Autodesk® Revit® Structure 2010
Feature Summary

This Autodesk® Revit® Structure 2010 Feature Summary provides an overview of the new functionality. Here are the main themes with some of the new features and enhancements that were made on Autodesk Revit Structure 2010 software:

Enhanced modeling capabilities

- Slanted columns
- Conceptual form modeling

Better productivity

- Spot Slope
- Column Location Mark in schedules and tags
- Estimated Reinforcement Volume in schedules
- Ribbon
- Application menu
- Quick Access toolbar
- Enhanced tooltips

Amplify your efforts

- Native 64-bit support
- API (application programming interface) enhancements

Improved Documentation

The online help for Autodesk Revit Structure 2010 includes a complete overview of the new ribbon interface, advanced tooltips that provide comprehensive information and graphics, and new learning tools that include: an interactive User Interface (UI) overview that enables a description of the interface element as the mouse hovers over it, and a Where is My Command tool that lists all commands by their previous menu location in Revit Structure 2009 and displays their current location on the ribbon.

The tutorials have been rewritten to provide a more workflow-based, beginner level set of instructions. A common building model is shared with other Revit tutorials to enhance the real-world concepts and design aspects of a typical project. For 2010, the Express Workshops are now a subset of the main tutorials. Also, many exercises have been improved to better demonstrate a typical engineering process.

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Enhanced Modeling Capabilities

Slanted Columns

Slanted Columns can be created and manipulated in elevation, section or 3D views. Currently, creation of slanted columns in plan view workflow is not supported.

You can access the Slanted Column tool in elevation or 3D view by selecting "Column" on Home tab and then click on "Slanted Column" in the "Placement" tab (automatically selected in 3D view).

Column Style

There are two styles of slanted columns (identified by parameter "Column Style"): "Slanted - Angle Driven" or "Slanted - End Point Driven". When the end height of an Angle Driven column is changed, the column will maintain its angle from the horizontal plane. An End Point Driven column, however, will maintain the end's XY position.

You can also create a slanted column by selecting an existing vertical column in the project, click Element Properties and then change the "Column Style" parameter to either "Slanted - Angle Driven" or "Slanted - End Point Driven".

Column Cutback

Columns now cutback and setback from beams when beams are adjusted using the Beam/Column Joins editor. While columns can’t be adjusted directly with the editor, they do respond to the beams joining them.

Column Joins

Slanted columns can join to beams (a join is created automatically when the end of a column coincides with the location curve of the beam). When a column is joined to the side of a beam or when a beam is primary in an end join (column is "driven" by the beam), the column will gain additional parameters that control the column's location on the beam's location curve. These appear in the "Structural" parameters and include "Top/Base Attachment Type", "Top/Base Attachment Distance" and "Top/Base Attachment Referenced End." These parameters work the same way as they do in braces.

Slanted columns can join to beams and braces. In an end join between a column and one or more beams, either the column or one beam can be primary. If the column is primary, then all beams cut back from the column. If a beam is primary, then all columns and beams in the join cut back from that beam. To modify the priority in a join, select the "Beam/Column Joins" tool in the Modify tab, and extend or un-extend a beam to, respectively, give or take away its priority.

Additionally, when a column is driven by a beam, it will gain parameters that control its geometry. Parameters "Top Geometry Treatment" and "Base Geometry Treatment" control the position of the column's geometry relative to the column's location curve. The option "Setback" keeps the geometry parallel to the location curve. "Vertical Offset" offsets the center of the geometry vertically to the top/bottom of the driving beam. "Offset From Attachment at Base" and "Offset From Attachment At Top" offset the position of the end cut plane.

Column Attachments

The top and bottom of a slanted column can be attached to a roof or slab by selecting a column and selecting "Attach" tool in "Modify Structural Columns" tab. The end point will be determined according to the rules specified by its "Column Type" parameter described above.

Each end of a slanted column can move with grid(s), whether an end of a column does this is determined by the parameters "Move Top With Grids" and "Move Base With Grids."

