The e-SPECS® BIM Process

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AB4786: In this class, we will focus on the connection between the building information model (BIM) and the project specifications. If a picture is worth a thousand words, then your specifications are a picture of your construction documents. Yet these two document types are typically created separately and without any automated coordination, requiring users to manually ensure that the objects represented in the model actually are correctly represented in the specifications. We will go through the process of setting up an automated coordination environment, including techniques for coordinating with those outside your office environment who may be off your company network. We will cover the process of automating and controlling the flow of information and review case studies of successful projects and clients that are utilizing these methods.

Learning Objectives:

At the end of this class, you will be able to:

- Describe how others in the AEC industry are successfully integrating their specification processes into their BIM workflow

- Evaluate what level of automation and content generation is necessary for individual project types

- Coordinate and integrate BIM models with their specifications

About the Speakers

Peter Marchese is a senior consultant with Microdesk, providing support to national architecture firms implementing Revit®. He also specializes in implementation, custom content creation, consulting services, customized training, and leading firms through the process of creating standards and workflows based on building information modeling technology. Prior to joining Microdesk, Peter worked at firms working on residential, institutional, liturgical, and commercial projects. He has managed projects throughout all phases from design through construction documentation. Completed projects include several laboratory/research buildings, residences, libraries, movie theaters, and a new processing and distribution center for the USPS. Peter has extensive working knowledge of AutoCAD® and Revit for construction documents, presentations, animations, and renderings. He holds a Bachelor of Science degree in architecture from Drexel University in Philadelphia, Pennsylvania.

Gilles Letourneau, AIA, CSI, is a co-founder of InterSpec Inc., a software development and specification management company located in Portland, Maine. Letourneau is the principal architect of e-SPECS®, InterSpec's innovative specification automation program that links architectural building information modeling (BIM) models and CAD drawings to the specification master documents to automate the preparation of project specification manuals. Prior to launching InterSpec, Letourneau spent seven years as an architect and spec writer for a number of architectural firms. He holds a degree in architecture from Syracuse University and an MS in architecture with a concentration in computer-aided design and artificial intelligence from the California Polytechnic State University.

Specifications

When I first started working in architecture, specs were defined to me as "the thousand words to the CD's picture." In other words, while the drawings convey the design intent and often appearance of a location, it is the specifications that call out the actual *who*, *what*, *how*, and, in many cases, *when* of the materials in use on a project.

Traditionally specs are done either on an as-needed per-project basis or are simply copied from similar projects and then edited. Both routes are acceptable, but they allow for certain inefficiencies to creep into the project cycle. Specs done as-needed require manual updates when changes are made and often require multiple people or companies to communicate intent and choices. Specs made from existing documents carry the risk that content specific to one project will not be changed or removed for its use on another. These inefficiencies can cause change orders, RFIs, and in some cases litigation.

BIM

One of the main benefits of BIM is the idea of the "parametric change engine," i.e., you make a change in one location and it automatically updates the rest of the model, schedules, plans, elevations, etc. For the most part everyone today is in agreement that BIM is the future of building design and that it can help project teams avoid many mistakes by automating certain processes.

However, many people see the term BIM and still only think of a 3D model or a specific program, which overlooks other critical aspects. The 3D model is almost a side effect process, and the software is simply a tool. BIM stands for Building INFORMATION Modeling (or Management in some circles), the key word being *information*. The information is essential to making sure coordination and consistency happens.

Current state of specification creation

Currently the spec writing process is done a few different ways, but typically boils down to one of two basic methods, or a mixture of the two: (1) The specs are written from scratch from Masterspec or custom office masters each time, or (2) the spec is copied and pasted from a previous (hopefully similar) job.

There are issues associated with both of these techniques. In the first case, much of the work has to be done over and over again. Unless all your projects are so similar that your office masters are close to being finished, you will have to make many decisions along the way to in order to get a set done. In the second case, you are introducing the risk of inserting information that does not belong in the current project. Certain terms, location information, or even client information may go unnoticed until the specs have been issued, and at that point RFIs and change orders can come in.

