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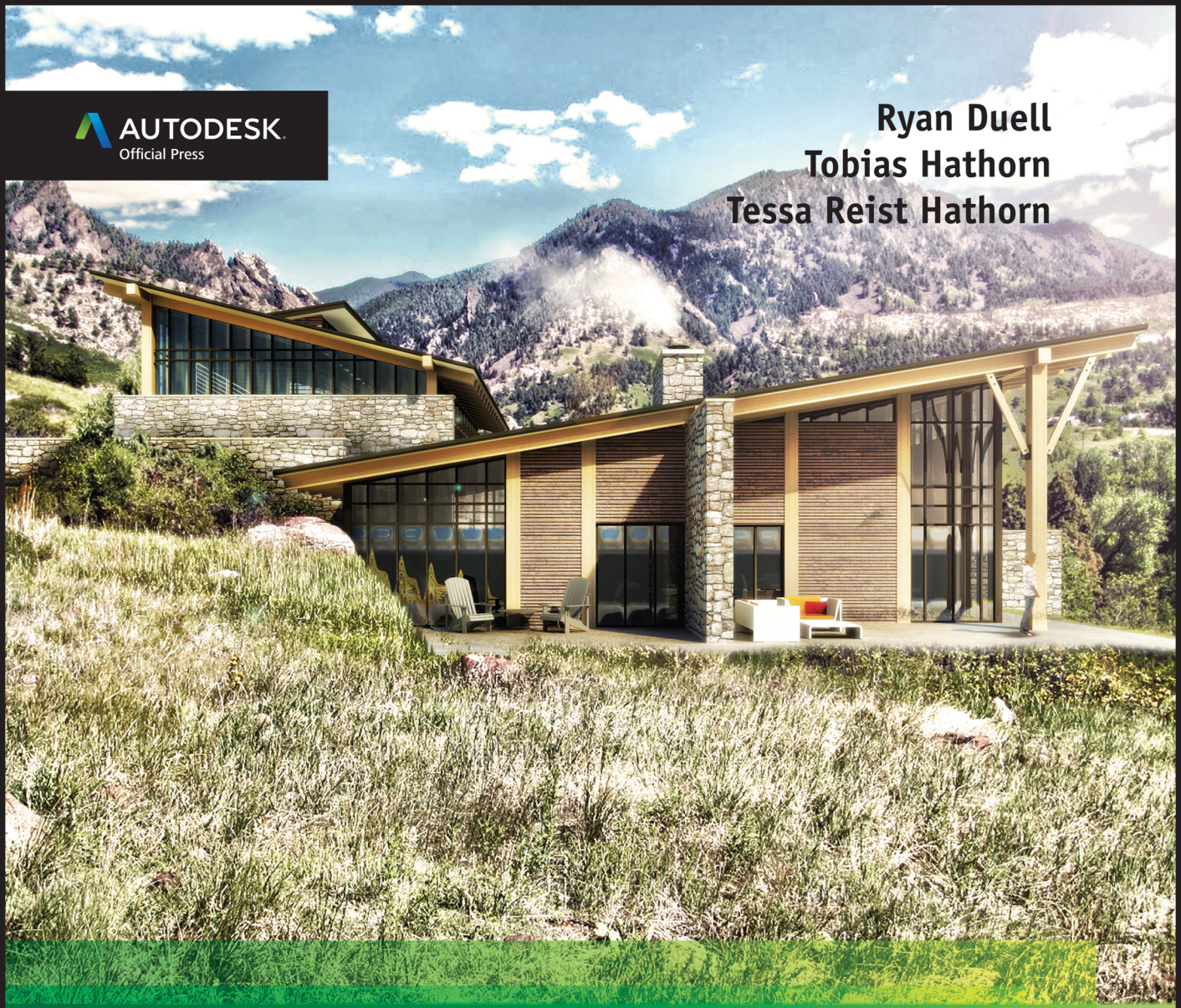
Ryan Duell
Tobias Hathorn
Tessa Reist Hathorn



Autodesk® Revit® Architecture 2016

ESSENTIALS

SYBEX
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AUTODESK® REVIT® ARCHITECTURE 2016

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For Stacey, Lucely, and Nathaniel—more caffeine, less snow please!

