

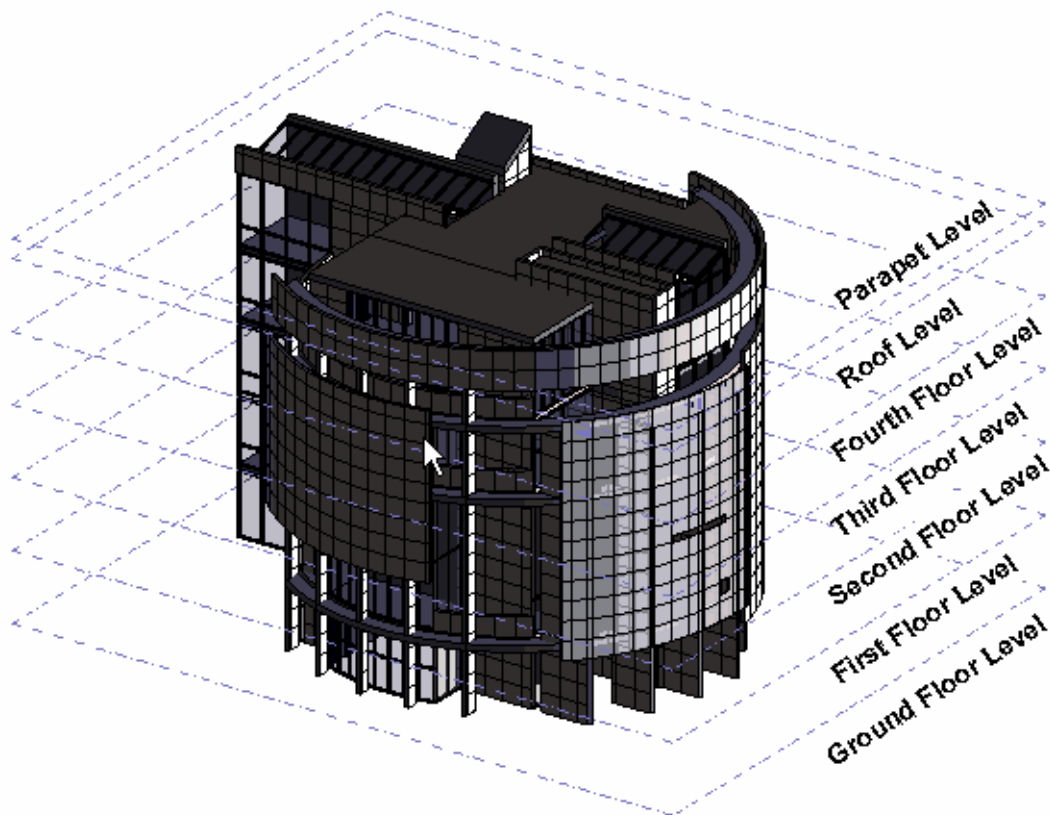
Understanding the Concepts and Features of Autodesk Revit

In this section, you will learn about the fundamental concepts that are the foundation of Autodesk Revit. You learn not only about each concept, but how it benefits you and your work.

Bidirectional associatively

Bidirectional associativity in Autodesk Revit ensures that any change to the relationships among objects is always instantly reflected by the parametric change engine throughout your design. Bidirectional associativity is at the heart of the mechanism by which Autodesk Revit maintains consistency in your model at all times.

Bidirectional associativity is applied automatically to every component, view, and annotation in Autodesk Revit. When you edit a dimension, for example, you change the underlying geometry of the object associated with that string. What may not be apparent is that bidirectional associativity is not an editable property of the wall. You don't turn it on or off. In Autodesk Revit, bidirectional associativity is automatic and managed at all times by the parametric change engine. This is the essence of making the computer do more work and enabling users to make changes at will.