Column Cross-Section Rotation

Slanted columns have also gained a parameter "Cross-Section Rotation" that works like that of beams.

New Conceptual Design Environment

A new set of tools have been introduced into Autodesk Revit Structure 2010 that support architectural conceptual design workflows. An entirely new design environment was created for this purpose and includes many new tools, described below.

To enter the new design environment in Autodesk Revit Structure 2010, you start by making a new massing family from the Mass family template or by creating an in-place mass. Here you will find a dedicated user interface for this environment and the tools available are different from the standard Revit Family Editor. These tools are ONLY available when creating or editing an in-place mass in a project, using the new Conceptual Mass family template, or using the new Curtain Panel Pattern Based template.

The conceptual design environment contains tools for form making, form manipulation, enhanced sketching of lines on faces and work planes, and creation of 3D levels and reference planes. It also contains a powerful set of form rationalization tools useful for creating buildable architectural components from advanced forms. New methods for applying and managing parametric constraints are also available in this environment.

The designs created in this environment are massing families that can be used in the standard Revit project environment to create a more detailed architecture by applying walls, roofs, floors and curtain systems. You can also schedule floor areas and conduct preliminary spatial analysis in the project environment.

The standard Revit Family Editor was not changed. The new tools outlined here are intended to support conceptual modeling and form exploration.

New Conceptual Form Making Tools

A new and radically different method for creating geometric forms is being introduced in Autodesk Revit Structure 2010 in the conceptual design environment. With the new form making tools you'll be able to more quickly create and directly manipulate a wide range of form types, including complex lofts.

Creating Forms

You can make forms by selecting nearly anything - model lines, reference lines, edges of other forms, imported lines, and edges of loaded families - then clicking the Create Form tool. Depending on the inputs provided, you'll be able to generate extrusions, lofts, sweeps, surfaces, and revolves with the click of a button. Forms created can be manipulated freely and still retain associative and parametric properties you would expect from a parametric modeler like Revit. Boolean operations (joining and cutting geometry) are supported. The new form making tools in Autodesk Revit Structure 2010 support open surfaces as well as closed solids.

Modifying Forms

Once you've made a form, you can edit it directly using interactive controls that appear whenever an edge, surface or vertex of the form is selected. In addition to free manipulation of form, temporary dimensions are also provided to support more precise edits. Forms can be further refined by adding or removing edges and profiles. Unlike the standard family editing environment, there is no sketch mode when creating and editing conceptual masses - forms are always modified in a direct way, so that you see the results of your design changes immediately.

Improved Void Form Interaction

Similar to the standard family editor, voids can be used to carve out forms. In the conceptual mass editor, the interaction has been improved to support the direct manipulation of surfaces, edges, and vertices. Once a void cuts a solid, it essentially disappears, allowing you to edit the resulting geometry in a more direct way.

Reference-Based Forms

In order to support 3D parametric and adaptive panels that can be arrayed across a surface, forms can be generated from reference lines and points. These forms will maintain a constant thickness across complex surfaces. The ability to unlock reference-based forms is also provided so that you can vary thickness if needed.

Improved Sketching

Sketching on Work Planes and Surfaces

In the new conceptual massing environment, improvements to sketching on work planes and surfaces make it easier to draw in 3D space. Selecting a reference line, plane, or point sets your work plane automatically, allowing you to draw lines on the desired work plane and maintain fluid workflow. To draw on an existing surface, simply place your cursor over the surface and start drawing.

3D Levels, Reference Planes

In the conceptual mass family template, levels and reference planes are truly 3D objects. Now that you can see and edit these elements in 3D, most of your work can be done directly in a 3D view. Levels and reference planes may be sketched on more easily using the new sketching tools.

Reference Points

A new reference point element was introduced that can be used to host lines and drive parametric geometry. Reference points can be moved freely in 3D using the same 3D manipulation controls available for form elements. Reference points can be placed on work planes in 3D space or be hosted on lines, edges or surfaces.

