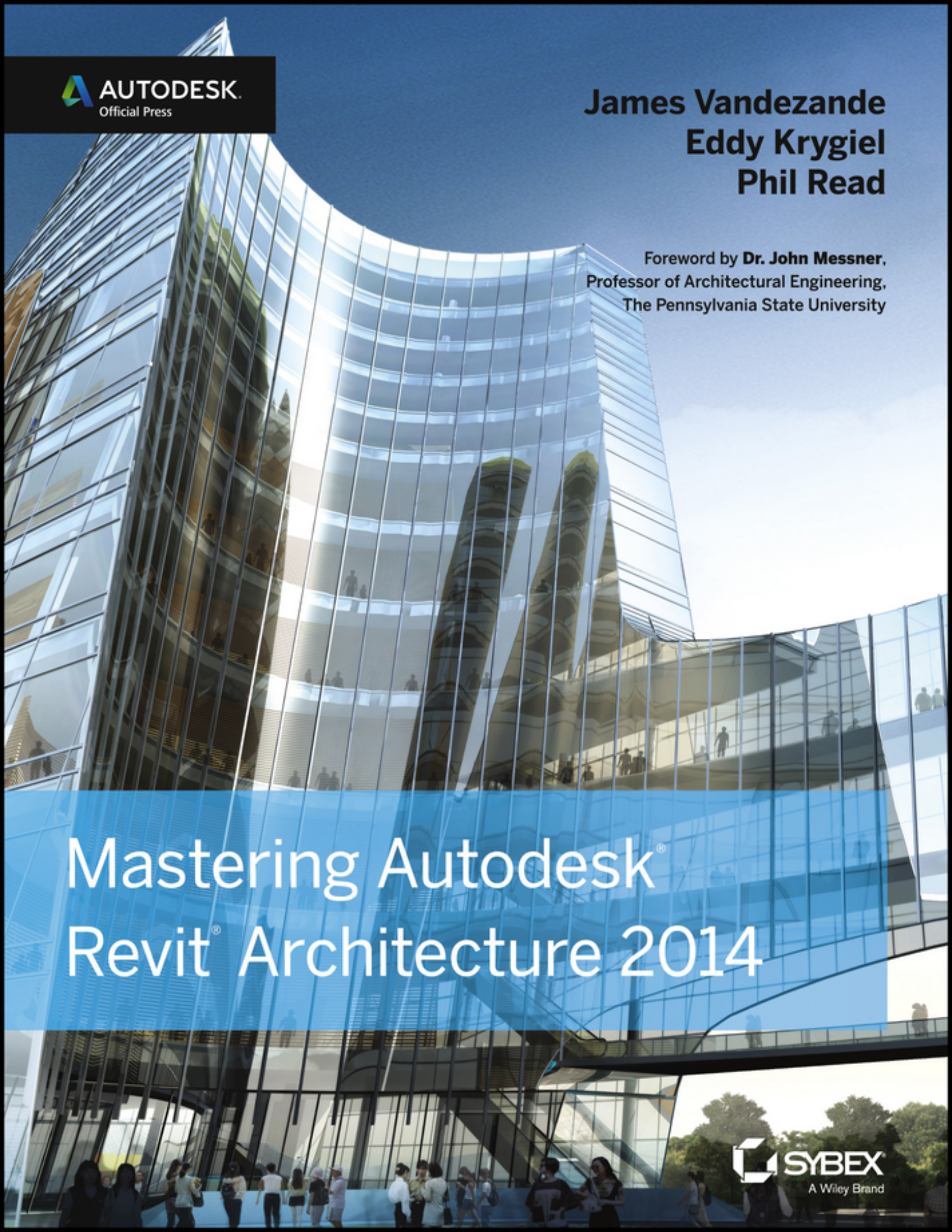
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Official Press
James Vandezande
Eddy Krygiel
Phil Read
Foreword by Dr. John Messner,