—Ryan

For RoMBIS, BoBTech, Reviteers, FormIteers, and TNT!

—Tobias

For T and N, my two sidekicks.

—Tessa

Acknowledgments

This has been an extraordinary year of change. I would like to first thank all of the family members who assisted us in transitioning out of our condominium and into our new home—it would not have been possible without your assistance. I would like to thank my wife, Stacey, for always being understanding about the crazy things I get myself involved in. I would like to give a huge round of thanks to everyone at Autodesk. From the QA guild to my agile team, your continued support, humor, and depth of knowledge is second to none. I couldn't ask for a better group of individuals to work (or share a beer) with. Next, Wiley—this book would have never been possible without your talented staff, editing, and support, so thank you. And Tobias and Tessa, thank you for the solid teamwork and dedication getting another edition wrapped!

—Ryan

Thanks to the lovely city of Boulder, Colorado, for the exciting year. The Boulder ADSK office especially has been great to work with—the team is brilliant and expedient. Thanks to my family for the support and bike ride destinations. Also, to Wiley, for making this book happen. Thanks to Ryan, for the solid, ahead-of-schedule work. Thanks to Tessa, for *everything still*. Thanks to Noelle, for the inspirational chatter.

—Tobias

Thank you to Fänas Architecture for showing me how to have a career and be a mom. You *can* have it all. Thank you to my cowriters: to Ryan, for always (again) being one step ahead of the game, and Tobias, for your great dedication and sense of humor. We did it again! Thanks also to our technical editor, Jon McFarland, for keeping us on our toes. And an enormous thanks to our team at Wiley—Stephanie McComb, Alexa Murphy, and the rest of the editorial staff—for making everything behind the scenes happen.

—Tessa

About the Authors

Ryan Duell is a principal quality assurance analyst for Revit at Autodesk. He holds a bachelor's degree in design computing from Boston Architectural College. He started his career with cbt Architects in Boston, Massachusetts, working on a variety of project teams ranging from single-family residential to large commercial projects. Ryan transitioned into the BIM manager role, focusing on Autodesk® AutoCAD® Architecture and Autodesk® Revit® Architecture standards along with contributing assistance to project teams. At Autodesk, he spent several years in the product support organization providing Revit support for end users and enterprise accounts. In addition to working at Autodesk, Ryan teaches Revit at the Boston Architectural College and contributes to the Revit Clinic blog.

Tobias Hathorn is a licensed architect and user experience designer for Autodesk. He holds a bachelor's degree in architecture from Kansas State University. He started his career at BNIM Architects in Kansas City, Missouri, working on a one-million-square-foot IRS paper-processing center in Revit Architecture. After working as a liaison between BNIM and Moshe Safdie and Associates on the Kansas City Performing Arts Center, Tobias moved to Boston to join the Revit product team in Waltham, Massachusetts. Tobias has honed his knowledge and experience with Revit, especially the graphics and rendering features, over the past seven years in the quality assurance and user experience groups. He is currently working on Autodesk® FormIt®, a conceptual design tool to aid in the early stages of a BIM workflow. In his free time, he likes to bicycle and play Tetris.

Tessa Reist Hathorn is a licensed architect and a LEED Accredited Professional with 10 years of experience in architecture using Autodesk® Revit®. After starting her career at BNIM Architects working on historic renovations and the renowned Kauffman Center for the Performing Arts, she eventually moved to Boston, Massachusetts, to work with Moshe Safdie and Associates, working on high-profile international projects, and later worked with Austin Architects in Cambridge, Massachusetts. Tessa currently works as an architect in Boulder, Colorado, at Fänas Architecture, specializing in custom homes.

Contents at a Glance

Contents

Foreword

Congratulations on choosing Autodesk® Revit® software to be your BIM authoring tool! To prepare you for the journey of learning Revit, there are three major phases you should be aware of: the challenges, the benefits, and the guru. Let's look at each.

The Challenges

Revit is hard, but don't let it scare you. Revit is a dialogue-heavy database with a graphic front end. If you have no idea what the last sentence means, don't worry; you don't need to understand it! My point is, you will not understand everything inside of Revit. I have been using Revit for over seven years and I still don't understand everything!