When the spec writer is not the same as the project architect, more complications can arise. Regardless of whether the spec writer is in house or not, the two need to communicate on design decisions, choice of materials and manufacturers, and any changes that occur throughout the project to ensure that the two pieces of the contract documentation are consistent.

Scenarios for fostering coordination

We will focus on two main ways of achieving coordination and automation. One is the "perfect world" scenario where the spec writer and the designers work in the same firm. The other is a situation that is happening more and more frequently, where an outside firm or consultant handles the specifications. In either case, e-SPECS can be used as a means of facilitating collaboration.

When the design firm is doing the specification work internally and the design model are one and the same, then the e-SPECS database will reside on their servers and all team members who have access to that database will be able to easily access the specifications for editing or review. Like any other program that works off of a database, user rights can be controlled and connection to the network is paramount.

When working with contractors or outside consultants that are not connected to your network, there are still methods of using the software to stay coordinated. One option is to allow the outside entity to have access to your network. This can be done via a solution similar to Citrix where they are granted minimal rights to your network to work with and access your content. e-SPECS also offers you the option of using a cloud-based database, where users would interact with the database and coordinate remotely through a web-based interface.

Seting up the e-SPECS coordination system

First of all, let's start with a very basic overview of how e-SPECS works in order to clarify some common misconceptions and to define some important terminology. e-SPECS does not magically create specification information using some super-sophisticated algorithm based on items it might find in a building model. It is much simpler than that. e-SPECS creates project-specific specification documents by filtering pre-configured master specification documents to the requirements of the building project based on information that it extracts from the Revit models. This is not unlike what most architects, engineers, and specifiers do routinely to create the project specification "by hand" with word processing systems. They typically start with a set of master specification documents, review the project drawings to determine what specification sections are required, and then proceed to mark up the master specification documents for the specific requirements of the project. e-SPECS simply automates this process and, in doing so, provides the added benefit of ensuring that the models (and resulting drawings) remain in sync with the specifications.

At the core of the e-SPECS integration technology is a patented process to simplify the filtering of the specification master documents based on selections in a master checklist. Figure 1 is a diagram that illustrates this fundamental concept. The checklist items, referred to as *tags* in the e-SPECS vernacular, are associated to the appropriate content in the master documents with relationships known as "mappings." For example, if the wood window tag is selected or "checked," the relevant wood window section is selected from the master specification documents and the required paragraphs in the section are automatically included in the resulting specification documents. All the other paragraphs that are not related to the wood windows are removed.
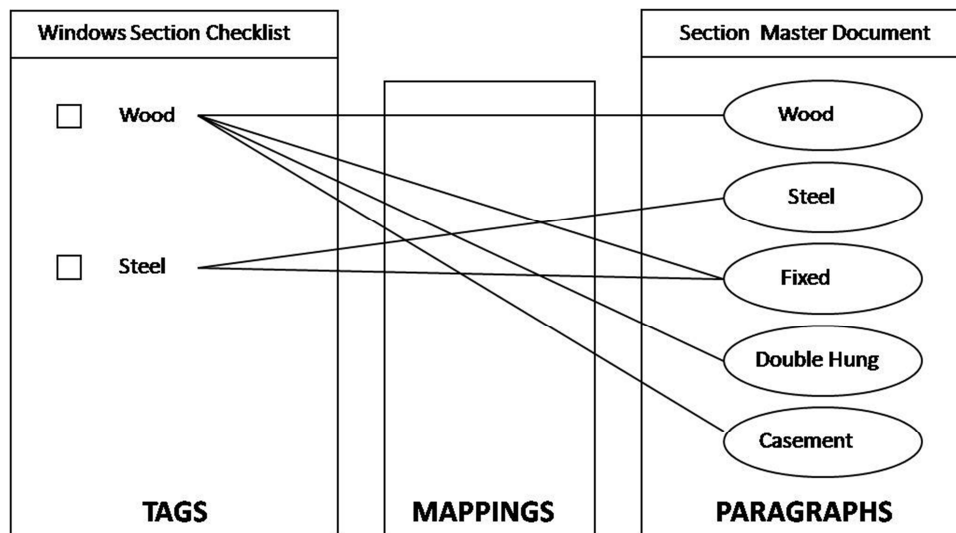

Figure 1: The patented e-SPECS tags and mappings are used to filter master specification documents.