Professor of Architectural Engineering,
The Pennsylvania State University
Mastering Autodesk®
Revit® Architecture 2014
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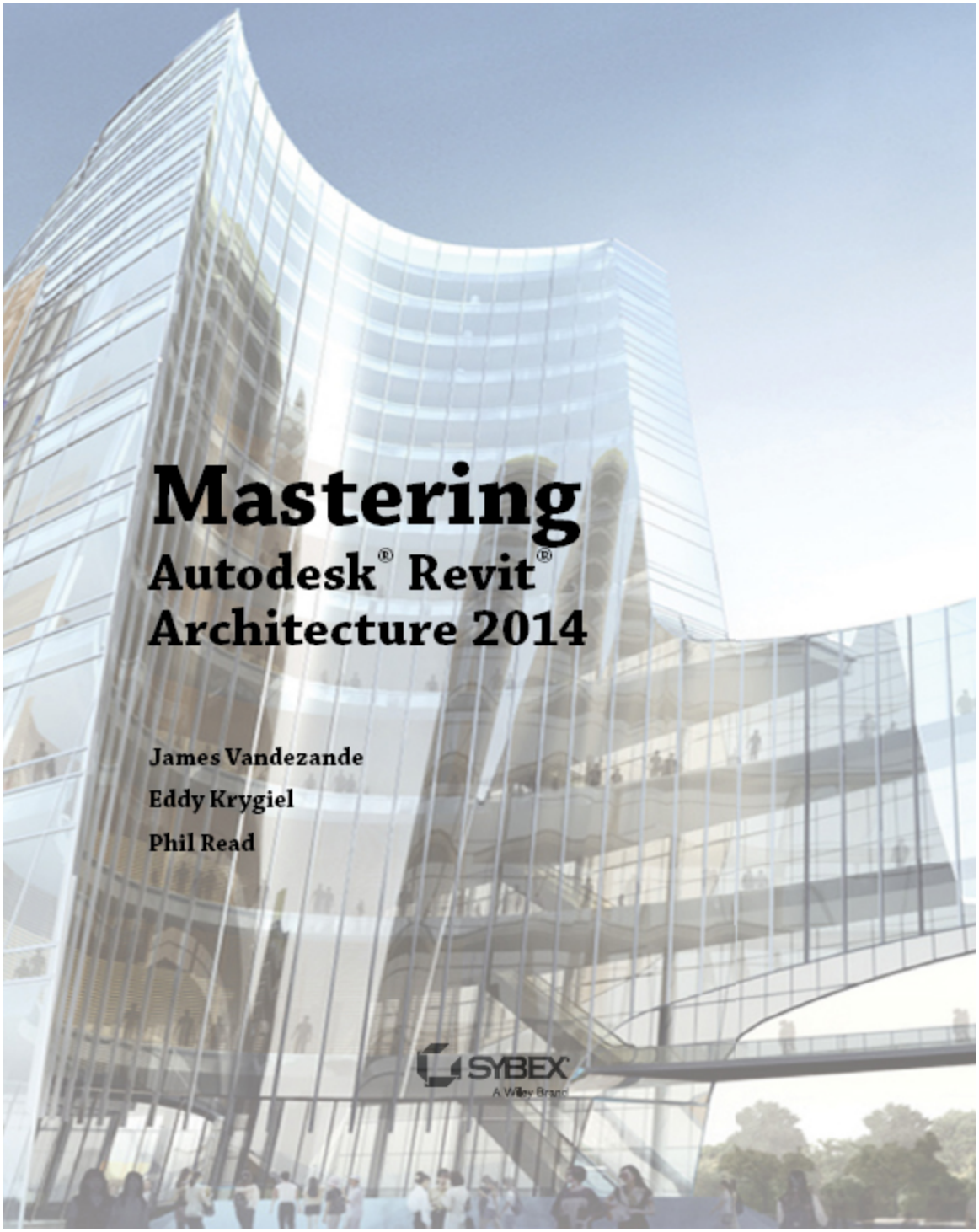

