



Questions and Answers

Contents

Contents.....	1
1. General Product Information	3
1.1 What is Autodesk Revit?	3
1.2 What is building information modeling and how does it apply to Autodesk Revit?	3
1.3 How does Autodesk Revit fit into Autodesk’s vision for the building industry?.....	4
1.4 Who in the building industry should be using Autodesk Revit?	4
1.5 What is the AutoCAD Revit Series? Should I consider that instead of Autodesk Revit?	4
2. About Autodesk Revit.....	4
2.1 What are the important new features in Autodesk Revit 6?	4
2.2 What about Revit 6.1? What are some of the improvements in that release?	5
2.3 What do you mean by “parametric,” as in “parametric change technology” and “parametric building modeling?” Why is this concept important?	5
2.4 Autodesk Revit seems to handle building modeling well, but what about conventional drafting and detailing? Do I still need AutoCAD to get my work done?.....	6
2.5 How does Autodesk Revit work with large teams and projects?.....	7
2.6 Can Autodesk Revit produce especially elaborate geometry?	7
2.7 What if my practice relies on a library of DWG details and drawings?.....	7
2.8 Will other building industry applications for other disciplines be available for Autodesk Revit?.....	8
2.9 Will Autodesk Architectural Desktop and Autodesk Revit be combined into a single product in the future?	8
3. Interoperability	8
3.1 Is Autodesk Revit interoperable with AutoCAD software?	8
3.2 What if my clients or consultants insist on DWG deliverables?	8
3.3 What about object compatibility between Autodesk Revit and Autodesk Architectural Desktop?	8
3.4 What about data compatibility between MicroStation and Autodesk Revit?	9
3.5 How can I work with other systems and coordinate with my consultants?.....	9
3.6 How do I use Autodesk Buzzsaw with Autodesk Revit?	9

Autodesk Revit Questions and Answers

3.7 Autodesk Revit uses AccuRender raytracing and radiosity as a rendering solution. Can I use Revit with Autodesk VIZ? Will Revit use Autodesk VIZ in the future?	9
3.8 Will there be an application programming interface (API) or other third-party development tools for Autodesk Revit?	10
3.9 What about the open Design Web Format (DWF)?	10
4. Understanding Objects and Elements	10
4.1 How do objects/elements in Autodesk Revit work? Does Autodesk Revit have an object model diagram?	10
4.2 Can I easily change the elements in my project after I've created them?	11
4.3 Does Autodesk Revit have layers? How does it organize my data?.....	12
5. Working with Autodesk Revit Families and Libraries.....	12
5.1 What are "families"? How are they different from blocks in AutoCAD software or cells in MicroStation software?	12
5.2 Can I create my own elements using Autodesk Revit families? How?	13
5.3 How many components are in the Autodesk Revit family library?	13
5.4 Am I limited to the parameters in the family template?	13
6. The Parametric Change Engine Does All the Work	14
6.1 How does Autodesk Revit keep everything updated when I change things?	14
6.2 How is modeling in Autodesk Revit different from other modeling programs?.....	14
6.3 If I don't have to specify any relationships, how does Autodesk Revit know what to do?	14
6.4 Do I have to wait for sections and schedules to generate?	15
7. Working in Autodesk Revit.....	15
7.1 Does Autodesk Revit use a coordinate system? How do I position things accurately? 15	
7.2 What is the best approach for positioning items relative to other things, like the edge of a window to a wall corner?.....	16
7.3 How can I represent things differently in different drawings, such as a presentation plan and a working drawing?	16
7.4 What kind of 2D tools does Autodesk Revit have for finishing my drawings? What does Revit do to reduce tedious documentation tasks?	16
8. Licensing Autodesk Revit.....	16
8.1 How is the licensing in Revit 6 and 6.1 different from Revit 5.1 and earlier?	16
8.2 Does the new licensing allow the option to use the product in trial mode or demonstration mode?	17
8.3 Does Autodesk Revit use the NIW (Network Installation Wizard) just like AutoCAD 2005-based products for creating network deployment?	17
8.4 What should customers do if they need help in installing the FLEX/m license server or getting their single user copy authorized?	17
8.5 Will the License Borrow Feature introduced for the network version of AutoCAD-based products work with Autodesk Revit?.....	17

1. General Product Information

1.1 What is Autodesk Revit?

The Autodesk® Revit® platform for building information modeling is a complete architectural design and documentation system supporting all phases of design and all the architectural drawings and schedules required for a building project. From massing and conceptual studies through the most detailed construction drawings and schedules, Autodesk Revit helps provide immediate competitive advantage, better coordination and quality, and can contribute to higher profitability for architects and the rest of the building team.

In the Autodesk Revit building model, every drawing sheet, every 2D and 3D view, and every schedule is a direct presentation of information from the same underlying building database. As the user works in familiar drawing and schedule views, Autodesk Revit collects information about the building project and coordinates this information across all other representations of the project. The Autodesk Revit parametric change engine automatically coordinates changes made anywhere—in model views or drawing sheets, schedules, sections, plans ... you name it. Autodesk Revit supports all phases of the building process, preserving all information from beginning to end. The same model that is rendered in design generates quantities exported to an estimating database after construction documents are prepared. Nothing is lost.