To see how this actually looks in practice, Figure 2 is an illustration of the e-SPECS specification checklist. If we select double-hung wood windows from the checklist options…
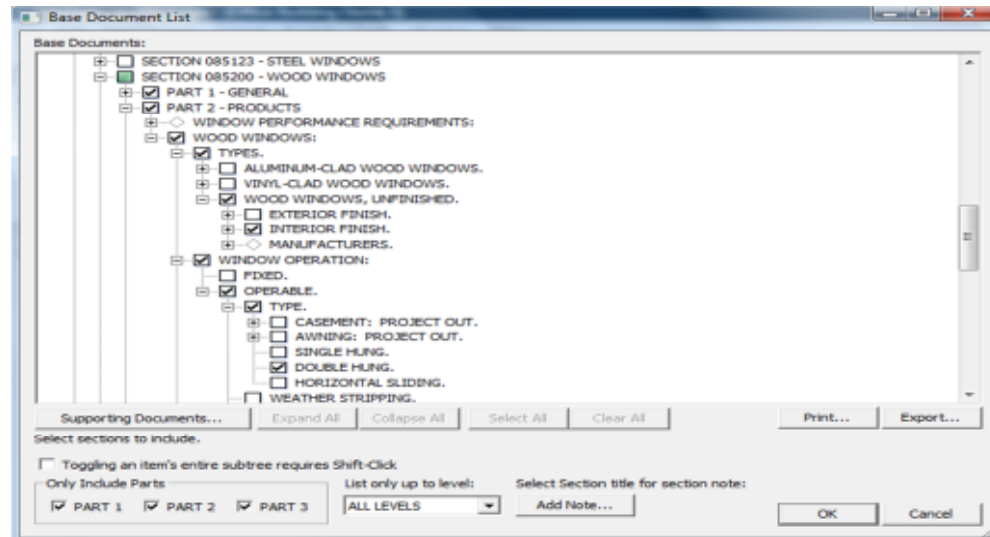

Figure 2: e-SPECS' Insert Section Checklist filters the master sections.

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… the wood window section will be inserted into the specification manual with the relevant language included and the non-required language removed, as illustrated by Figure 3 below.

SECTION 085200 - WOOD WINDOWS

PART 1 - GENERAL

1.1   RELATED DOCUMENTS

    A.   Drawings and general provisions of the Contract, including General and Supplementary
          Conditions and Division 01 Specification Sections, apply to this Section.

1.2   SUMMARY

    A.   Section includes [aluminum-clad] [vinyl-clad] wood windows.
          .
          .
          .

PART 2 - PRODUCTS

2.1   WOOD WINDOWS

    A.   Operating Types: Provide the following operating types in locations indicated on
          Drawings:

          ?.   Casement: Project out.
          ?.   Awning: Project out.
          ?.   Single hung.
          1.   Double hung.
          ?.   Horizontal sliding.
          ?.   Fixed.

Figure 3: Wood Window Section as it appears in the e-SPECS Editor with required paragraphs included and all others struck out and removed.

One of the principal components of the e-SPECS system is the scope and integrity of the specification master database. e-SPECS is fully integrated with MasterSpec®, a product of the American Institute of Architects and the most widely used master guide specification system in the world today. The e-SPECS tags and mappings have been preconfigured for all versions of MasterSpec as a standard option with the e-SPECS for Revit software.

e-SPECS also provides full integration with the U.S. Department of Veterans Affairs master guide specifications as well as a number of building product manufacturers' proprietary specifications. However, e-SPECS is fully configurable, so you can easily customize the checklist and master documents around your company's particular requirements. In addition, you can add new sections and integrate your own custom office masters if you desire.