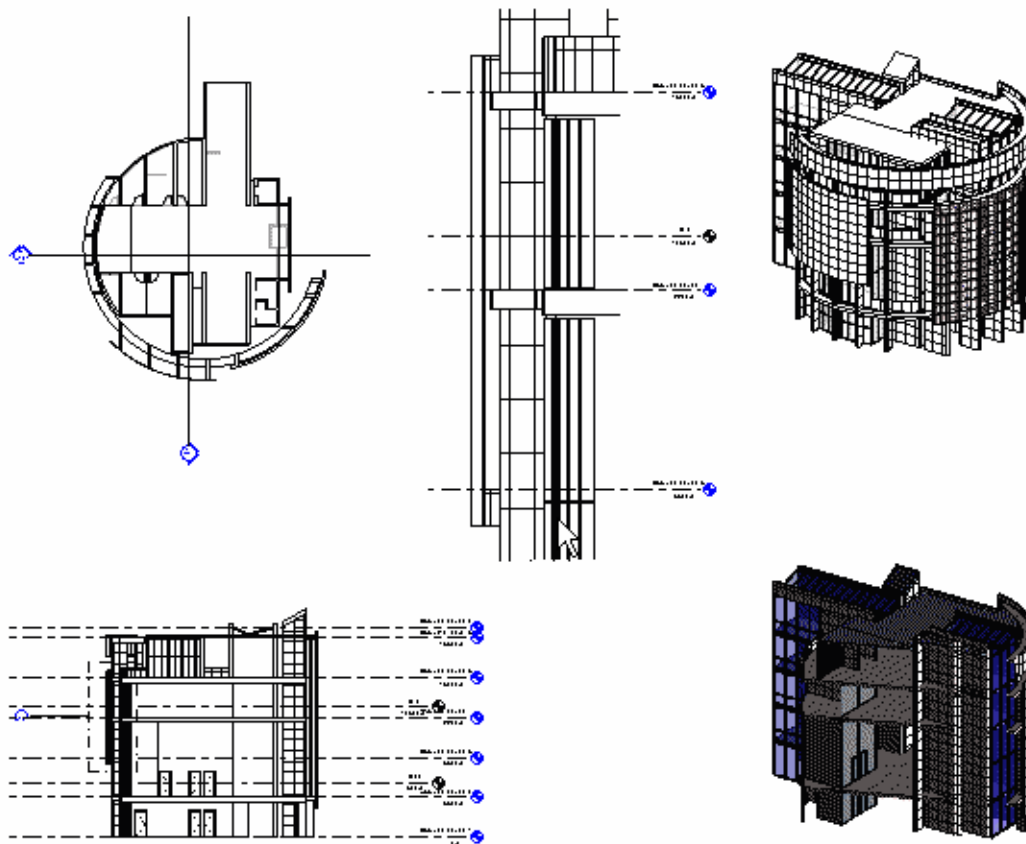
Bidirectional associativity in Autodesk Revit is universal, meaning that you need never refresh or regenerate any view, annotation, sheet, or other component. Contrast this behavior with other three-dimensional (3D) add-ons

to two-dimensional (2D) drafting systems, which often require you to edit in one view to reflect in another, or which require refreshing ancillary views or annotations. The change engine is capable of handling locked intent across the entire model, and features technology that manages all associatively so that Autodesk Revit is able to scale to large buildings while maintaining consistency at all times.

In Autodesk Revit, errors do not creep into a design. To change the size of a wall, you directly manipulate the wall or the dimension annotation, and the software automatically updates all other annotations and components to reflect the change. And it all happens instantly.

Integrated scheduling

Integrated scheduling in Autodesk Revit is an excellent example of how a parametric change engine can deliver real results in your projects. Schedules in Autodesk Revit are simply another view of the integrated model. As you would expect, bidirectional associativity means that when you change something in the view, the schedule changes. And when you change a component in the schedule, the component changes in all associated plans, elevations, sections, and other views.