Spline through Points

In addition to a standard set of line creation tools, a new type of spline tool creates a 3D spline through reference points. The geometry of the spline passes though the control points as opposed to being influenced by a control polygon, as with the standard Revit spline tool. With this type of spline, you are not restricted to drawing on a plane as the control points may be moved in 3D space. Use these lines to more rapidly create complex surfaces and forms such as lofts and 3D sweeps.

Surface Rationalization

Dividing Surfaces

Divide Surface is a new tool for dividing a range of surfaces (planar, ruled surfaces, revolved surfaces, and double-curved surfaces) in order to rationalize the surface into buildable components. The Divide Surface command is available after you select a surface of a form, an import file (like a 3D dwg or sat), or a surface from another family instance.

Surfaces can be divided by number of divisions or by distances between divisions. When you select a divided surface, additional contextual controls are available, allowing you to edit division numbers, justification, and rotation.

Patterning Surfaces

Another aspect of conceptual design involves patterning surfaces. To support this workflow, the Type Selector includes a collection of patterns that can be applied to surfaces. Patterns are created using the new Curtain Panel Pattern Based template, and can be loaded into any mass family.

Creating and Applying Components Based on Patterns

In Autodesk Revit Structure 2010, the Curtain Panel by Pattern family template enables you to create intelligent and flexible parametric components. These parametric components can be loaded into a mass family and applied to divided surfaces to populate a large variety of geometric surfaces with buildable architectural components. By building a parametric component based on the Curtain Panel by Pattern template, you can apply the new form-making tools to create variety of shapes. Once loaded into a conceptual design model, components appear in the Type Selector and can be applied to a divided or a patterned surface. Components can be modified individually after being applied to the divided surface.

Treatment of Surface Borders

Patterned surfaces may have border tiles that intersect the edge of the surface and are not complete tiles. These border tile conditions can be set to be partial, overhanging, or empty. When components are applied to a surface, the border components can have a faceted trim. The component can be also cropped or stretched.

Surface Representation

The way a divided or patterned surface is represented can be controlled, allowing you to show the surface at varying levels of detail:

- For divided surfaces you can show/hide the original surface, nodes, and UV grids.
- For patterned surfaces you can show/hide pattern lines and pattern fills.
- For surface with pattern components you can show/hide the component.

Improved Parametric Control

Interactive Exploration of Parameter Values

The existing labeled dimension functionality, which allows forms to be driven parametrically, is maintained in the conceptual design environment, but has been made more flexible.

Conceptual design depends heavily on the "flow" of the process of form exploration, of which direct manipulation is a key part. Autodesk Revit Structure 2010 allows interactive exploration of different parameter values through direct manipulation. When a dimensioned geometry is manipulated, the labeled dimension adjusts, and in turn, updates the related family type parameter.

Locking Labeled Dimensions

New Revit families support locking of labeled dimensions. When a labeled dimension is selected, it displays a lock/unlock icon like non-labeled dimensions do. Locking dimensions effectively locks parameters. When a labeled dimension is locked and any part of the geometry referenced by the dimension is moved, Revit attempts to preserve the dimension value (as a constraint).

Improvements to Labeling User Interface

When a parameter has related dimensions (for example, a formula associated with values from other parameters) and you select that parameter from the Label list on the Options Bar, the formula is shown along with the name and the value of the parameter. For example, A = 2 * B = 200’

Improvements to Selection Behavior

When a locked dimension is selected, other related dimensions are highlighted.

Improvements to Graphics

The look and feel of 3D views and selection graphics have been improved in Autodesk Revit Structure 2010 through the use of anti-aliasing and gradient backgrounds.

Anti-Alias Edge Display for 3D views

Anti-alias edge display is now an option for all 3D views, set from the Options dialog box. This option makes 3D views look more natural, and less jagged.

Gradient Backgrounds

For any 3D view, you can now enable gradient backgrounds with control over ground, horizon, and sky colors.

Selection, Highlight and Alert colors

Selection, highlight and alert colors have been changed in Autodesk Revit Structure 2010, and can be specified in the Options dialog box.