The first phase in your learning process will be the challenges. You *will* get stuck. You *will* break things. This is all part of the process. Don't let it stop you. Many of the little tips, tricks, and techniques I publish were discovered when I was stuck or broke something. Welcome the challenges with open arms instead of frustration.

The Benefits

Once you have accepted and conquered the aforementioned challenges, you will enter the benefits phase. In the benefits phase you will begin to understand the power of Revit. You will begin creating construction documents faster than ever, your callouts will be automatically coordinated, and you'll have a greater understanding of your buildings than ever before.

This phase will make you smile. You are now beginning to see the "BIM light" at the end of the tunnel and it excites you! But don't stop there!

The Guru

The benefits phase has such a positive effect on you that you just *have* to expand your knowledge. If you can double your productivity with the essentials put forth in this book, imagine what you can do beyond the essentials!

The guru phase is the final phase on your journey. You'll know you are in the guru phase because you are no longer afraid of the program and it has become part of your workflow. You are reaping the benefits of BIM and forgot what life was like before it. Now, you want to push the program to its limits and become an elite user. Embrace this phase. You've earned it.

I began my Revit journey reading a book just like this one. Let this book be your guide and help you through the challenges. Keep it on your desk for reference as you reap the benefits. Finally, pass it on to a new user when you are a guru. Who knows, maybe you will be asked to write the foreword one day...

Jeffrey A. Pinheiro, AIA
"The Revit Kid"

BIM After Dark.com
@TheRevitKid

Introduction

Welcome to Autodesk Revit Architecture 2016 Essentials, based on the Autodesk® Revit® Architecture 2016 software release.

We continually shape the focus and content of our book from our diverse experience as Revit teachers, writers, users, support specialists, designers, and testers. We have tailored the content to what we think is the most valuable combination of topics and generated exercise files that target these topics. Because we teach Revit Architecture to first-time users, we feel this book's content is of most value to our students learning the program for the first time. This book should benefit new Revit Architecture users as well as long-term users who may not use every aspect of the program on a daily basis and could benefit from revisiting exercises as needed.

Revit Architecture 2016 includes several new valuable tools. While each tool may not be considered "essential," we have made an effort to mix new tools, tips, and tricks, along with established features, into the context of the text and supporting exercises. For this book, many of the existing exercises have been revisited, and we've included new exercises meant to further your knowledge of Revit. The book follows real-life workflows and scenarios and is full of practical examples that explain how to leverage the tools within Revit Architecture. We hope you find that the topics in this book are beneficial and contribute to your continual Revit development.

Who Should Read This Book

This book is written for architects, designers, students, and anyone else who needs their first exposure to Revit Architecture or has had an initial introduction and wants a refresher on the program's core features and functionality. We've designed the book to follow real project workflows and processes to help make the tools easy to learn, and the chapters are full of handy tips to make it easy to leverage Revit Architecture. This book can also be used to help prepare for Autodesk's Certified User and Certified Professional exams. For more information on certification, please visit `www.autodesk.com/certification`.

What You Will Learn

This book is designed to help you grasp the basics of Revit Architecture using real-world examples and techniques you'll use in everyday design and

documentation. We'll explain the Revit Architecture interface and help you find the tools you need as well as help you understand how the application is structured. From there we'll show you how to create and modify the primary components in a building design. We'll show you how to take a preliminary model and add layers of intelligence to help analyze and augment your designs. We'll demonstrate how to create robust and accurate documentation and then guide you through the construction process. Whenever possible, we will both teach you how to use Revit and show you how to put those newfound skills to use in focused exercises.

As you are already aware, building information modeling (BIM) involves more than just a change in software; it also represents a change in architectural workflow and culture. To take full advantage of both BIM and Revit Architecture in your office, you'll have to make some changes to how you work. We've designed the book around an ideal, integrated workflow to aid in this transition.

What You Will See

The screen captures and other graphics in this book are based on Revit 2016, which combines the architectural, structural, and MEP disciplines and tools into a single application. If you notice small differences based on the exact version of Revit you have installed, we apologize, but it would be very confusing to base the book on all versions of the application, noting all the small differences along the way. However, whichever version you have, you'll be able to follow the lessons and chapter exercises of this book with ease.