Mastering
Autodesk® Revit® Architecture 2014

James Vandezande
Eddy Krygiel
Phil Read

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Best regards,

Neil Edde
Vice President and Publisher
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About the Authors

Eddy Krygiel is a registered architect and the Director of Design Technology at HNTB Architecture headquartered in Kansas City, Missouri. He has been using Revit since 2003 to complete projects ranging from single-family residences and historic remodels to 1.6-million-square-foot office buildings. Eddy is responsible for implementing BIM at his firm, and also consults for other architecture and contracting firms around the country looking to implement BIM. He has been teaching Revit to practicing architects and architectural students in the Kansas City area, and has lectured around the nation on the use of BIM in the construction industry. Eddy has also coauthored several other titles on Revit and sustainability.

James Vandezande is a registered architect and a principal at HOK in New York City, where he is a member of the firm-wide BIM leadership and is managing its buildingSMART initiatives. After graduating from the New York Institute of Technology in 1995, he worked in residential and small commercial architecture firms performing services ranging from estimating and computer modeling to construction administration. In 1999, he landed at SOM and transformed his technology skills into a 10-year span as a digital design

manager. In this capacity, he pioneered the implementation of BIM on such projects as One World Trade Center, aka Freedom Tower. James has been using Revit since version 3.1 and has lectured at many industry events, including Autodesk University, VisMasters Conference, CMAA BIM Conference, McGraw-Hill Construction, and the AIANYS Convention. He is a cofounder of the NYC Revit Users Group (http://nyc-rug.com), and has been an adjunct lecturing professor at the NYU School for Continuing and Professional Studies as well as the Polytechnic Institute of NYU.

Phil Read is the founder of Arch | Tech as well as one of the forces behind the original Revit software. He's also a blogger, a speaker, a tweeter, and a popular presenter at Autodesk University. After working in both civil engineering and architecture, he downloaded Revit version 1.0 (at the suggestion of an ArchiCAD reseller) and was hooked. Less than a year later, he began working for Revit Technology and then Autodesk as a project implementation specialist, where he had the honor and pleasure of working with some of the most remarkable people and design firms around the world. Phil holds degrees in communications and architecture as well as a master's degree in architecture.

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Of all the people to thank, first of all, we'd like to thank the staff at the Revit Factory. Without their fine work, this would be a very empty book. Thank you guys and gals for your hard work, innovative ideas, and desire to stay in touch with current design and construction issues.

Second, a thank-you goes to John Messner of Pennsylvania State University for his wonderful foreword and, more important, the spectacular work he's done at Penn State. In his time there he's spearheaded the creation of a very comprehensive BIM guideline to help agencies and building owners figure out what they want from BIM during design and construction; see http://Bim.psu.edu.

Finally, a big thanks to our technical team. They dot our i's, cross our t's, and chide us every time we turn in something late. Their work and effort ensure that we as authors can produce something that you the reader can actually follow. So a thank-you to our developmental editor, Connor O'Brien, for putting up with our drama (and I mean *drama*); to copy editor Linda Recktenwald for taking our school-yard grammar and making it flow; and to production editor Becca Anderson for putting all the pieces together and getting it ready for print. Thanks also to Pete Gaughan for watching the schedule and allowing us to use you as an excuse not to visit family on weekends during "Book

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The building image on the cover was provided by The Beck Group of the SaRang Church in Seoul, Korea. A huge thanks to Kelly Cone for providing the rendering. The Beck Group, Founded in 1912, The Beck Group offers a full spectrum of real estate services including development, planning, architecture, interior design, construction and sustainability consulting. The company, headquartered in Dallas, maintains a team of over 500 employees, working among offices in Atlanta, Austin, Denver, Fort Worth, Houston, Mexico City, San Antonio, and Tampa.