How does e-SPECS integrate with the building models?

Taking this a step further, instead of having to make the selections "manually" by checking the checkboxes in the e-SPECS checklist, we can associate those checkboxes to Revit elements (or assemblies) from the Revit model so that when those elements are used in a particular project model, the specification section and the associated paragraphs are added to the specification manual for that project. Figure 4 is a graphical representation of this process.
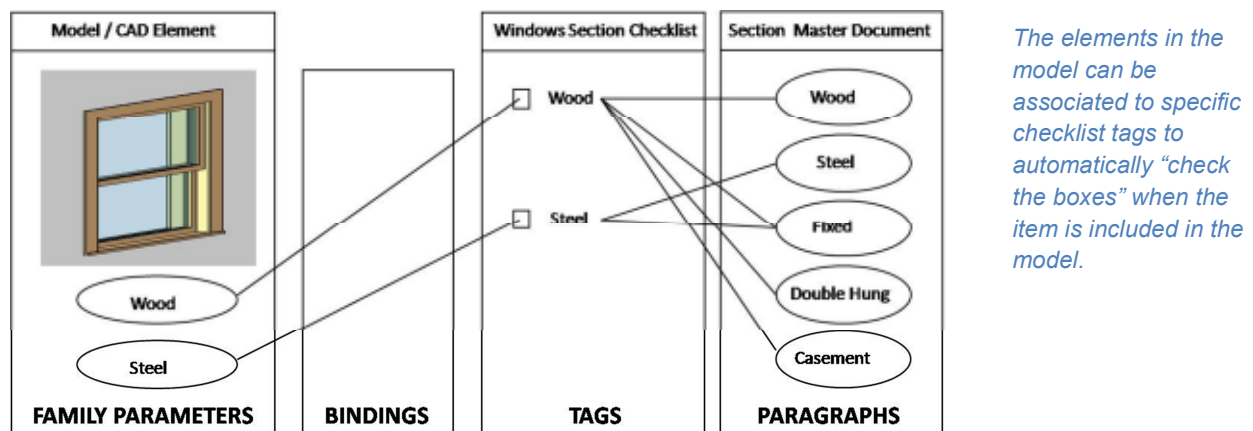

The elements in the model can be associated to specific checklist tags to automatically "check the boxes" when the item is included in the model.

Figure 4: Illustration of how the model elements can be linked to required specification information in e-SPECS.

The elements in the model are associated with specific checklist tags so that the program will automatically "check the boxes" when the item is included in the model. This association between an element in the model and the e-SPECS tags is called an e-SPECS *binding*.

e-SPECS provides a simple way to manage these associations with the e-SPECS Binding Manager, which is pictured in Figure 5. If you examine the layout of the Binding Manager you will notice that we have the same simple checklist as above in Figure 2, only now the checkbox items are associated (or "bound") to information that is accessible in the Revit model.
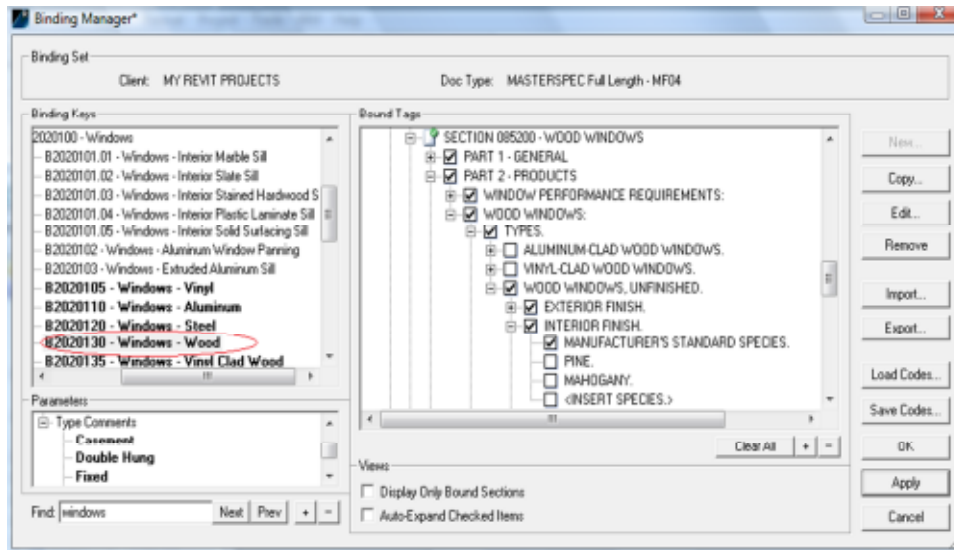
Figure 5: The e-SPECS Binding Manager is used to manage the associations between the Revit Assembly Codes and the specification tags.