What You Need

To leverage the full capacity of this book, we highly recommend you have a copy of Revit installed on a computer strong enough to handle it. To download the trial version of Revit (offered as Revit 2016), go to `www.autodesk.com/revitarchitecture`, where you'll also find complete system requirements for running the application.

From a software standpoint, the exercises in this book are designed to be lightweight and not computationally intensive. This way, you avoid long wait times to open and save files and perform certain tasks. That said, keep in mind that the Autodesk-recommended computer specs for Revit Architecture are far more than what you need to do the exercises in this book but are *exactly* what you need to work on a project using Revit Architecture.

Free Autodesk Software for the Education Community

The Autodesk Education Community is an online resource with more than five million members that enables the education community access to download—for free (see website for terms and conditions)—the same software used by professionals worldwide. You can also access additional tools and materials to help you design, visualize, and simulate ideas. Connect with other learners to stay current with the latest industry trends and get the most out of your designs. Get started today at `www.autodesk.com/joinedu`.

What Is Covered in This Book

Revit Architecture is a building information modeling (BIM) application that has emerged as the forerunner in the design industry. In this book, we'll focus on using real-world workflows and examples to guide you through learning the basics of Revit Architecture 2016—the *essentials*.

Autodesk Revit Architecture 2016 Essentials is organized to provide you with the knowledge needed to gain experience in many different facets of the software. The book is broken down into the following 14 chapters, which also contain numerous exercise files:

Chapter 1, "Introducing the Autodesk Revit Architecture Interface," introduces you to the user interface and gets you acquainted with the tools and technology—the workflow—behind the software.

Chapter 2, "Walls and Curtain Walls," helps you build on that initial knowledge by establishing some of the basic building blocks in architecture: walls.

Chapter 3, "Floors, Roofs, and Ceilings," introduces you to the other basic building blocks: floors, roofs, and ceilings. By the end of the first three chapters you will begin to see how easy it is to create the core elements of your building.

Chapter 4, "Stairs, Ramps, and Railings," explains the basics of stairs, ramps, and railings. These core components are versatile, and using them can be a bit tricky, so we'll guide you through the process of creating several types of stairs and railings.

Chapter 5, "Adding Families," shows you how to add a core element to your project: families. You use families to create most of your content, and Revit Architecture by default comes with a robust supply.

Chapter 6, "Modifying Families," shows you how to take these families and modify them or create your own, making the library of your content limitless.

Chapter 7, "Schematic Design," introduces you to conceptual design workflows using Autodesk® FormIt™ software and Autodesk® Sketchbook® Pro software to generate design sketches. Using those sketches, you can take the building design and model it in Revit Architecture.

Chapter 8, "Rooms and Color Fill Plans," shows you how to add room elements to your spaces, assign information to them, and create colorful diagrams based on space, department, or any other variable you need.

Chapter 9, "Materials, Visualization, Rendering," introduces you to visualization tools and techniques. You prepare presentation-quality views of your design in elevation, axonometric, and perspective views.

Chapter 10, "Worksharing," discusses how to take your Revit Architecture file into a multiperson working environment. Worksharing allows several people within your office or project team to work on the same Revit Architecture file simultaneously.

Chapter 11, "Details and Annotations," focuses on adding annotation to explain your designs. You'll learn how to add detail to your model in the form of dimensions, text, keynotes, and tags and how to embellish your 3D model with additional detailing.

Chapter 12, "Drawing Sets," shows you how to take all this information and place those drawings and views onto sheets so they can be printed and distributed to your project stakeholders.

Chapter 13, "Workflow and Site Modeling," provides the basics on how to take your office from a CAD environment to one that works with BIM. This chapter explores tools for every level of the project team—from the new staff to project managers. Understanding the process and workflow will be key to the success of your first Revit Architecture project.

Chapter 14, "Repetition in Revit," covers the primary methods to repeat geometry in Revit. This chapter explores several approaches, focusing on the primary benefits of each tool. Wrapping up the chapter are some tips and shortcuts to utilize on your own projects.