Controllable Underlay Graphics

The graphics of elements seen in underlay can be set to use any line weight and line style or to be displayed in halftone. Underlay graphics are set for the project and can be overridden for specific elements or edges.

Controllable Halftones

The visual density of halftone can be set as a project wide setting. At print time, halftone can be replaced by thin line printing.

Better Productivity

Spot Slope

Autodesk Revit Structure 2010 provides a new spot dimension for slopes. The spot slope can be placed on sloped faces to display the slope in several formats: Degrees, Percent, Ratio, or Fraction. In section and elevation views, the symbol can be set to a triangle, rather than an arrow, on an instance basis.

Column Location Mark in Schedules and Tags

The Column Location Mark is now a schedule property and a label category parameter for structural columns so that they may be included in schedules and tags.

Estimated Reinforcement Volume in Schedules

Estimated Reinforcement Volume parameter is now an available field for schedules.

Show Family Pre-Cut in Plan Views with Structural Framing Components

Structural framing category components now contain the “Show family pre-cut in plan views” parameter so that the geometry can be cut by the cut plane in medium and fine views.

Ribbon

The Autodesk Revit Structure 2010 UI is built around a ribbon interface that continues Revit's traditional task based structure and provides consistency with other Autodesk applications. The ribbon is context sensitive, presenting options that are relevant to the current state of the project and selections. It replaces the toolbars and design bars of earlier Revit releases.

Relocatable Ribbon Panels

Individual ribbon panels can be torn off and relocated anywhere on the screen. They will remain visible and in that position until returned to the ribbon. When Revit is reopened, the last used configuration will be recreated.

Relocatable Project Browser

The Project Browser window can be moved outside the application frame to any place on the screen. It will remain there until moved to another location. The browser position is remembered when Revit is opened again.

Navigation Toolbar

All view navigation tools (zoom, pan, SteeringWheel®, and ViewCube®) are accessed through the new Navigation Bar. This toolbar can be suppressed and activated from the ribbon. It can be moved and docked to any edge of the application frame.

Application Frame

The top bar of the Autodesk Revit Structure 2010 application frame provides constant access to Help tools and Communication and Subscription Centers. It also contains the customizable Quick Access Toolbar. The appearance of the application frame has been redesigned to align with other Autodesk products.

Customizable Quick Access Toolbar

The Quick Access Toolbar provides a set of tools that are always visible in the application frame. Most tools in the ribbon can be added to the Quick Access Toolbar by right clicking on the tool icon.

Snap Overrides

When a drawing tool is active or an element is being moved, copied, or otherwise manipulated, snap overrides are provided on the shortcut (right-click) menu.

New SteeringWheel Features

The SteeringWheel has been enhanced with several new features.

- By holding down Shift in Look mode, you orient the view to a selected face.
- There is an option on the shortcut menu to undo view orientation changes and return a view to its last saved state.
- The rewind feature snaps to frames that represent the previous view changes.
- Walk speed can be increased or decreased.
- There is an option on the shortcut menu to level the camera.

ViewCube Enhancements

- The compass ring is visible when the viewpoint is looking up at it.
- When hidden, the ViewCube can be turned back on by selecting it on the Navigation Bar.
- The ViewCube can be set to be visible in active views only.
- The compass can be turned off.

Task Error Dialogs

Many error dialogs have been reformatted in a task oriented manner. They describe the error and provide clickable options that describe the potential solutions.

Recent Files Page

The Recent Files page will only be displayed when there are no open documents; it can be disabled entirely through the Options dialog.

Filter by Function

The Function parameter of walls, floors, stairs, ramps, or doors can be used when constructing filters for graphic overrides or hiding.

Enhanced Tooltips

When you pause the cursor over an icon, a brief description of the tool displays. After a (user-configurable) interval, a more detailed description of the tool displays. Pressing F1 while the description is displayed opens the relevant Help topic.

Autodesk Seek Integration

In addition to helping you to find product design information, Autodesk Seek lets you share your own content with others. Upload Revit families to Autodesk Seek to give your partners and customers ready access to your content.