1.2 What is building information modeling and how does it apply to Autodesk Revit?

Building information modeling (BIM) is an innovative approach to building design, construction, and management introduced by Autodesk in 2002. BIM delivers high-quality information about project design scope, schedule, and cost when you need it, how you need it, dramatically helping reduce inefficiencies and risk throughout the building process.

The ability to keep this information up to date and accessible in an integrated digital environment gives architects, engineers, builders, and owners a clear overall vision of their projects, as well as contributing to the ability to make better decisions faster—helping raise the quality and increase the profitability of projects.

Although building information modeling is not itself a technology, it does require suitable technology to be implemented effectively. Examples of some of these technologies, in increasing order of effectiveness, include:

- CAD
- Object CAD
- Parametric Building Modeling

With a high level of effort, CAD-based software can be used to achieve some of the benefits of BIM. With some effort, so can Object CAD-based software. Parametric building modeling (PBM) software offers the highest level of effectiveness with the least effort, but also requires a full commitment to building information modeling, a new way of working. There is no other way to use parametric building modeling to support a traditional drafting workflow.

Autodesk Revit software is purpose-built for building information modeling on PBM technology for industry professionals ready for a new way of working and the correspondingly high level of building information modeling benefits that go with it.

For more information about building information modeling and Autodesk's strategy for the application of information technology to the building industry, please see our white paper on the subject at www.autodesk.com/bim.

1.3 How does Autodesk Revit fit into Autodesk's vision for the building industry?

Autodesk Revit software is Autodesk's strategic authoring application and platform going forward for building information modeling and the building industry. Autodesk is expanding resources and investment in the Autodesk Revit platform to support that objective.

As Autodesk's strategic *authoring application* for the building industry, Autodesk Revit will continue to be developed as an architectural design and documentation system. We also plan to add HVAC, electrical, and plumbing engineering applications on the Autodesk Revit platform in the future, and to expand the existing structural and construction functionality in Revit into full applications for those disciplines.

As Autodesk's strategic *platform* for the building industry, support for ODBC-compliant database products in Revit and the Revit family editor offer opportunities for developers to add value on top of the Revit platform today, and further opportunities are being planned for the future.

You can be confident that Autodesk will continue to develop Autodesk Revit to serve the needs of architectural professionals and to expand its scope to serve other building industry segments for years to come.

1.4 Who in the building industry should be using Autodesk Revit?

Autodesk recommends Autodesk Revit for architects, interior design firms, and design-build firms, who are willing to take on a new way of working and want to use technology to gain a competitive advantage.

1.5 What is the AutoCAD Revit Series? Should I consider that instead of Autodesk Revit?

The Autodesk® AutoCAD® Revit® Series is a bundle of Autodesk Revit and AutoCAD® software with a single serial number and a single authorization. If you are an AutoCAD user interested in Autodesk Revit and building information modeling, the AutoCAD Revit Series may be right for you. It couples industry-leading AutoCAD software with the powerful Autodesk Revit building information modeling system—an unbeatable combination that protects your investment in technology and training, offers the competitive advantage of building information modeling, and gives you the flexibility to move to new ways of working when you're ready. For more information about the AutoCAD Revit Series, visit www.autodesk.com/autocadrevitseries.

2. About Autodesk Revit

2.1 What are the important new features in Autodesk Revit 6?

Autodesk Revit 6 includes hundreds of new and improved features to help make you more competitive, deliver higher coordination and quality, and help you improve your business. A complete list is available for download at www.autodesk.com/revit. Here are a few of the more important new features:

Design Options: The Design Options feature lets you create alternate schemes inside a single project file, allowing multiple schemes to be studied in the context of the rest of the building. Each option can be substituted into the model for visualization, quantification and other data analysis to inform decision making. Beyond documenting and presenting the design itself, you now can demonstrate the design thinking behind your proposals.

Multi-user element borrowing: Element Borrowing allows any team member to instantly share (or borrow) whichever component or group of components in the model they need to complete a particular part of the project. Permissions and messaging between team

members working on the same parts of the building are fully integrated into the work environment, so everybody can always see who is working on what. The software automatically coordinates concurrent changes for all team members.

Project Browser Customization: The Project Browser manages and helps you navigate the various views, families, groups, renderings, and sheets of the project. In Autodesk Revit 6, you can reorganize the project browser's Views and Sheets sections to match your desired project organization.

Data Export Improvements: In Autodesk Revit 6, more custom user data is now available for export via ODBC (including export of shared parameters). Links between geometry exported to DWG and DXF™ formats and the ODBC export are now provided, allowing connections between business data and geometry information outside of the Revit application.

And a few other favorite requests from long-time Revit users include

- Even more powerful stair and railing tools
- Ellipses
- Curved structural grids
- Split-level plans
- An architectural spell-checker

2.2 What about Revit 6.1? What are some of the improvements in that release?

Here is a list of the most important improvements in Revit 6.1:

Additional Modeling Functionality: Revit 6.1 supports increasingly elaborate geometry and model fidelity, including true curved ramps, sweeps along splines and ellipses, and more detailed control over how individual layers of a compound structure wrap at inserts such as doors and windows.