In Revit, the primary integration component is the Assembly Code parameter in the Revit Family Type Properties, as the example in Figure 6 shows. The Revit Assembly codes are defined by the familiar UniFormat classification system. UniFormat is an industry standard classification system, developed in part by the Construction Specifications Institute (CSI), and used primarily as a way of categorizing information about building elements, which may contain multiple detailed parts. As defined by the CSI, *"UniFormat is a method of arranging construction information based on functional elements, or parts of a facility characterized by their functions, and often referred to as systems or assemblies. It is a way to organize information about an entire assembly with multiple detail components."*
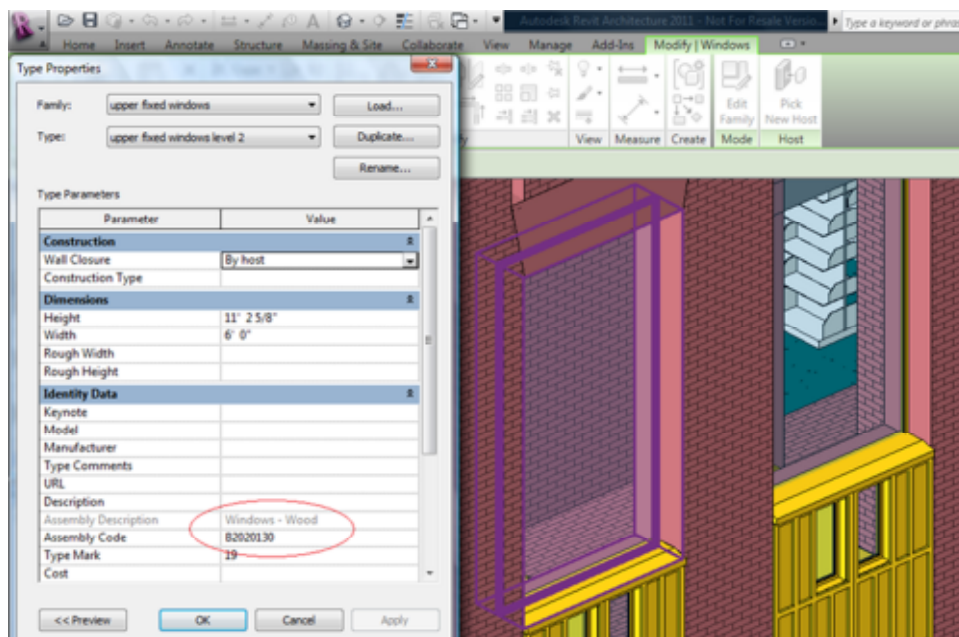
Figure 6: Revit Window Family Assembly Code.

UniFormat provides a consistent way to classify building model components, regardless of the complexities of the assemblies or model elements that they represent. In the wood window example in Figure 6, the entire assembly could consist of a number of component parts, such as the wood frame, glazing, joint sealants, insulation, and hardware. In other cases, an assembly could consist of one simple component such as an electrical junction box or a ceiling tile.

