functionality of a system that must accommodate data from a variety of sources and diverse industries; and the trend toward shared geodata through full enterprise-wide integration of all IT systems—spatial technologies are becoming more and more complex as they mature.

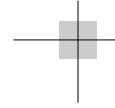
For users of spatial systems, the starting point has always been the map window, where the company's infrastructure is represented cartographically, along with relevant land features (roads, buildings, bodies of water, etc.).

It is standard practice for the designer to work primarily within this highly abstract graphical environment, creating and manipulating points, lines, areas, symbols, annotations, and other design elements. To specify, view, or edit the attributes of particular facilities, the designer typically accesses a separate object editor for each facility. Although the graphical environment shows the location and shape of the design in the map window, it does not give the designer a single, highly organized view of all the design data. To perform engineering analysis or optimization of the design, the designer usually exports the data to external applications with their own user interfaces. To exchange information with the work management system, the designer opens a customized application with yet another interface. It is not surprising, then, that spatial design work has of necessity been restricted to engineers and highly skilled technicians, who still need, according to a leading industry consultant, roughly two years to reach the threshold point of the learning curve. But as data created and maintained in spatial systems assumes a more elevated position in infrastructure planning and management, Bentley has addressed the need to diffuse and democratize access to spatial data by eliminating the steep learning curve traditionally associated with these systems.

The following sections describe how Expert Designer's interface paradigm provides unprecedented ease of use in the way information is displayed, manipulat-

ed, and shared with other systems. For purposes of discussion, Expert Designer's ease-of-use features are grouped into a few broad categories:

- Dedicated task space
- Work organizers
- Standard Windows controls
- Intelligent views
- Shielded complexity
- Error prevention



## Dedicated task space

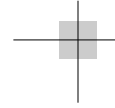
Dedicated task space means that the user performs all data entry in a single place, allowing Expert Designer to push the data into the appropriate system. For example, instead of working within the spatial system, with its many complex functions that are nonessential for most design work, the user performs all design tasks within the dedicated task space provided by Expert Designer. The map window of the spatial system is simply a geographical/spatial frame of reference.

This focused tasking is achieved by Expert Designer's advanced open architecture, which provides seamless, invisible integration with external systems. Powerful connector technologies operating in the background exchange spatial and tabular information between Expert Designer and other systems, giving users a permanent, integrated environment for doing their work. And because Expert Designer unifies geospatial and work management data, the Expert Designer environment consolidates and simplifies design tasks, significantly boosting the designer's productivity.

Working within Expert Designer, users can retrieve and manage assigned jobs, access up-to-date lists of cost units, lay out and optimize new facilities, upgrade existing facilities, post as-built modifications, and numerous other tasks—all without switching to another application. They do their work in a single environment that integrates disparate sources of data into a meaningful whole with a consistent presentation style.

By working in Expert Designer's specialized environment, designers have less software to navigate and fewer controls to master, so proficiency comes quickly. Faster learning means improved productivity among users and lower training costs for the company.

And for designers who want to generate a report in Crystal Reports, fill in a form based on Microsoft Word data, or populate an Excel spreadsheet, Expert Designer integrates directly with these tools, automatically passing in the pertinent design information from the dedicated task workspace.



## Organizers for job information and design data

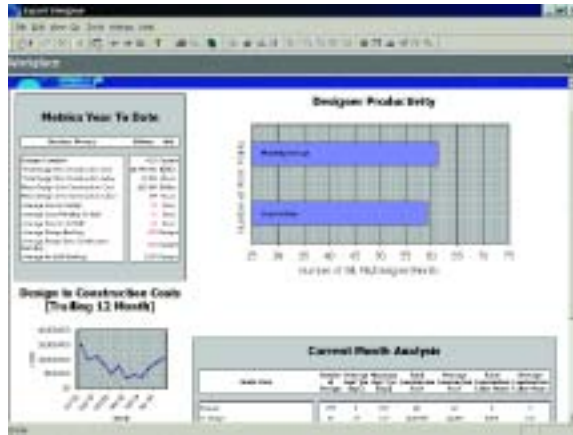
Expert Designer is much more than a set of powerful design tools. The user-centered interface pulls information from diverse data sources and structures it in a meaningful way. As utility companies accumulate and maintain more data about their facilities and customers, software capabilities for representing data in a context that makes sense to users become increasingly important. Expert Designer assists users in finding information quickly and in employing their own organizational strategies.