Drafting and Detailing Enhancements: Revit 6.1 includes single-click wall dimensioning, allowing you to dimension entire wall segments including openings and intersecting walls with one selection. Also, filled regions can now be transparent so background geometry within the region can be seen.

Scheduling and Data Exchange: Revit 6.1 now supports export to gbXML for use in third-party energy and heat load analysis applications, such as Green Building Studio by GeoPraxis and Trane Trace 700. Also, you can now highlight the location of an element in your design by selecting it from a schedule table. And more ODBC Export parameters are available, including Structural Usage, Room Phase Information, and additional stair and wall information.

Structural Enhancements: Revit 6.1 includes a selection of new and improved tools for structural layout, including the ability to create beams on selected grid lines, plate and weld symbols, moment frame connections symbols, structural column creation at grid intersections, structural usage parameters, and stick symbol graphics based on structural usage.

2.3 What do you mean by “parametric,” as in “parametric change technology” and “parametric building modeling?” Why is this concept important?

The term *parametric* in this context refers to the relationships among and between all elements of the model that enable the coordination and change management that Autodesk Revit provides. These relationships are created either automatically by the software or deliberately by the user as the user works. Examples of such relationships are as follows:

1. The outside of a doorframe is a fixed dimension, say 4", on the hinge side from a perpendicular partition. If the user moves the partition, the door retains this relationship to the partition. In this case the parameter is 4".
2. Windows or pilasters are spaced equally across a given elevation. If the length of the elevation is changed the relationship of equal spacing is maintained. In this case the parameter is not a number but a proportional characteristic.
3. The edge of a floor or roof is related to the exterior wall such that when the exterior wall is moved the floor or roof remains connected. In this case the parameter is one of association or connection.
4. The scale of a plan view is changed from $1/8" = 1'-0"$ to $1/4" = 1'-0"$. All annotations (text, dimensions, room tags, etc.) immediately "grow" in relation to the building to stay a fixed paper size. In this case, the text has a parameter fixing it to the scale of the drawing.
5. Four walls in plan view are sketched to form a rectangle. Autodesk Revit automatically joins their ends. In elevation, the user selects a wall and drags it 5'-0". The other joined walls automatically stretch to stay connected. In this case the parameter is one of association or connection.
6. Detail drawing 5 on sheet A9.03 is referenced from the plan drawings on sheets A2.01, 02, and 03 with a detail tag. If you move the detail drawing to another sheet and renumber it, all of those tags are updated automatically with the new location. In this case the parameter is one of linking or association rather than a number.

In mathematics and mechanical CAD the numbers or characteristics that define these kinds of relationships are called parameters, and hence the operation of the software is "parametric." This concept is important because it is this capability that delivers the fundamental coordination and productivity benefits of Autodesk Revit: *Change anything at any time anywhere in the project and Autodesk Revit will coordinate that change through the entire project.* This change management is also one of the fundamental characteristics of a building information modeling solution.

2.4 Autodesk Revit seems to handle building modeling well, but what about conventional drafting and detailing? Do I still need AutoCAD to get my work done?

You can work comfortably either way, entirely in Autodesk Revit or with both Revit and AutoCAD software. Autodesk Revit includes powerful 2D drafting tools that can be used to create drawings directly in drafting views or to draft over views of the model and Revit also has tools to integrate drawings done using AutoCAD software should you so choose. You can work comfortably in both Revit and AutoCAD and Revit will manage the work done in both systems through its parametric database. The choice depends on the skills and background of your team and the work process preferences of your practice.

Autodesk Revit does not directly model building features at the construction detail level. For example flashing, fasteners, sealant, and similar construction features are not included in the model geometry. Construction details in Autodesk Revit are developed using 2D parametric detailing components (for example, detailed section graphics showing brick, sealant, and metal angles) and conventional 2D graphics and linework. These details can be developed using a detail view of the model as an underlay or can stand alone. These details are integrated with the building model and managed by Autodesk Revit in the document set.

Details developed in AutoCAD software can also be incorporated into the building model and will be managed just like the details developed within Autodesk Revit. This functionality

accommodates customers who want to continue to use AutoCAD and AutoCAD-trained staff on their projects, but AutoCAD is not required to complete a project in Revit.

A white paper on the interoperability of Autodesk Revit with AutoCAD and other CAD systems is available at www.autodesk.com/revit.

2.5 How does Autodesk Revit work with large teams and projects?

Autodesk Revit has been designed to work with large teams. The Autodesk Revit building information model is stored in a single database. On a multi-user project, the database is divided into worksets, which allow the single database file to be shared between multiple team members over a network. Worksets allow team members to work simultaneously on different parts of the building database using a local copy of the model file without interfering with the work of others. Autodesk Revit manages and coordinates changes as team members save their work to the central file location on the network.

The central file maintains a record of all changes made by each team member, which can be viewed in a log file. These changes can be rolled back to previous states if they turn out to be useful.

For even more seamless workflow, Autodesk Revit 6 added a new feature, multi-user Element Borrowing, which allows groups of components to be dynamically allocated to a user as required for specific editing, irrespective of their workset assignments. Permissions and messaging between team members working on the building are fully integrated into the work environment, so everybody can always see who is working on what.