The benefits of integration

Integrating specifications with building information models fulfills one of the great promises of BIM: to be able to use a single source of information to facilitate and coordinate complementary processes. The benefits of well-coordinated construction documents are un-mistakable and well known to the building owners and design and construction teams who have implemented systems like the one described above. Fewer change orders and modifications to the project and documentation saves everyone time and money.

One of the great benefits of using e-SPECS is the ability to fully or partially automate the preparation of a project specification manual. But the real benefit here is to ensure that the models and specifications stay in sync. Even the slightest oversight or ambiguity in the construction documents can lead to time-consuming and costly change orders if these things are not discovered before construction begins. e-SPECS facilitates the reconciliation of the construction documents with several reconciliation reports. In addition to a Model Validation Report, an e-SPECS Section History Report (Figure 7) gives a snapshot of all the sections and indicates why they are in the specification manual, either as a result of a model element, a

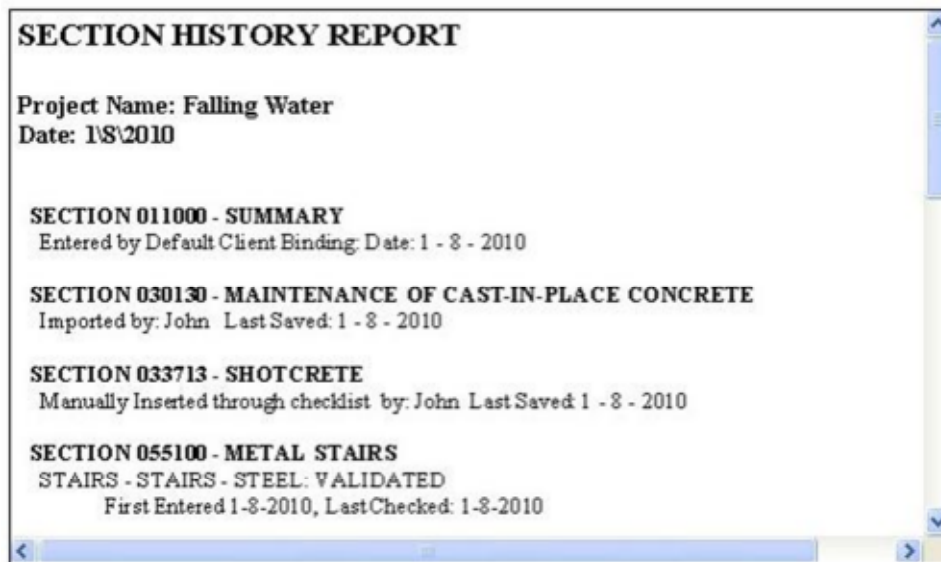manually inserted section, a section inserted as a result of a default binding, or an imported section.

SECTION HISTORY REPORT

Project Name: Falling Water
Date: 1\8\2010

SECTION 011000 - SUMMARY
Entered by Default Client Binding: Date: 1 - 8 - 2010

SECTION 030130 - MAINTENANCE OF CAST-IN-PLACE CONCRETE
Imported by: John Last Saved: 1 - 8 - 2010

SECTION 033713 - SHOTCRETE
Manually Inserted through checklist by: John Last Saved: 1 - 8 - 2010

SECTION 055100 - METAL STAIRS
STAIRS - STAIRS - STEEL: VALIDATED
First Entered 1-8-2010, Last Checked: 1-8-2010

Figure 7: A Section History Report indicating the source of the specification sections that appear in the Project Manual.

Another example is the Assembly Report (Figure 8), which provides a summary of all the model elements and resulting specification sections. Here we see the sections in the project manual required for the interior flush wood doors and the foundation wall. Notice that the curtain wall, however, is currently "unspecified." This is an indication that this particular element has not been associated (using an e-SPECS *binding*) to any section or group of sections. This gives the designer and specifiers a quick way to review all the specification requirements of the model to ensure that the two are in sync. In this case, the specifier would simply double-click on the curtain wall, which would open the Binding Manager to let them select the specification section (or group of sections) and enter the required details.