### **Customized Portals**

To give users structured summaries of task- and performance-oriented information, Expert Designer can be customized with specific HTML screens that recognize the user's login and the group to which the user belongs (such as Designer, Map Technician, Manager, Supervisor, etc.). These “portals,” which are dynamically updated and continually available from other Expert Designer screens, display information that helps each group of users manage their work.

For example, the Workplace Today portal shows designers and design supervisors a calendar, along with dynamically updated lists of work requests with start or due dates within a specific time period, tasks that need their attention, the number of jobs in their backlog (sorted by status), and key performance metrics for their past work. By clicking on a job or a task, they can hot-link directly to the data. Pending tasks can also be marked complete from this screen.

The Workplace Scorecard and Workplace Dashboard portals help supervisors, managers, and executives manage their specific job responsibilities for more efficient and productive work groups that contribute to an overall effective business operation. These screens display a wealth of metrics, such as number of completed designs, total Design to Construction costs and labor hours, average number of days in design, as-built activities, and average backlog for each activity. The screen also displays graphs of designer productivity for the year to date and trailing 12 months.



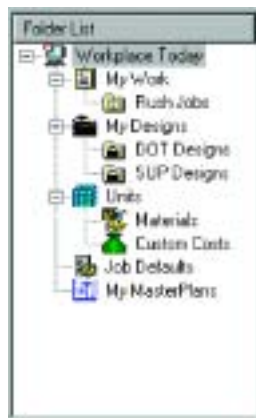
**Sample Workplace Scoreboard**

compatible units, with subfolders for other types of cost units, such as Materials and Custom Costs

- Job Defaults-predefined attribute settings and mapping defaults for particular types of jobs

Folders can be collapsed for general viewing and navigating, or expanded for locating detailed data.

Using standard Windows capabilities, Expert Designer users can also create personal folders and subfolders for further organizing their work. They can add a personal folder for their rush jobs, for designs that they want to keep indefinitely, for frequently used job defaults, or for other items that they want to access quickly. The user can apply an SQL statement to control which items are placed in a particular folder or can move data from a default folder (such as My Work) to a personal folder through simple clipboard operations such as cut/copy and paste.



**Folder List with custom folders**

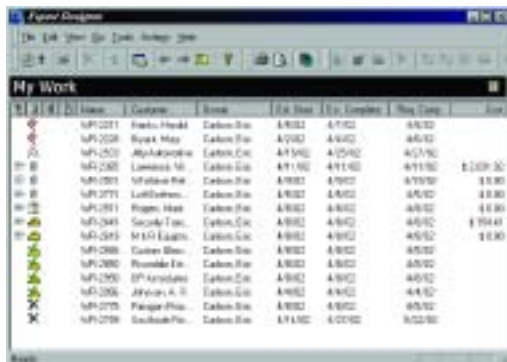
Opening one of the standard folders displays a list of all the data in this category. The Data Lister can be organized as the user prefers: any column can be selected as a sort field-for sorting in ascending or descending order-and the columns can be resized or moved. A user can also add a new column to a lister, based on a system attribute or a custom attribute. And listers support dynamic editing, which allows the user

## Folders

The Folder List, a readily available pane in all of Expert Designer's main screens, organizes information into hierarchical groups of folders:

- My Work-the user's assigned jobs
- My Designs-the user's designs
- Units-macro and compatible units, with subfolders for other types of cost units, such as Materials and Custom Costs

to change certain text strings and values directly in the lister instead of the source dialogue box; Expert Designer will instantly update the relevant database.



### My Work Data Lister

A path might represent a run of primary conductor along Main Street or a service drop from an underground transformer to a business. Paths, which Expert Designer has retrieved from the spatial system, are further organized into work locations, each of which is associated with a group of facilities. Work location and facility information is represented with the same familiar organizing principle as other Expert Designer data-expandable and collapsible folders arranged in a worksheet format. Depending on user preference, the design information can be sorted by work location or by facility type.