A white paper on using worksets, "Multi-user Collaboration with Revit Worksets," is available at www.autodesk.com/revit.

For larger, more complex projects, Autodesk Revit models can be linked together. Models can be worked on separately, while the information from other, related models is always available for reference and presentation. This is especially appropriate for multi-building campuses and large buildings with discrete wings. Significant improvements to performance and file operations for large projects were also made in Autodesk Revit 5 and Revit 6, extending the range of projects that can be maintained in a single building database.

2.6 Can Autodesk Revit produce especially elaborate geometry?

Yes. Autodesk Revit can model elaborate and expressive forms. Splines, arcs, ellipses, sweeps, and blends allow for freedom of form, while ruled curtain surfaces offer expressive opportunities described in curtainwall assemblies. The standard tools in Autodesk Revit are optimized for the majority of regular forms found in most buildings. The Create button on the Modeling Design Bar allows creation of elaborate geometry for any type of building element (such as a wall) while maintaining the expected behaviors for that type of element.

2.7 What if my practice relies on a library of DWG details and drawings?

Libraries of details and drawings are compatible with Autodesk Revit and easier to manage. Revit can, for example, directly place DWG details on sheets and continuously manage references to that DWG detail. Manufacturers' representations of their custom components can be managed in the same way. Autodesk Revit imports, exports, and links to DWG, DXF, and DGN[®] file formats with full control over layer and level mapping. An interoperability white paper discussing the methodology for managing DWG files within an Autodesk Revit project is available or at www.autodesk.com/revit.

2.8 Will other building industry applications for other disciplines be available for Autodesk Revit?

Autodesk is beginning planning for other building industry applications on the Autodesk Revit platform.

2.9 Will Autodesk Architectural Desktop and Autodesk Revit be combined into a single product in the future?

No. Autodesk® Architectural Desktop is based on the AutoCAD platform. Autodesk Revit is based on an entirely different technology and principle of operation. Thus, the products cannot be combined, and Autodesk has no plans to do so.

3. Interoperability

3.1 Is Autodesk Revit interoperable with AutoCAD software?

Autodesk Revit provides industry-leading DWG compatibility using the Autodesk ObjectDBX™ toolkit, and is interoperable with AutoCAD software to ensure clear communication of design data among project teams.

Autodesk Revit can import, export, and link DWG files. Imported files can be drawn on to create Revit parametric model geometry. Autodesk Revit can also manage imported or linked files so that detail libraries in either DWG or DGN file format can be placed on sheets and all callouts are automatically managed. Autodesk Revit can even map a specific DWG layer on input to a specific DGN level number on output or vice versa in any combination.

You can download a white paper on Autodesk Revit interoperability from www.autodesk.com/revit.

3.2 What if my clients or consultants insist on DWG deliverables?

Autodesk Revit can produce DWG deliverables just as AutoCAD can. Autodesk Revit provides industry-leading DWG compatibility using the Autodesk ObjectDBX toolkit, plus, because these DWG deliverables were created in a modeler, they are well structured and any required changes can be made easily.

Autodesk Revit supports the process most architectural firm's use with their consultants by producing well-organized and layered DWG files using any layering standard the user wants. Autodesk Revit ensures that nothing in an exported DWG file ends up on the wrong layer, easing consultant interactions and speeding the design and construction process.

3.3 What about object compatibility between Autodesk Revit and Autodesk Architectural Desktop?

Autodesk is researching tools users might need to migrate libraries developed for use with Autodesk Architectural Desktop onto Revit including tools for converting Autodesk Architectural Desktop multi-view blocks to Autodesk Revit components.

Autodesk Revit has a comprehensive interoperability strategy for managing and delivering value for customers' existing DWG content and block libraries. Tools within Autodesk Architectural Desktop can be used to convert Autodesk Architectural Desktop content to DWG format for transfer to Autodesk Revit. For technical details of this strategy, please see the Autodesk Revit Interoperability white paper available at www.autodesk.com/revit.

3.4 What about data compatibility between MicroStation and Autodesk Revit?

Autodesk Revit provides several important interoperability capabilities for AutoCAD and MicroStation® users. First, Autodesk Revit can import, export, and link DWG and V7 DGN format files. Imported files can be drawn on to create Revit parametric model geometry. Revit can manage imported or linked files so that detail libraries in either DWG or DGN file format can be placed on sheets and all callouts are automatically managed. Further, Revit can map a specific DWG layer on input to a specific DGN level number on output or *vice versa* in any combination.

Finally, and maybe most importantly, Autodesk Revit supports the process most architectural firms use with their consultants by producing perfectly layered DWG or DGN files using any layering standard the user wants. Revit ensures that nothing in an exported DWG or DGN file ends up on the wrong layer or level, easing consultant interactions and speeding the design and construction process.

3.5 How can I work with other systems and coordinate with my consultants?

Autodesk Revit provides functions to integrate your work with consultants. As you create floor plans, Revit automatically creates coordinated ceiling plans, which are crucial for issuing base sheets to MEP consultants. Create a set of base sheets for your consultants and export these to DWG. Later in the project you can easily issue updated consultant backgrounds in one simple step using the multiple-sheet export capability in Autodesk Revit.