Project Name: Falling Water
Date: 12\21\2010

CATEGORY
    FAMILY - TYPE
        CODE   DESCRIPTION   BOUND SECTIONS

Doors
    Single-Flush - Interior 30" x 80"
        C1020330 INTERIOR WOOD DOORS WITH WOOD FRAMES   SECTION 064023 - INTERIOR ARCHITECTURAL WOODWORK
                                                           SECTION 081416 - FLUSH WOOD DOORS
                                                           SECTION 087100 - DOOR HARDWARE
Walls
    Basic Wall - Foundation - 6" Concrete railing
        B2010110 EXT. WALL - CIP   SECTION 033000 - CAST-IN-PLACE CONCRETE
                                                          SECTION 071113 - BITUMINOUS DAMPPROOFING
    Curtain Wall - Storefront
        B2020200 CURTAIN WALLS   Unspecified

Figure 8: The e-SPECS Assembly Report provides a summary of all the Revit model elements and their associated sections in the Project Manual.

If a Revit modeler adds a component that is not recognized by e-SPECS (meaning it does not have a known association or binding), then the designers or specifiers can review the specification validation report to see at a glance where the two components of the construction documents will differ. Similarly, if some sections are added to the specification project and have yet to be included in the model, the discrepancy will show up in a report that the designers and specifiers can review. If the item included in the specifications has no counterpart in the model, the user can indicate the exception so that it will no longer appear on the report.

What others have done to blaze the trail
There are many organizations that have successfully made the move from a more traditional workflow to a more integrated workflow—and in some cases even a paperless workflow!

One such firm is Dal Pos Architects, a full-service architectural integration firm specializing in commercial and retail design. When they chose to upgrade their specification process they were already on board and working with Revit, having completed an office-wide implementation of the program in 2005. The workflow they had created with Revit allowed for fast and coordinated design iterations. Their specification preparation process, however, was outmoded and slow.

"e-SPECS for Revit is a powerful, easy-to-use solution that saves money and boosts productivity."
Scott Bloss, Program Manager
Dal Pos Architects

First, a principal architect reviewed the drawings to determine which spec sections were required. Lists of unedited master sections were printed and then painstakingly marked up to meet the project's specific requirements. Each revision was then manually typed into a Word document by an administrative assistant. This unwieldy process was repeated with input from other team members until the final specs matched the project's exact requirements.

Bottlenecks invariably resulted. Project team members typically faced repeated delays waiting for updates, then had to scramble to meet deadlines. The final production process — setting headers and footers, inserting blank pages, printing, collating — was also time-consuming. This traditional approach was slow, error-prone, generated an inordinate amount of paper waste, and could rarely be repurposed for future projects.

What helped push them to upgrade the process was an opportunity to win a project whose owners **insisted on a paperless workflow.** Dal Pos researched the options and made a commitment to adopting e-SPECS to achieve that deliverable.

By integrating their Revit BIM model with their guide specs, e-SPECS for Revit assured the creation of Dal Pos project manuals that precisely matched the building requirements. With

training they were up and running quickly, and had their Revit models fully integrated within a week. They were even able to determine that the time required to prepare their initial specification manual was **reduced by 35%,** while providing tighter integration with the construction drawings. The result: a **more coordinated, more accurate** construction specification package, produced in **less time with less effort and less paper waste**.

As their implementation continues, Dal Pos can now **instantly update building specs** as their architects develop their designs. This further reduces the time required to complete subsequent project manuals, while improving coordination. The result: additional **cost savings** and **higher profit margins**.

Another example is Gilfillan Callahan Nelson Architects, a full-service architectural firm that specializes in designing public spaces for communities throughout the Chicago metropolitan area. Its three guiding principles — High Touch, High Performance, Outcomes Based — have guided the successful completion of more than 300 projects, including schools, village and city halls, police stations, libraries, medical offices, restaurants, and amusement parks. With project types like those, you know that the specs they use on one project can't be easily transferred to the next. Firms that do many different kinds of work can really benefit from the rapid updates and coordination of the model to the specifications.