In addition to spatial information, Expert Designer simultaneously displays related material, labor, and other costs, which are dynamically updated as the user makes changes to the design.

By organizing the design data within a comprehensive, centralized view that also serves as the workspace for building and modifying the design, Expert Designer makes the designer's job easier, faster, and more efficient.



### Sample overhead electric design (Work Location view)

Another organizational feature of the Data Listers is the use of distinctive icons that reinforce logical categories visually. Clicking on a listed item opens it in the appropriate window for viewing or editing.

When a user opens an in-progress or finished design, information is likewise displayed in a highly structured view, organized into paths. A

### Catalogs

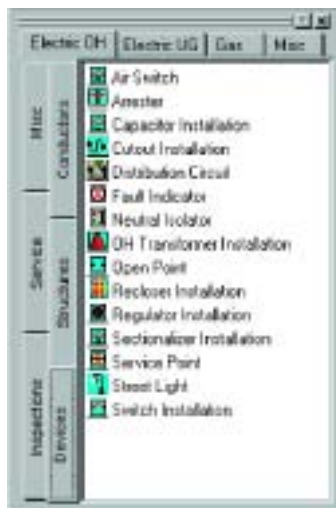
Expert Designer's catalogs are tabbed panes containing highly organized lists of objects that users need in building their designs:

- Features Catalog-various facility types used by the company (poles,

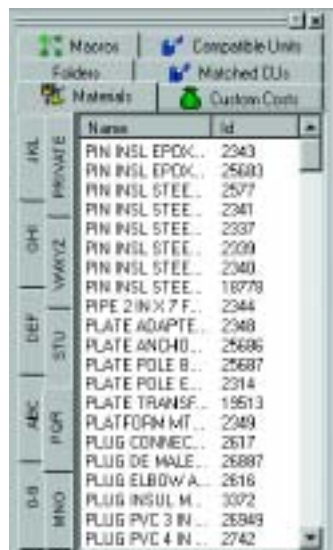
wire, transformers) and other design objects

- Units Catalog-the company's cost units, such as compatible units, macro units, materials, and custom costs

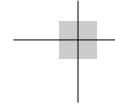
Items in the catalogs are further subdivided into functional or alphanumeric groups, accessed by clicking a tab, and users determine how the information is sorted on a catalog page. The catalog format presents large quantities of information within a logical structure that users quickly grasp. Furthermore, the catalogs can remain open while the user is working on a design, which speeds up the process of selecting the design's building blocks.



**Features Catalog**



**Units Catalog**



## Standard Windows controls

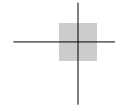
The Design Worksheet paradigm behind Expert Designer's interface incorporates standard Windows controls, so users can perform detailed design tasks in a comfortable environment with familiar controls and intuitive commands. Designs, for example, are handled much like files in Expert Designer—a user can open them, delete them, save them under a different name, move them into special folders, and so on.

Expert Designer's drag-and-drop functionality greatly simplifies and speeds up design tasks. A user drags features from the Features Catalog to the Design Worksheet and drops it on the work locations where these facilities are to be installed. A feature like a pole can be dropped on a path if the user wants to install the pole at every point-type work location in the path. To manually assign cost units (instead of automatically assigning them during feature placement), the user drags them from the Units Catalog and drops them on the appropriate features. With drag-and-drop operations, users can also quickly assemble custom macro units and compatible units or move work requests, designs, and units from the standard folders into custom folders.

With standard clipboard operations, the user can move features from one work location to another (if the action is compatible with the enabled business rules) or move cost units; copy-paste operations allow the user to copy facilities and units and duplicate them at other locations of the design. Likewise, the familiar Undo/Redo commands are always available in Expert Designer and trigger the appropriate behaviors in the spatial environment, such as deleting a map feature or rolling back an attribute change.

Because Bentley follows Microsoft standards, Expert Designer's interface elements exhibit the behavior that users have come to expect from an application. Toolbars and panes can be repositioned through docking or floating, or they can be hidden altogether. Toolbar buttons can also be rearranged. Expert Designer supports multiple selections via the CONTROL key, so the user can apply an action to several items with one step. Right-clicking an item displays a context-sensitive shortcut menu that saves time and effort.