Visualization and presentation

Autodesk Revit makes it easy to create and modify presentation materials directly in the model. Impressive presentation materials do not require add-on products. Autodesk Revit includes AccuRender® raytracing and radiosity (see Figure 5). In Autodesk Revit, you can use AccuRender for rendering and for export and import of bitmap and other graphic file formats. Autodesk Revit also features walkthrough animation exportable to AVI files, interactive panoramic files, procedural plants, and full control of range, resolution, and image sizing. Rendered images can be saved in the project and included on plottable sheets just as any other view, drawing, or schedule in the project. Renderings can also be created at any size and resolution, and can be saved outside the project in various graphic file formats for presentation and publication. Autodesk Revit includes PANTONE® color matching for complete accuracy of your printed and plotted output. Autodesk Revit also includes support for RPC™ content from ArchVision™, and several RPC files are included with the product. This innovative image-based rendering technology is capable of reflecting rich detail through synthesized image data rather than relying on complex geometry to represent objects in 3D.

Coordinating with consultants

Autodesk Revit, using the Autodesk ObjectDBX™ toolkit, not only provides the industry's best DWG compatibility-allowing import, export, and linking of your AutoCAD® data better than any other system-but also supports import, export, and linking to DXF™ files and MicroStation® DGN® files. Autodesk Revit enables you to always provide up-to-date underlay shell drawings and other deliverables to your consultants. Exported files present the proper level of information expected by AutoCAD or MicroStation users when opened in those systems. The component and element categories in Autodesk Revit are properly mapped to the layering standard of your choice, specific sets of geometric entities appear as blocks, and the correct pen and plotting information is provided in an associated file. You can also bring native DWG files directly into Autodesk Revit to use as reference geometry, library components, or as the starting point for a new design. In addition to direct support of DWG and DGN file formats, any CAD system that supports these file formats can work effectively with Autodesk Revit.

Working in large teams

Autodesk Revit worksets enable communication, collaboration, and coordination across multiuser project teams. Worksets enable team members to select the portions of the project they are responsible for; check them out from the single, integrated building information model; change them at will; and then check them back in. When returned to the shared model, worksets reflect all changes back into that model with full bidirectional associativity, maintaining consistency across the entire project.

Worksets enable large teams to collaborate using a single building information model. Worksets are dynamically reserved and released by team members over the network as they work. The Worksets dialog box always shows current information about who is working in each workset. Worksets can be

thought of as a distributed building database, one in which the entire team can move from stage to stage, process to process, to easily and quickly create whatever portion of the project is required. With Autodesk Revit, the computer works harder- ensuring consistency across multiple team members-while the essential ease of use is maintained and the integrated model preserved during the entire design and documentation process.

Working with large projects

Large projects involving multiple buildings or building wings can be developed by linking together several separate Autodesk Revit project files. Users can work on the files individually while the building geometry from the other individual linked files is visible. Presentation materials and other deliverables, including all the parts of the project assembled together, can be prepared from the linked files.

Support for unusual geometry

Autodesk Revit supports architects and designers in creating their most imaginative designs within the industry's most powerful building modeler. Designers can use splines to easily create free-form sketches for walls, roofs, floors, and family (parametric building content) elements. Advanced wall geometry provides tapered and battered walls, cornices and reveals, and curtain walls spanning any two lines, arcs, or splines. Roof geometry supports 3D-path sweeps to create fascias, eave conditions, and soffits for the most detailed roof designs. Roofs can incorporate skylights within any condition. The ability to divide wall faces and other surfaces into multiple separate regions enables designers to sketch and describe areas of different appearance, design, color, or texture on any model surface, providing highly detailed renderings and other documentation.

Sharing data with other applications

Autodesk Revit provides for export of the building information model to industry-standard open database connectivity (ODBC) compliant relational database tables. Using the digital quantification of the building and any of a number of common analysis tools from spreadsheets to traditional cost-estimating packages, industry professionals can now reliably estimate what is in a building project and how much material is needed. Using Autodesk Revit to create this business data eliminates the expensive and error-prone activities of measuring a building from drawings and recalculating results when the design changes. Substantial reductions in cost and scheduling rework and error along with increases in quality result from the unique ability of Autodesk Revit to automatically provide business data from a model created simply by drawing the building.