Gilfillan Callahan Nelson found that their specification documents were not consistently at the high quality levels the firm demanded and its clients deserved. The firm's standard front-end requirements were not always correctly written into spec documents, and the required product sections were frequently omitted. This lack of coordination resulted in extensive addenda hindering the entire project. These issues prompted them to look for a better way to manage their workflow.

Because e-SPECS® for Revit reads the model's content (the elements assembly data and properties) to determine the relevant product and material specifications required, the firm was able to create automatic coordination. This ensured that their preferences were included and reduced the manual editing requirements for each section. With this in place, the architects and project managers can verify the specifications on the fly as questions arise, even from within the Revit application.

"These features have greatly increased our ability to produce specifications faster and more accurately, not to mention delivering true integration of plans and specs," said Senior Principal Pat Callahan. "e-SPECS has truly added traction to our Integrated Project Delivery."

Gilfillan Callahan Nelson achieved significant time savings, cost reductions, and improved productivity and quality with the adoption of e-SPECS. The first time Callahan applied e-SPECS was to a 40,000 sf municipal building project. "It was an architectural BIM model, so integrating non-linked spec sections was crucial," Callahan said. "With the help of our support staff we managed to import specification sections from multiple consultants, query the Revit model, insert additional sections, then review, edit and publish the specification manual — over a long

weekend! **That would normally have taken 1 to 2 weeks.** And this was **the first time we'd ever used e-SPECS!"** e-SPECS' intuitive interface makes it easy to achieve measurable results.

The firm's project architects and project managers now use this process in all of the firm's offices, and are coordinating and managing their cost estimating via their Revit model. They are moving step by step toward having a completely coordinated, true BIM experience. Again, BIM is not just a 3D model; there are many parts and steps that can be taken advantage of and leveraged toward a consistent and profitable deliverable. Gilfillan Callahan Nelson started with Revit, then added e-SPECS, and then other software for more results. This is a process that is repeatable for others.

"I would absolutely recommend e-SPECS. The ability to query the Revit model as you're making design decisions is worth the price of admission."

Pat Callahan, Senior Partner
Gilfillan Callahan Nelson

These two examples exemplify some of the major issues that many organizations have today regarding specifications. For a more in-depth look at how and why these firms made the change to an integrated or BIM process for their specs I recommend looking at the [customers](#) page at the Interspec website.

Where do we go from here?
Going forward, project schedules are only going to get more streamlined and expectations for successful coordination are only going to go up. If you want to start to taking advantage of tools like e-SPECS, then the best way forward is to make a plan. If your firm has already moved to a BIM process then you have already made a critical first step. This means you are already familiar with Revit (although as mentioned earlier, this software will also run with AutoCAD) and you've already taken the first step in changing your current workflow.

Just like the switch from 2D CAD to 3D BIM programs like Revit didn't happen overnight, implementing a BIM process takes time. We recommend outlining a series of steps and goals. As with the example of Dal Pos Architects,, your first project will likely be a hybrid using Revit for building sections, and from that point on CAD would be referenced back in. For the specification process, you would start by using e-SPECS' binding function to grab the major elements of our project.

As with BIM integration process, we can phase in the amount of information and process needed as you work your way through your initial pilot project. When the redundant tasks are eliminated from your workflow and the program is integrated such that continuous project review is occurring, we will be closer to having a real BIM deliverable--something that is consistent, coordinated, and computable at all points.

For More information:

- *Website*: http://www.e-specs.com/
- *Whitepaper*: e-SPECS for Revit BIM Integrated Specifications Paper.pdf (Details the Revit e-SPECS integration process. Also available on www.e-specs.com)
- *At Autodesk University*: visit **Interspec's booth 3C** or **Microdesk's Booth 201** to speak with a representative
- *Contact Us*:

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