The Essentials Series

The Essentials series from Sybex provides outstanding instruction for readers who are just beginning to develop their professional skills. Every Essentials book includes these features:

- Skill-based instruction with chapters organized around projects rather than abstract concepts or subjects.
- Digital files (via download) so you can work through the project tutorials yourself. Please check the book's web page at `www.sybex.com/go/revit2016essentials` for the companion downloads.

At the book's web page, you'll also find a special bonus file full of suggestions for additional exercises related to each chapter, so you can practice and extend your skills.

NOTE **Should you choose to browse the book's companion web page, it will look like a site to purchase the book, which it is. But if you pan down just a bit, you'll see three gray tabs. The third one is the book's companion downloads.**

Contacting the Authors

We welcome your feedback and comments. You can find the three of us on Facebook at Mastering Revit. We hope you enjoy the book.

CHAPTER 1

Introducing the Autodesk Revit Architecture Interface

After more than a decade of use in the architecture, engineering, and construction (AEC) industry, Autodesk® Revit® Architecture software continues to be unique in its holistic building information modeling (BIM) approach to design. There are other tools that allow you to design in 3D, and 10 years ago 3D might have been a differentiator, but today 3D is the standard. BIM is quickly becoming the standard as well.

Revit Architecture provides the unique ability to design, update, and document your project information from within a single file — something no other BIM tool allows you to do. Because all of your data resides in a single project file, you can work in any view to edit your model—plan, section, elevation, 3D, sheets, details, even a schedule—and then watch as your file updates in all views automatically. To begin your journey of learning Revit Architecture, we'll help you become comfortable with the user interface and the basic steps of the Revit Architecture workflow.

In this chapter, you'll learn to:

- **Use the Properties palette**
- **Use the Project Browser**
- **Use the View Control Bar**
- **Navigate with the ViewCube®**
- **Create floors, walls, and levels**
- **Change a wall type**
- **Place doors and windows**
- **Space elements equally**

Understanding the User Interface

The user interface (UI) of Revit Architecture is similar to other Autodesk products, such as the Autodesk® AutoCAD®, Autodesk® Inventor, and Autodesk® 3ds Max® products. You might also notice that it's similar to Windows-based applications such as Microsoft Word. All of these applications are based on the "ribbon" concept: tools are placed on panels organized on tabs in a *ribbon* across the top of the screen. The ribbon is contextually updated based on the elements you have selected. We'll cover the most critical aspects of the UI in this section, but we won't provide an exhaustive review of all tools and commands. You'll gain experience with a variety of tools as you read the chapters and go through the exercises in this book.

Figure 1.1 shows the Revit Architecture UI with labels illustrating the major UI elements. Four project views are tiled to display at the same time: plan, elevation, 3D, and perspective camera.

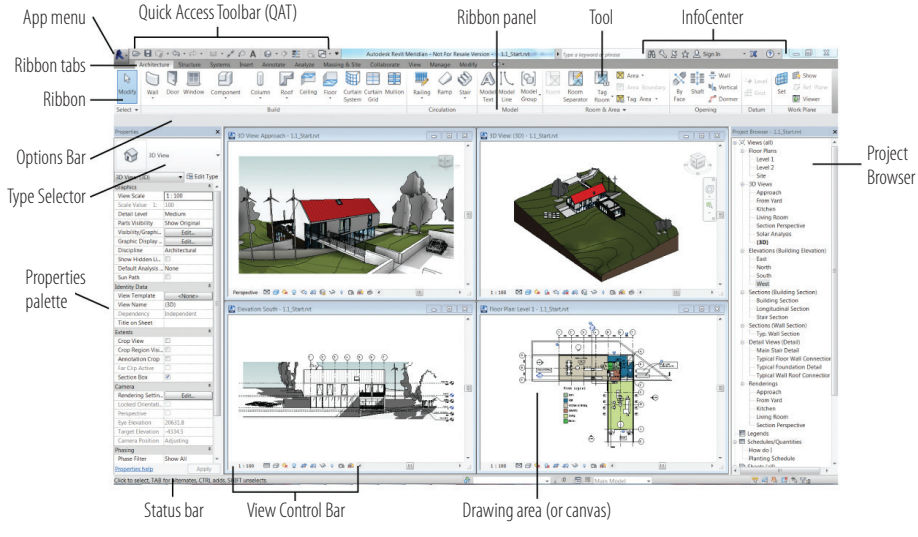


FIGURE 1.1 Revit Architecture user interface

Exercise 1.1: Use the Properties Palette to See Dynamic Updates of Properties

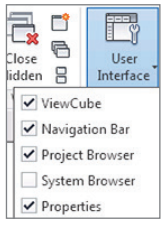
The Properties palette is a floating palette that remains open while you work in the model. The palette dynamically updates to show the properties of the

element you have selected. If you have nothing selected, then the view's properties are displayed.