You can import or link DWG files directly into Autodesk Revit to use as reference geometry or as the starting point for a new design, such as a site plan. Any CAD system that supports the DWG, DGN, or DXF file formats can work effectively with Revit.

For more information about using Autodesk Revit with conventional CAD systems please see the "Autodesk Revit Interoperability with CAD" white paper at www.autodesk.com/revit.

3.6 How do I use Autodesk Buzzsaw with Autodesk Revit?

The Autodesk® Buzzsaw® online collaboration service is independent of the software used for building design and documentation. Autodesk Revit model files (RVT files) can be posted to Buzzsaw for sharing with the project team just like any other file. A read-only copy of Autodesk Revit allows users to print and export models that have not been edited, so this serves as a robust viewer and file translator for team members who receive Autodesk Revit models but who are not using the software themselves. Autodesk Revit also publishes directly to industry-standard file formats, so team members can share sets of deliverables on Autodesk Buzzsaw in this way as well.

3.7 Autodesk Revit uses AccuRender raytracing and radiosity as a rendering solution. Can I use Revit with Autodesk VIZ? Will Revit use Autodesk VIZ in the future?

Users can transfer geometry from an Autodesk Revit model into Autodesk® VIZ through DWG file export. If users are going to do this frequently or repeatedly, they can expedite material assignments in Autodesk VIZ by customizing the export layer template to map Autodesk Revit categories into material-specific layers for rendering using AutoCAD Color Index (ACI) numbers for each material. A white paper on using Autodesk Revit with Autodesk VIZ is available at www.autodesk.com/revit. Autodesk is investigating closer integration between Autodesk VIZ and Autodesk Revit in future releases.

3.8 Will there be an application programming interface (API) or other third-party development tools for Autodesk Revit?

Autodesk Revit is Autodesk's strategic platform for third-party building industry applications and for manufacturers to publish their building industry content. Support for ODBC-compliant database products in Autodesk Revit and the Revit family editor offer opportunities for developers to add value on top of the Autodesk Revit platform today. Plans are under way to open the product further for third-party applications and to support manufacturers in publishing their building industry content.

Partners who are already developing applications for Autodesk Revit include:

GeoPraxis

Green Building Studio™ is a web service that gives 3D-CAD users quick, reliable, and free estimates of a building's energy costs during the early stages of conceptual design. Find out more at www.greenbuildingstudio.com.

Interspec

e-SPECS® for Revit automates the project specifications by linking the product and material requirements directly to the Autodesk Revit building information model. Find out more at www.e-SPECS.com

Mcs Software (Italy)

ArchVISION Revit is a dynamic link between Revit and ACCA Primus 3000 r2, a popular Italian cost estimating software. Find out more at www.mcs-software.it/pages/Revit.html

3.9 What about the open Design Web Format (DWF)?

The Design Web Format™ (DWF™) open, secure, file format enables the efficient distribution of rich design data. DWF is the ideal platform for building industry teams to share design information because it allows the user to view and print rich data—from single design elements to multi-sheet drawing sets. Autodesk Revit users can publish to DWF using the Autodesk® DWF™ Writer software. Installation for this software is included on the Revit product CD. DWF files are viewable through the widely available Autodesk® DWF™ Viewer

4. Understanding Objects and Elements

4.1 How do objects/elements in Autodesk Revit work? Does Autodesk Revit have an object model diagram?

The Autodesk Revit building modeler uses software objects but does so differently than other CAD software. Autodesk Revit has only five object classes: *host*, *component*, *annotation*, *view*, and *datum*. This implementation provides more flexibility for designers.

Some CAD systems have objectified their internal structure so they can add new types of objects for specific purposes. This structure is commonly known as a "class tree" or "class hierarchy." Each object class has a specific set of properties and behaviors wired into it that generally can't be changed. In this model, the vendor publishes object model diagrams so outside software developers can extend and enhance the objects provided by the vendor.

Autodesk Revit objects (or elements, actually) are designed to be extended by the user directly; programming is not required. If you can draw, you can define new parametric elements in Autodesk Revit. However, *parametric elements are nothing new and not nearly as important as the way they are created and work together in Revit.*

In Autodesk Revit, the elements determine their behavior largely from their context in the building. The context is determined by how you draw the component and constraint relationships that are established with other components. Often, you do nothing to establish these relationships; they are implied by what you do and how you draw. In other cases, you can explicitly control them, by locking a dimension or aligning two walls, for example.

These relationships provide one of the most important benefits of using Autodesk Revit: coordination of all representations of the project. In Autodesk Revit all views are “live” representations of the model. Move a section cut line in plan and it instantly updates the corresponding view. This happens because a view is one of the basic classes and uses the fundamental software architecture of Autodesk Revit to interact smoothly with all the components in the building. To see this for yourself, create a section in Revit and then move the section line. Watch as the section immediately and automatically updates where it cuts through the building.

This fundamental technology difference is, in a nutshell, why Autodesk Revit is so easy to use. Revit does what you expect: instantly revise the model to whatever view you require of the building at that moment.