Using Autodesk Revit for structural layout

Autodesk Revit presents information to each design team professional in exactly the way they are accustomed to working with it. Thus, for a structural engineer, framing plans and bracing elevations are presented using structural engineering graphic conventions, while the architect views the same building database as architectural floor plans and building sections. For the structural engineer, the steel framing is shown as labeled, diagrammatic lines, while the architect sees the same steel framing in its actual dimensions, which is necessary for coordination.

Structural bearing and shear walls shared between the architect and the structural engineer are identified in the building information model. Bearing walls are available in the structural engineer's view of the database for framing; architectural walls are not available for framing and are not included in the structural view of the building model. The structural framing plan, the architectural floor plan, the architectural building section, and an isometric of the structure are all views of the same fully coordinated building database.

Integrated site modeling

Autodesk Revit is the first building modeler to integrate parametric site modeling. Site surfaces can be imported from existing survey information or created using Autodesk Revit and coordinated with the building design. You have direct control over triangulated surfaces and contour displays. Autodesk Revit components placed on the terrain automatically find the terrain surface to attach to, and, because the site is an integral part of the overall project, section cuts automatically reflect changes in the terrain should any part of the building be modified.

Parking spaces and plant materials are parametric components placed in the Autodesk Revit model. Parking spaces are inventoried and scheduled in the model, and plant materials are scheduled by their proper scientific names. Designers can study grading, create realistic sections, and further reduce preparation time for construction documentation.

Improving the design and construction process

In Autodesk Revit, the design and documentation process is a cycle of team-based tasks that are constantly iterating from stage to stage, not a series of discrete, serial steps ending in a set of construction documents. Autodesk Revit is the single, integrated tool you use to move through the entire process. In this section, a few of the common tasks you may have in the design and documentation process are illustrated. The objective isn't to detail features; it's to encourage you to rethink your use of CAD by demonstrating how Autodesk Revit helps you create construction documentation directly, while making it easy to cycle through different tasks in your project.

Massing capabilities in Autodesk Revit enable multiple iterations of the earliest design concepts-much the way you would create models from rigid foam blocks-while protecting that investment of time and effort by allowing the massed forms to be developed all the way into construction documents.

Changes made to the model in later phases are reflected in the massing studies, so the architect can switch between massing and shell modes at will.

You can generate cost and construction data from the massing study. Note that even though no effort has yet been spent in specifying the types of electrical systems in this building, the parametric cost report can extract intelligence from the model, so it can make accurate estimates for many building systems, including power systems. Other systems, such as the mechanical system, are also priced based on experience. (Means CostWorks® cost reporting is currently available only in North America.)

Although model-based massing and cost reporting are impressive, a major challenge is to preserve the value of the model as the design and documentation process progresses, increasing in both the size of the team and complexity of the requirements for information from the building information model. Until now, modelers have not supported the design and development cycle well once it progresses beyond simple massing or concept design.

Autodesk Revit supports phasing information in the building information model. Drawings that represent different phases of construction are easy to create. Autodesk Revit allows each component to be assigned to a phase, which determines how it is displayed at various points in time. And, because every view in Autodesk Revit is always associated with the model, the phased components and views automatically reflect any changes to that model. Phasing enables you to manage time-the fourth dimension-in the building information model.

Sheets in Autodesk Revit are "what you see is what you get," meaning that you can change the scale of the elevations, plans, and so forth, without complex layer management (there are no layers in Autodesk Revit). You can even make design changes directly on the view contained on the sheet and be assured that Autodesk Revit will reflect that change instantly throughout the model. Call-out annotations are up-to-date and accurate because the parametric change engine, not the user, is responsible for keeping them current.

Construction documents are easy to produce and revise at any time in Autodesk Revit. The Autodesk Revit building information modeler enables building design and production professionals to use a single, integrated digital model from the beginning of a project through to completion, and on into the lifecycle of the building. It does this by providing the easiest-to-use interface available for the building industry coupled with a sophisticated parametric change engine that transfers the burden of coordinating change from the user of the design tool to the computer, where it belongs.