Amplify Your Efforts

Interoperability

Project Coordinate System, Project Base Point, and Survey Point

Autodesk Revit Structure 2010 provides an exposed Project Coordinate System (PCS) in each project. Each project contains two named points to help manage the Project and Shared coordinate systems.
The Project Base Point defines the origin of the PCS. It can be moved and reoriented using standard modification tools. It can also be used to relocate the entire project with respect to the shared coordinate system.
The Survey Point locates a specific point in the project with respect to the shared coordinate system. It can be used to replicate the surveyor's benchmark and help correctly locate surveys and site models within the project.

Open Building Component

In Revit projects, you can incorporate building components designed using Autodesk® Inventor® software or other mechanical applications that create Autodesk Exchange (ADSK) files.

Worksharing

Open as Local

A workshared project file can be opened directly as a local file. When this open option is selected, a copy of the central file is made and renamed as a local file. If a local file already exists, you can either overwrite the existing file or create one with a new name.

Set Default Worksets to Open during Save

When a workshared file is saved, you can set which worksets will be opened when the project is next opened. If the setting is changed when saving to a new central file, the setting will be applied to all users. If the change is made when saving a local file, it will be valid only the next time that local file is opened.

Macros Development with Revit VSTA

The Macro Manager

The Macro Manager has been redesigned to help streamline the workflow of creating macros in the Revit VSTA IDE and implementing them at the document and application level. The new Macro Manager increases the visibility and organization of your API macro development while you work.

Macro Security Implementation

New macro security features have been implemented to protect your workstation from running unknown malicious code. Macros can be disabled at the application and document levels, or can be set to prompt you to allow them when they are detected.

API Improvements

New Revit User Interface

Autodesk Revit Structure 2010 offers a new ribbon-based user interface. The API has been modified to support customization of the new user interface in a manner similar to what was supported in previous releases for toolbars and menus.

External commands registered directly to Revit through the Revit.ini file are now located on the Add-ins tab under the External commands pulldown. No code changes are required to move the buttons to this location. The Add-ins tab will be displayed automatically if any external command is registered with Revit.

External applications can register and add panels on the Add-ins tab of the ribbon. Custom panels may be given an application-specified name, and may contain:

- Pushbuttons – a single button with label and icon, which invokes a command when pressed
- Drop-down menus – a button with label and icon which opens a menu with different choices when clicked.
- Separators – a vertical line separating panel components

The API for creating ribbon panels is completely different from the toolbar and menubar API. External applications that added content to the toolbars and menus will need to be modified to create ribbon panel(s) instead.

Family Creation API

The Family Creation API provides programmatic access for creation and modification of the contents of Revit family documents. Geometric data, family types, and other information that can be specified through the Revit Family Editor can now be specified through the API. As a result of this project, API external commands are now displayed while you are editing a family document in the Family Editor. API access to in-place family editing is still restricted. The project introduces the class Autodesk.Revit.FamilyManager, which allows access to family types and parameters. Using this class you can add and remove types, add and remove family and shared parameters, set the value for parameters in different family types, and define formulas to drive parameter values.

The Category and Categories classes have been enhanced, and a new GraphicsStyle class has been created to provide control of the appearance of Revit families.

The new class FamilyItemFactory lets you create elements in families. Access this class through the Document.FamilyCreate property. It includes the following methods:

- NewBlend
- NewDimension
- NewDuctConnector (in Autodesk® Revit® MEP 2010 software only)
- NewElectricalConnector (in Autodesk® Revit® MEP 2010 software only)
- NewExtrusion
- NewFamilyInstance
- NewModelText
- NewPipeConnector (in Autodesk® Revit® MEP 2010 software only)
- NewRevolution
- NewSketchPlane
- NewSweep
- NewSweptBlend
- NewSymbolicCurve
- NewTextNote

The new class ItemFactoryBase lets you create elements both in project and family documents. This class includes the NewAlignment method.