4.2 Can I easily change the elements in my project after I've created them?

Yes. The way you change things depends on the element. As stated earlier, Autodesk Revit has five top-level groupings of elements. Each represents something fundamental to your project:

- **Host**—Built-in-place construction: walls, floors, roofs, ceilings, stairs, and ramps.
- **Component**—Everything else in your model: doors, windows, furniture, and so on.
- **Annotation**—2D elements that maintain scale on paper and are visible only in one view: dimensions, text, window tags, door tags, room tags, and so on.
- **View**—The way you see and interact with things in Autodesk Revit: plans, sections, elevations, detail callouts, sheets, 3D views, schedules, and reports. Views interact with all other elements. Schedules are simply a type of view.
- **Datum**—Nonphysical items used to establish project context: floor levels, column grids, and so on.

Hosts are things like walls, floors, roofs, and ceilings. Walls that you sketch in the project are based on family types that exist in the project. Changing the wall type definition changes all walls of that type. You always create hosts by sketching. The host elements “remember” their sketches so you can always go back and change them later. Roofs are a particularly good example of how sketches work (see the tutorials on the Help menu in the software for more information about this example). As you sketch, Autodesk Revit interprets what you draw and infers appropriate relationships to other elements in your project. For example, if you pick a wall while creating a roof sketch, the edge of the roof maintains its overhang if the wall moves later.

Components are things like windows and doors. They are easy to work with and change because they act just like their real-world counterparts (doors, windows, furniture). Components know if they should be placed in hosts (like a window or door in a wall) or on a level (like a desk or a chair). Components are “family based” so changes you make to the family or the type are propagated through the model, and are reflected in all instances.

The idea behind component families is simple. You can think of them as AutoCAD blocks or MicroStation cells, but with the following enhancement: You can change existing families and types in the project on the fly, without redefining and reloading, and these changes ripple through the project and stay coordinated. Families are designed to ease data-

management headaches. A single family with 20 types effectively takes the place of 20 separate blocks or cells. Changes to the family definition are propagated to every placed component automatically. Component families are defined in separate files called family files and are loaded into the project.

Annotations are 2D, view-specific elements that help you produce your documentation. Annotation elements know how to size themselves on views of different scales and update when the scale of the view changes. Annotations like text, dimensions, and tags are family based as well, which makes it easy to make global changes to their appearance. Tags expose model element properties in the views and automatically update whenever the model changes.

Views in Autodesk Revit are all “live” views of the model and are always up-to-date. There is no need to manually update or regenerate a view. Views recognize when they are placed on sheets and fill out their view tags accordingly.

Datums are reference elements that help you put your building together. You can easily create multistory buildings by simply adding levels. Levels know the height at which they are located and appear consistently in all section and elevation views. They can be used to easily change the floor-to-floor heights of your building. Column grids are similar elements that appear consistently across the document set.

4.3 Does Autodesk Revit have layers? How does it organize my data?

The Autodesk Revit building modeler uses a system of categories and subcategories that mirrors the major and minor grouping categories of the National CAD Standard issued in the United States in February 2000. You can create your own subcategories for organizing your data. For exporting to DWG or DXF, the element categories in Autodesk Revit are properly mapped to the layering standard of your choice. Four default mappings ship with the product: National CAD Standard 2000 (US), BS1192 (UK), ISO13567 (Europe), and CP83 (Asia). You can also create your own project-specific layer mappings.

5. Working with Autodesk Revit Families and Libraries

5.1 What are “families”? How are they different from blocks in AutoCAD software or cells in MicroStation software?

All elements in Autodesk Revit are “family based.” The term *family* describes a powerful concept used throughout Autodesk Revit to help you manage your data and make changes easily. The term *family* refers to an element’s ability to have multiple *types* defined within it, each of a different size and shape. Even though the types can look completely different, they are all still related and come from a single source, hence the term *family*. Changes to a family or type definition ripple through the project and are automatically reflected in every instance of that family or type in the project. This keeps everything coordinated and saves you the time and effort of manually tracking down components to update.

The family definition contains all the data to represent an element in 2D and 3D at various levels of detail. The family also contains other nonphysical data about the element (such as a URL linked to the manufacturer’s Internet site or the assembly code indexed to cost data). The types of data stored in a family are customizable by the user, and data fields can be structured in flexible ways to extend between different families. Thus electrical connection data can be stored about every device requiring power, whether it is lighting, equipment, or part of the HVAC system.

5.2 Can I create my own elements using Autodesk Revit families? How?

Yes. You can create whatever you like, without any programming and without any limitations. If you can draw, you can define new parametric elements.

You can think of families as AutoCAD blocks or MicroStation cells, but with the following enhancements:

- Dimensions you draw as parameters can be used to drive the shape.
- Parameters can be added to existing families by drawing and labeling dimensions.
- Changes to a family or type definition ripple through the project and automatically update every instance you have placed.
- New sizes can be made without redefining and reloading them.
- Families contain all the data to represent a component in 2D and 3D at various levels of detail.
- Families can contain other nonphysical data (like manufacturer and cost).