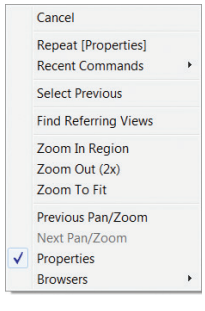
To begin, go to the book's web page at `www.sybex.com/go/revit2016essentials`, download the files for Chapter 1, and open the file `c01-ex-01.1start.rvt`. You can open a Revit Architecture project file by dragging it directly into the application or by using the Open command from the Application menu (also known as the App menu).

1. Go to the Modify tab of the ribbon, find the Properties panel on the far left side of the ribbon, and click the Properties button. This button will open or close the Properties palette. Leave the Properties palette open.

2. Go to the View tab of the ribbon, find the Windows panel to the far right, click the User Interface button, and uncheck or check the Properties option. This will also open or close the Properties palette. Leave the Properties palette open. This is how to turn on UI elements that you accidentally turn off!



3. Move your mouse into the drawing area, or canvas, and then right-click with the mouse; this will bring up a context menu. Click the word *Properties* near the bottom of the list. This will also open or close the Properties palette.



4. You can also toggle the visibility of the Properties palette by pressing Ctrl+1 on your keyboard.

5. The palette can be docked on either side of your screen or it can float in your canvas. To move the palette, just click the Properties palette header and drag it with your mouse. You will see an outline preview of the palette to aid you in placement; release the mouse button to place the palette.

6. To dock the palette back to the left side of the screen, click and drag the mouse *all the way* to the left side of the screen, until the preview outline spans the entire height of the screen. The Properties palette may be up against the Project Browser. See Figure 1.2. You will move the browser to the right side of the screen in the next exercise.

The Properties palette can be pulled outside the Revit application frame. This is especially helpful if you have a second monitor. You can move the palette to a second screen for maximum Revit canvas space on the primary screen.

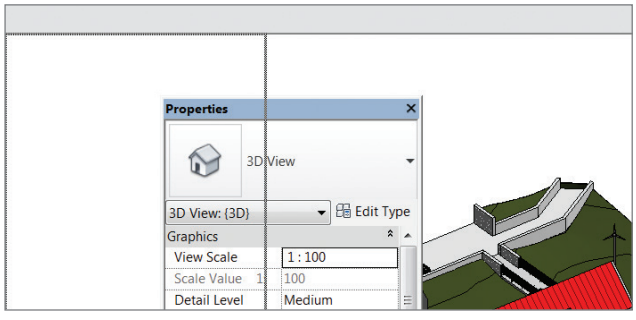


FIGURE 1.2 Preview of docking the Properties palette to the left side

7. Make sure you don't have any elements selected; look in the Properties palette and notice that it displays the properties of the active view, the 3D view. Use the scroll bar on the right side of the Properties palette to find the Extents group of properties. Check the Crop View option. You don't need to use the Apply button to commit the change; instead, just move your mouse into the canvas to automatically apply your changes.

The Properties palette displays element properties. Changes made in the Properties palette will affect only the currently selected elements. Changes made in the Type Properties dialog (found by clicking the Edit Type button, below the Type Selector) will affect all elements of the type currently displayed in the Type Selector, whether they are selected or not!

8. Select the red roof in the 3D view. Notice that the Properties palette updates to show the properties of the current selection, the Basic Roof SG Metal Panels roof. Any changes to these properties will affect this Roof element only.

9. While you still have the roof selected, click the Type Selector drop-down at the top of the Properties palette. Choose the Warm Roof - Timber option from the list. Click your mouse off into space to deselect the roof. You'll notice that the roof is no longer red. When you choose another type from the list, you are swapping the current roof type for another roof with different *type properties*, but the *element properties* stay the same!