New document methods (Document.LoadFamily and Document.EditFamily) have been introduced to bring families from the Family Editor to the project environment and vice versa. These methods can be used to examine the contents of the family in terms of its elements, parameters, and types; as a result, the properties of Family that access the contents have been removed (Family.SolidForms, Family.VoidForms, Family.Components, Family.LoadedSymbols, Family.Others).

New Events

The Revit API offers totally revamped events which allow an application to subscribe to events taking place in the Revit user interface or in API workflows. In all of the new events, events now occur before and after various triggering actions (known as "pre" and "post" events). Many of the new pre-events are cancellable, offering the API application the ability to prevent the event from taking place based on predetermined criteria. (It is the responsibility of the event subscriber to inform the user of the reason for the cancellation.)

Events that existed before the Autodesk Revit Structure 2010 release have been marked Obsolete. You should use the new events added in this release to cover situations like:

a. Document creation
b. Document opening
c. Document saving
d. Document saving as (new filename)
e. Document closing
f. Dialog box showing

The dialog box showing event has been restructured to support notification by Revit when task dialogs are shown.

The new events added in Autodesk Revit Structure 2010 are:

a. File export
b. File import
c. View printing
d. Document printing
e. View activating
f. Document save to central

API for New Massing Functionality

Autodesk Revit Structure 2010 introduces new conceptual design functionality for creation of complex geometry. Intuitive and flexible form-making is supported by the addition of new objects: points and spline curves that pass through these points. The resulting surfaces can be divided, patterned, and panelized to create buildable forms with persistent parametric relationships.

The following classes provide the API user with access to this functionality:

- CurveByPoints
- CurveByPointsArray
- DividedSurface
- DividedSurfaceData
- Form
- ReferencePoint
- ReferencePointArray
- TilePatterns
- TilePattern

Other methods and properties added to support this functionality are:

- ModelCurve.ChangeToReferenceLine()
- FamilyCreate.NewLevel(double)
- Family.IsCurtainPanelFamily
- Family.CurtainPanelHorizontalSpacing
- Family.CurtainPanelVerticalSpacing
- Family.CurtainPanelTilePattern
- SketchPlane.PlaneReference
- Level.PlaneReference

The following classes cannot be used in Autodesk Revit Structure 2010 Mass families. Instead, equivalent geometry can be created with the Form class.

- Blend
- Extrusion
- Revolution
- Sweep
- SweptBlend

Upgrade to .NET Framework Version 3.5

Revit now uses Microsoft .NET Framework version 3.5. Applications compiled using .NET 2.0 should continue to work unless they are affected by other changes in the Autodesk Revit Structure 2010 API.

Small Enhancements & API Interface changes

Parameters

The new property Autodesk.Revit.Parameters.InternalDefinition.BuiltInParameter provides access to the enumerated type for the parameter, if it is a built-in parameter. The property makes it easier to locate a built-in parameter value based on the name of the parameter shown in the Revit UI.

Grids

The new method Autodesk.Revit.Elements.Grid.ExtendToAllLevels() allows grids to intersect all levels of a project.

The method Autodesk.Revit.Creation.Document.NewGrid will throw an exception if given an unbounded line.

Batch Creation Methods (NewWalls, NewGrids, and so on)

If one of the elements which is supposed to be created cannot be created, the entire operation will be properly rolled back.

Rebar

NewRebar:StartHookOrientation and EndHookOrientation arguments were changed to an enum.
Rebar.SetLayoutRuleWithoutExaminingHost value type was changed to an enum.

Structural Framing

Beams created with an offset from their level now have their analytical model aligned with the physical geometry of the beam.
Curved beams can be created in the vertical plane.

Categories

Internal categories that are not directly exposed through the Revit UI can be accessed through the API. This makes it possible to add shared parameters to materials using the Revit API.

The new Category.AllowsBoundParameters property indicates whether a category can have shared or project parameters. When Category.AllowsBoundParameters is false, it may not be bound to shared parameters using the BindingMap.

Category. AllowsVisibilityControl(view) indicates whether the visibility of a category can be controlled in a given view.