With its standard Windows look and feel, Expert Designer offers a friendly environment to which users have already become accustomed, so they spend less time learning the software and more time on design work.



## Intelligent Views

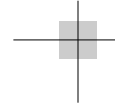
Regardless of the task being performed, Expert Designer presents the user with an intelligent and natural view of the data. Based on system settings, the capabilities assigned to the user, and the nature and state of the data, Expert Designer selectively displays information that is appropriate to that particular user and to the data at this point in time.

For example, when a regular designer opens the My Work view, only the jobs assigned to this designer will likely be displayed. If the user is a supervisor, the My Work view will show all assigned jobs. By retrieving precisely the information users need for the job at hand, Expert Designer performs a helpful screening function—users do not have to spend time dealing with extraneous data.

Furthermore, Expert Designer's menus, list boxes, and toolbar buttons are similarly context-sensitive, so only the options that are appropriate to the user and the data are available. With work requests, for instance, the current position of the job in the workflow determines where it can go next. Typically, a job in the “Waiting Approval” state cannot be modified or submitted for scheduling; it must be either canceled or approved. Additional requirements, such as a site inspection, are often imposed on certain jobs by the work management system before a job can move to the next phase.

With its system-level intelligence, Expert Designer enforces the proper workflow protocols by making only the permissible or required options available to the user. By limiting choices to the right ones, the context-aware interface actually guides users through every procedure, simplifying decision-making and preventing mistakes at the same time. And since menus, lists, and pop-ups are populated according to context, Expert Designer's data sensitivity reduces interface clutter and complexity, which is easier on the user and economical in the use of screen space.

Expert Designer also provides numerous context-aware resources that assist the user in performing specific tasks. A full-featured context-sensitive on-line Help system, which opens from every screen and dialog box, gives the user information about the current window and functions. Major data operations trigger confirmations or warnings that explain, in plain language, what the user must do to execute an action successfully.



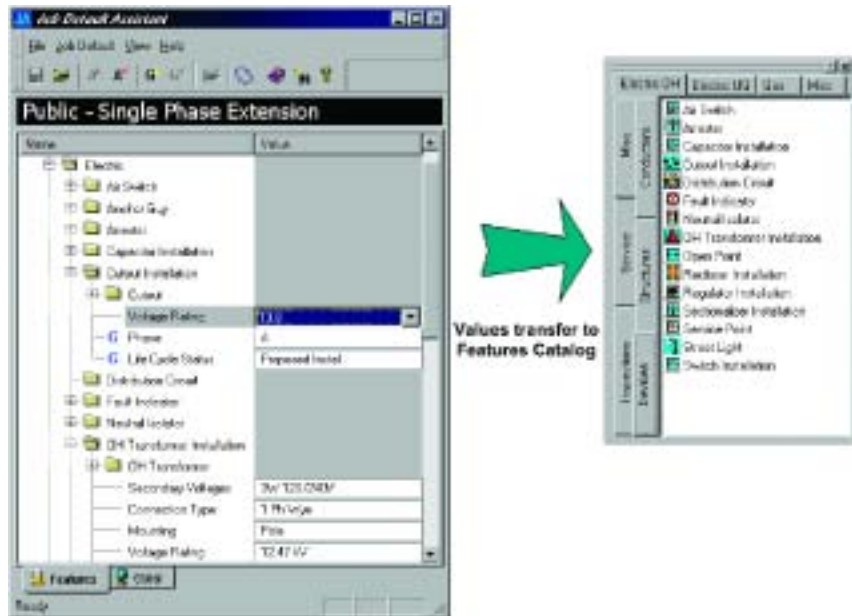
## Shielded Complexity

The operations behind Expert Designer's sophisticated capabilities for searching, sorting, retrieving, and displaying data from a variety of sources are shielded from users, so they do not have to learn how to interact with the spatial system, the work management system, or other third-party products that have been integrated with Expert Designer in order to perform these tasks. Fewer user interactions with the other systems also means there is less chance of making mistakes. Equally significant is the fact that many of the complexities of normal design work are removed from the designer's environment through Expert Designer's innovative Job Defaults functionality.