You establish the context in which the component will be used by starting with a family template (RFT file) when you create the family. An example is the template "Generic model ceiling-based," which can be used for several items, such as ceiling-hosted diffusers, lights, and so on.

You can create families in two ways: in advance and in-place. Both methods use the same tool set. The primary difference is that with in-place creation you can see the family in the context of your building as you create it.

A family is loaded into a project. All copies of the family refer back to one master, but the individually placed "instances" can vary if you enter values for the parameters (size, dimensions) in the master.

5.3 How many components are in the Autodesk Revit family library?

The Autodesk Revit library contains thousands of families. The library includes both imperial and metric components. Because of space limitations, only a portion of available family files is included on the product CD.

Autodesk Revit family files are also available from the Revit web library (accessible from within the product) and from other publicly accessible websites. Each family file can produce many actual components. On average, each file typically includes several sizes or types. So the number of parts available is in the tens of thousands.

5.4 Am I limited to the parameters in the family template?

No. You can add new parameters to any family, new or existing, by drawing and labeling dimensions. The only thing you establish when using a template is the context in which the part will be used. An example is the template "Generic model ceiling-based," which can be used for several items, such as ceiling-hosted diffusers, lights, and so on.

This means that sometimes the fastest way to make the component you want is to find a similar component in the Autodesk Revit family library and then add or alter parameters or geometry to suit your design.

6. The Parametric Change Engine Does All the Work

6.1 How does Autodesk Revit keep everything updated when I change things?

A fundamental characteristic of a building information modeling application is the ability to coordinate changes and maintain consistency at all times. The user does not have to intervene to update drawings or links. Doing so only invites opportunities for errors and getting the model out of synch.

At the heart of Autodesk Revit is technology that is new to building design and documentation systems: a *parametric change engine*. Revit is built from the ground up using this technology. Though related in concept to similar technology in parametric mechanical CAD systems, it operates much differently for the purpose of building design and documentation. The Autodesk Revit parametric change engine uses the information captured as you work to build a network of relationships between elements. When you change something, Revit immediately determines what is affected by the change and reflects that change to any affected elements.

Typically, as the building gets larger, the number of relationships any one element has with other elements stays about the same. Even as the building gets bigger, in most cases, changes propagate at the same rate.

Since Autodesk Revit infers many relationships and does not require the user to rigidly define every relationship, this model is called “partially constrained.” The beauty of the Autodesk Revit engine is its flexibility. It is designed to handle changes without having to calculate how every piece of the building will be affected. In certain cases, the change produces interferences, in which case Revit warns you and asks what to do.

You can think of the change engine as the 3D equivalent of the page-numbering feature in your word processor. It renumbers pages while you type in new text. Another example is the cell engine in your spreadsheet. That engine recalculates your formulas whenever an affected cell changes. Both do this with no extra intervention by the user.

6.2 How is modeling in Autodesk Revit different from other modeling programs?

Autodesk Revit uses two key concepts that make it especially powerful and easy to use. The first is the capturing of relationships while the designer works. The second is its approach to propagating building changes. The result of these concepts is software that works like you do, without requiring entry of data that is unimportant to your design.

Mechanical CAD software packages generally rely on some form of history-based engine. The model retains actions in the order they are performed. To change a parameter in the model, the software goes back to the point where the parameter is stored, changes it, and replays the entire history to resolve the change. Using this technology to resolve even a small building would be prohibitively slow.

Mechanical CAD software packages also generally require the user to embed a lot of constraints so that the software can recalculate the result. This is called a “fully constrained” model. The “fully constrained” assumption is unworkable and unnecessary for designing buildings. There are relatively few constraints that really matter to a building designer. The designer need not set any constraints or can create only those that are important to the design, meaning that the model is “partially constrained.”

6.3 If I don't have to specify any relationships, how does Autodesk Revit know what to do?

Autodesk Revit is designed to efficiently handle partially constrained models. The Revit parametric change engine relies on design relationships captured during sketching and

component placement. It builds a network of building element relationships as you design and uses this network to help resolve changes later.

The parametric change engine in Autodesk Revit uses *context-driven parametrics*. When you sketch or place components, Revit retains various interelement relationships. There is no particular order to these relationships. Subsequently, as you modify one element, the parametric change engine determines which other elements need to be updated and how to make the change. The approach is scalable because it never starts with the entire building model; it always starts with a few elements explicitly touched by the user and continues with selective propagation of changes. This approach minimizes the number of elements that must be updated.

6.4 Do I have to wait for sections and schedules to generate?

No. In Autodesk Revit a section view is “live” and presents itself instantly when you create it. This happens because the view is one of the basic classes and uses the fundamental software architecture to interact smoothly with all the components in the building. This is a key feature of Autodesk Revit and one that makes all the difference in the system’s ease of use and responsiveness. Create a section in Revit and then move the section line. Watch as the section immediately updates where it cuts through the building automatically.

Convenient sections and details are crucial to the workflow and documentation of the design. After all, this is the view of the building with the most information about how the building will be put together. It is critical that sections present an accurate, detailed description of the model and enable the user to add more information as needed. Sections must update when the model is changed without any intervention. You should also be able to work (add or edit components) in the section view without restrictions.