Sketch

Autodesk.Revit.Elements.Sketch.CurveLoop now returns CurveArrayArray instead of CurveArray. If the sketch contains multiple loops, the output will be segregated into separate CurveArrays within the output.

Revit Session Properties

The new Autodesk.Revit.Application.Language property identifies the language used in the current session of Revit.

The new Autodesk.Revit.Application.Product property identifies the Revit vertical application (Architecture, Structure, MEP) using an enumerated type.

External Commands and Applications

Revit now offers improved diagnostics when it is unable to run an external application or command listed in the Revit.ini file. A popup message will explain the problem. If the problem is related to an exception caught from the application, the popup will include the exception stack trace.

Revit no longer silently renumbers the Revit.ini file entries when they fail to load or start. An option in the popup message will allow a user to permanently disable a failed API application.

HostedSweep

In the Autodesk.Revit.Elements.HostedSweep class the new abstract method AddSegment() allows applications to write generic code that operates upon all hosted sweep types (gutter, fascia, or slab edge).

VolumeCalculationOptions

The Autodesk.Revit.VolumeCalculationOptions.VolumeComputationEnable field was removed. Use the property VolumeComputationEnable instead.

Curtain Systems

Autodesk.Revit.Elements.CurtainGridLine new property ExistingSegmentCurves allows access to the existing segments in the grid line (excluding those which have been removed).

Autodesk.Revit.Elements.Mullion now provides access to its location through the LocationCurve property.

Output Arguments from API Methods

Output arguments are now marked with the [Out] attribute. Methods changed include:

- Application.GetAllTopMenus
- ControlledApplication.GetAllTopMenus
- Document.Import - both overloads
- Face.Intersect
- Curve.Intersect
- Curve.IsInside
- Face.IsInside
- Document.LoadFamily
- Document.LoadFamilySymbol

Previously these output arguments were declared as “reference”. In C#, where these arguments were passed using the “ref” keyword, this should now be “out”.

Visual Studio Tools for Applications (VSTA) 2.0

Revit's macro functionality is now based on VSTA 2.0. More information about VSTA and version 2.0 is available at Microsoft's MSDN Developer Center at http://msdn.microsoft.com/en-us/vsx2008/products/bb933739.aspx

Find References in the Direction of Array

This new method returns a reference array of all references found when moving through the Revit model from a specified point in a specified direction.

Syntax:

```
public ReferenceArray FindReferencesByDirection(XYZ pOrigin, XYZ pDirection, View3D pView)
```

Reference Parsing

The Autodesk.Revit.Geometry.Reference class now offers properties to extract the element, geometry object, transform, point, and parameters of the referenced item.

Element Hiding

To allow hiding and un-hiding of elements through the API, the methods View.Hide(ElementSet) and View.Unhide(ElementSet) have been added. The properties Element.IsHidden(View) and Element.CanBeHidden(View) return a Boolean value that indicates if an element is currently hidden and if it can be hidden.

Parameter.Set Return Value when Value Is Unchanged

Previously, Revit returned False if the input value for Parameter.Set was the same as the current value. Revit now returns True in this case.

NoConditionType Removed for Spaces

The NoConditionType enum has been removed as an option for spaces. All spaces must have a ConditionType value and the default is HeatedAndCooled. To specify an unconditioned space, use the value ConditionType::Unconditioned.

Detail Curves Use Sketch Plane of Their View

NewDetailCurve and NewDetailCurveArray no longer require specification of a sketch plane. The sketch plane of the view is used.

SketchPlane Property Added to View Class

The property View.SketchPlane has been created to return a view's sketch plane.

Export Family Data to XML for Autodesk Seek Integration

The method `ExtractPartAtomFromFamilyFile` will open a family file and create an XML file with data used by Autodesk Seek for content search.

Exceptions when Parameters Are Disabled

Set and Get for the following parameters may now result in exceptions when the parameter is disabled for the specified object: View.Scale, RoofBase.FasciaDepth, FootPrintRoof.SlopeAngle

New Options for Export to DWF

The option DWF2DExportOptions.ExportFormat allows specification of the paper format for the DWF.