Job defaults are “smart” sets of default values that are applied when the user picks a feature in the Features Catalog and assigns it to a design. Any number of job default sets, reflecting the utility company's construction standards, can be configured for Expert Designer. A job default can apply to all features assigned to a design-which means it serves as a Global default-or it can apply to only individual features.

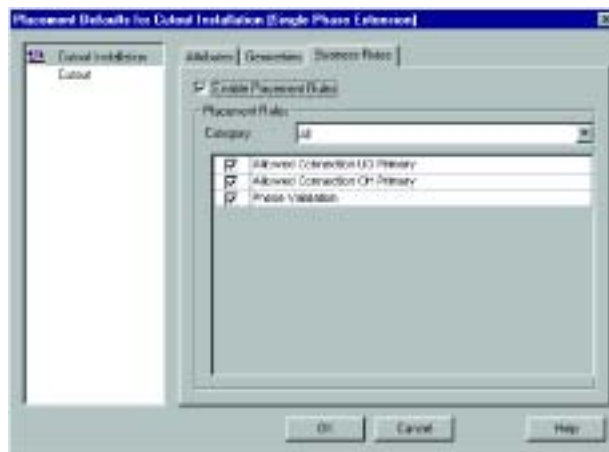
A feature default can be a spatial value-such as the position and orientation of a feature's annotation relative to the feature symbol on the map. Or it can be a textual attribute value-such as the height and class of a pole or the voltage rating of a transformer. One or more cost units can also be linked to a feature as a default value, resulting in automatic placement of the units when the user assigns the feature. Expert Designer can even sift through the database of units and display all units that match the feature. The user can either accept the existing default unit or choose a different matching unit.

By selecting an appropriate job default (for example, Overhead Single-Phase Extension, Three-Phase Commercial, or Overhead Service), the user can skip the tedious and time-consuming step of specifying settings for each feature to be placed and searching for suitable units.

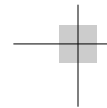


### Sample job default (Single-Phase Extension)

Furthermore, job defaults can enforce the company's construction standards for the way features must attach and connect to each other. These business rules, discussed more fully in the next section, operate behind the scenes to eliminate guesswork from the layout process and making it easier for users to produce high-quality work.



### Business Rules settings for a feature in a sample job default

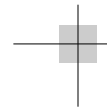


## Error Prevention

Expert Designer provides numerous safeguards for guiding users through their design tasks and ensuring consistent, error-free work.

Expert Designer can enforce business rules continuously throughout the design process, at specific stages in the process, or on demand. Continuously enforced business rules are helpful when the user's current operation violates company engineering standards because the rule engine not only prevents the user from violating the rule but also triggers a message explaining what the user must do to correct the problem. This protects company data and, just as important, makes the design process faster and more satisfying because the user avoids reworks due to errors.

Business rules configured to be run on demand or at specific stages in the workflow prevent any type rule violation that cannot be linked to a single user action. For example, a design may have missing design elements or contain a group of elements that collectively violate some engineering standards. Rules run in this manner generate a list of violations or warnings that are displayed to the user. The user can automatically navigate to the problem area by selecting the violation or warning message. These types of rules can also be enforced by the Work Manager, requiring the user to address violations before proceeding to the next step in the design process.



## Summary

Expert Designer's Design Worksheet interface paradigm combines a familiar look and feel with many ease-of-use features that give users natural, readily understandable ways of

accessing and manipulating information. These features can be summarized as follows:

- **Dedicated task space.** The user works almost exclusively within Expert Designer's centralized design environment, which provides single-point access to the data in the geospatial and work management systems.
- **Work organizers.** Expert Designer provides a highly structured environment, through logical groupings and visual devices, for vast quantities of infrastructure information.
- **Standard Windows controls.** The look and feel of Expert Designer reflects conventions that are universally known by even less experienced users.
- **Intelligent views.** The information and operations that are made available to the user are appropriate to that particular user and to the nature and state of the data at this point in time.
- **Shielded complexity.** System-level operations as well as many of the complexities of design are concealed from the user, simplifying the environment.
- **Error prevention.** Built-in rule-based safeguards ensure that the user's work is done correctly.

If you would like to obtain additional information about Expert Designer or any of Bentley's product offerings, please visit [www.bentley.com](http://www.bentley.com), call 1-800-BENTLEY, or your local Bentley office.