Schedules are created using the same principle. They are simply another type of view. So they are also “live” and update as you change the model. In fact, you can change things in the schedule and Autodesk Revit updates the model and drawings.

7. Working in Autodesk Revit

7.1 Does Autodesk Revit use a coordinate system? How do I position things accurately?

Autodesk Revit has an internal coordinate system that is not exposed to the user. In the real world, things in buildings are always located relative to other things; even the civil engineer uses a benchmark to locate a corner of the building to lay out the first wall.

Autodesk Revit has implemented snapping alignment and temporary dimension functions that improve on the placement tools in conventional CAD software. Revit tools are based on an inference engine that shows meaningful angular, perpendicular, and parallel relationships between elements. Temporary dimensions are also active during placement, providing direct entry of distances while sketching.

Even without an exposed coordinate system, it is possible to precisely locate your building in relation to its surroundings. You can link separate Revit models together and have each building project maintains its precise position with regard to the other linked projects. This coordination happens automatically, without the user having to manually change and maintain xref insertion points, and so forth. To maintain fully consistent data, Revit projects can share coordinates with one another, so that all buildings on a campus, for example, are automatically positioned correctly with regard to the site and any other linked DWG, DXF, or DGN files.

7.2 What is the best approach for positioning items relative to other things, like the edge of a window to a wall corner?

Autodesk Revit does not require construction lines or similar concepts to position items relative to each other. The temporary dimensions in Revit have small, blue grips on the witness lines. Clicking the grips toggles the position of the witness line to other meaningful positions, such as the edges of openings and the intersections of walls.

In addition to toggling dimension references by clicking, you can simply move the witness line to anything in the model by dragging a blue square over any other element. Using temporary dimensions is the best approach for positioning anything in Autodesk Revit precisely and quickly.

Autodesk Revit also includes standard editing tools like Move, Copy, Rotate, Mirror, and Align that you can use to quickly and accurately lay out components.

7.3 How can I represent things differently in different drawings, such as a presentation plan and a working drawing?

The “view” is a basic concept in Autodesk Revit. Every view has independent control of visibility, scale, linework, and annotations. You can use this concept to create different presentations of your design information. For example, to make two plans with differing presentations, simply copy the view, name it appropriately, and then alter the properties of the elements you are viewing to make it look the way you want. Each view retains what you have done for the life of your project. Graphic adjustments do not need to be remade when a view has changed. To produce printed output, place the views on sheets, or place views side by side on the same sheet. They can be different scales, with different levels of detail, showing different items from the model with different annotations.

7.4 What kind of 2D tools does Autodesk Revit have for finishing my drawings? What does Revit do to reduce tedious documentation tasks?

Autodesk Revit comes with a full suite of tools for completing your documentation set. In Autodesk Revit, drafting intelligence is intact. Annotation elements know how to size themselves on views of different scales and update when the scale of the view is changed.

In addition, Autodesk Revit element tags expose model element properties in the views and automatically update whenever the model changes. This also allows plans and schedules to stay synchronized without any preplanning.

Finally, automatic and consistent cross-indexing of views and sheets via section, elevation, and callout keys provides automatic coordination of your drawing set. Renummer your sheet index and Autodesk Revit ensures that every callout on every plan, section, and elevation is keyed to the correct drawing on the correct sheet.

8. Licensing Autodesk Revit

8.1 How is the licensing in Revit 6 and 6.1 different from Revit 5.1 and earlier?

Releases of Autodesk Revit after 5.1 use a different licensing technology than 5.1 and earlier releases. With the launch of Revit 5.1L, Autodesk updated the Revit licensing technology to make it more consistent with many other Autodesk products. With Revit 5.1L, Autodesk will be introducing the SafeCast® technology to license stand-alone versions of Revit, and the FLEX/m® technology to license network versions of Revit. The major benefit for network users is the ability to serve Revit licenses from the same ADLM license server as AutoCAD and Autodesk Architectural Desktop software.

8.2 Does the new licensing allow the option to use the product in trial mode or demonstration mode?

Yes, after installing the software, customers will have the ability to license a 60-day trial that does not require a serial number. In addition, unlicensed Autodesk Revit will continue to run in demonstration mode with all features except save, plot, and export. The software can be fully licensed with a serial number.

8.3 Does Autodesk Revit use the NIW (Network Installation Wizard) just like AutoCAD 2005-based products for creating network deployment?

No, Revit will still use its current installation technology and process. The Network Installation Wizard is only designed to work with AutoCAD-based products.

8.4 What should customers do if they need help in installing the FLEX/m license server or getting their single user copy authorized?

As they do with all other products, users of Autodesk Revit software should contact their reseller first for help with installation and licensing issues. Resellers can then escalate issues that cannot be easily resolved to Autodesk Revit Client Services. In addition, customers on subscription can email Autodesk directly for help with installation issues.

8.5 Will the License Borrow Feature introduced for the network version of AutoCAD-based products work with Autodesk Revit?

Yes, one of the biggest benefits that network users of Revit gain by going to the new licensing technology is the license borrow feature for laptop users. For existing Revit users, license borrow replaces the legacy Revit concept of "external floating licenses."

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