The option DWF2DExportOptions.PortraitLayout allows specification of the layout for the DWF.
The new option DWF2DExportOptions.ImageFormat allows specification of the format for the exported image in the DWF.

The option DWF2DExportOptions.ImageQuality allows specification of the format for the exported image in the DWF.

The option DWF2DExportOptions.StopOnError and DWF3DExportOptions.StopOnError controls whether Revit stops the export process when an error is generated during export of one view, or attempts to continue the export for other pending views.

New Option for Export to FBX®

The option FBXExportOptions.StopOnError controls whether or not the export process stops when an error is generated during export of one view, or whether Revit attempts to continue the export for other pending views.

New Method for Export to DGN

The method Document.Export(String, String, ViewSet, DGNExportOptions) exports a model into DGN format.

New Method for Import from gbXML

The method Document.Import(String, GBXMLImportOptions) imports a Green-Building XML file into Revit.

New Method for Import from Inventor

The method Document.Import(String, InventorImportOptions) imports an Inventor file into Revit. The Inventor file must be an .adsk file exported from Autodesk Inventor 2010 for the purposes of transfer to Revit.

Document.Application Property

The property Document.Application returns the Application object which contains the document.

New Element Collector Properties

Two new methods for collecting elements have been added.

- `int Elements[Filter, ElementArray]` - Collects all elements which satisfy a specified filter within the document.
- `int Elements[Type, ElementArray]` - Collects all elements which satisfy a specified type within the document.

These methods are similar to previously existing methods that accepted a System.Collection.Generics.ICollection<Element>.

ImportInstance Elements

The new element sub-type ImportInstance represents external geometry content such as DWG file that has been imported to Revit. This element type is also output from the Import() methods; however, those methods have not been updated to specifically output this new type. You can downcast the output to this sub-type.

The ImportInstance element types lets you access and modify the Visibility and Pinned parameters.

LocationCurve.ElementsAtJoin

This property has changed type since Revit Structure release 2009. The property now returns an ElementArray, instead of List<Element>.

Element Material Quantities

The API provides access to the material quantities for a material in a given element. These values are the same values calculated by Revit for display in material takeoff schedules. In some cases the value may be approximate. Access these values through:

- Category.HasMaterialQuantities
- Element.Materials
- Element.GetMaterialArea()
- Element.GetMaterialVolume()

Instance.Transformed[Transform] and Geometry of Instances

This property has been removed. Obtain the transformed geometry of the instance using Instance.GetInstanceGeometry(), Instance.GetSymbolGeometry(Transform) and Instance.GetInstanceGeometry(Transform)

PlaceGroup()

The method Autodesk.Revit.Creation.Document.PlaceGroup() has been modified to correctly interpret the coordinates of the input point in the coordinates of the document. Previously it interpreted the points in the coordinates of the group, which were not accessible.

gbXMLParamElem.ShadingSurfaces

This property has been removed and replaced with gbXMLParamElem.ExportComplexity, which includes a wider variety of options.

Creating Topography Surfaces

The following new methods allow you to create and populate topography surface elements in projects.

- Autodesk.Revit.Creation.Document.NewTopographySurface()
- Autodesk.Revit.Elements.TopographySurface.AddPoints()

Changes to Printing

The workflows for changing print settings through the PrintManager class have changed. Previously, changes to settings happened immediately, were visible in the Revit Print dialogs, and applied to all API printing activities. In the Autodesk Revit Structure 2010 API, you must commit your changes to the PrintManager, PrintSettings and PrintParameters classes by one of these methods:

1. Calling PrintManager.SubmitPrint to execute a print job.
2. Calling PrintManager.Apply to save settings without executing a print job.

The properties PrintSetup.PaperSizes and PrintSetup.PaperSources have moved to the PrintManager class.
A new option has been added to PrintParameters: ReplaceHalftoneWithThinLines.