The SaRang Church itself is comprised of two curvilinear glass towers that each provide 150,000 SF of space. The 6500-seat worship center auditorium is part of an additional 400,000 SF located underground. In the event that church attendance exceeds the capacity of the main auditorium, there are multiple large, multi-purpose overflow worship areas located throughout the facility. The church also offers youth and small group ministry spaces, 600-seat chapel, bookstore/cafe, roof gardens, and a global ministry plaza.

For more information, visit http://www.beckgroup.com.

Foreword

Building information modeling (BIM) is transforming the architecture, engineering, and construction industry. A recent SmartMarket Report by McGraw Hill Construction ("The Business Value of BIM in North America," 2012) found that 71 percent of firms are implementing BIM on projects. This is an increase from just 28 percent in 2007. BIM implementation has reached a tipping point, and this book can help you to either join or expand your role in this important, game-changing technology.

Autodesk® Revit® software is playing a pivotal role in pushing BIM over this tipping point. Revit was one of the first feature-rich BIM authoring applications, and it continues to be an application of choice for many design and construction firms. The ability to quickly and easily generate content allows designers to create information-rich design models that can be leveraged for many uses throughout a project.

While Revit is relatively easy to learn, it is important to remember that it is very powerful, and with power comes some level of complexity. This book is targeted to guide you through the learning process related to the development of models using Revit.

You will enjoy this book. The authors are leading experts in the implementation of BIM, and they not only have experience in using BIM but are also very skilled at training. They are the visionaries who are leading the practical implementation of BIM, along with tirelessly working behind the scenes to set in place BIM standards that will allow everyone to more easily share information between applications.

I do hope you take advantage of this very valuable guide to not just skim the surface of developing models using Revit but instead learn the details that will help you add value to your entire project team. To truly gain the benefits of information-rich models on a project, it is important to view BIM as a team sport. This book will help make you one of the valued members of the team.

John I. Messner, Ph.D.
Professor of Architectural Engineering
Director, Computer Integrated Construction Program
The Pennsylvania State University
Citation: *SmartMarket Report*

Introduction

Architecture is the process of turning a thought into space. While it's so simple to convey that in the written word, the actual act of doing so is much more than it is possible to write. It's glory, it's torment, it's frustration, it's freedom, it's the realization that one miscalculation means a complete redesign, like blowing on a house of cards, and it's the 3 a.m. epiphany when you realize that the new design was what you were meant to get to in the first place. With all of that, it's also the burning desire to work relentlessly to make something better one step at a time.

Autodesk® Revit® Architecture software is one of the many tools we employ to help us through this organic process. It's one tool in the toolbox, but it can be much more than that. It can be the workflow that helps to empower a team. That team is the designers, the contractors, and ultimately the owners who are all looking to speak the same language.

We hope that in the process of using this book, you'll experience a bit of the struggle to realize a bit of the satisfaction of finding the solution. We hope what you learn in this book helps inspire you to your own bit of greatness. Because what's most important is that architecture isn't about buildings. It's about what we are able to accomplish with what little time we have. This is the elegant essence of Revit. Before we go much further, there are a few semantics to discuss.

First off, all the tutorial files necessary to complete the book's exercises plus sample families are hosted online at www.sybex.com/go/masteringrevit2014.

Don't have a copy of Revit 2014? Download the trial version of Revit Architecture, at http://usa.autodesk.com/revit-architecture, where you'll also

find complete system requirements for running Revit. This list of requirements is also included in Appendix B.

For the clearest direction when following the exercises in this book, please make sure to install all of the Revit support files that come with the default installation. We reference them heavily, and you'll need them to best leverage the software.

Also, it should be noted there are a few flavors of Revit. Starting with the 2013 edition, Autodesk released Revit Architecture, Revit Structures, and Revit MEP as separate packages. They also released a 'One Box' solution that has all of those products in a single version of Revit. Depending on what you have installed—Revit as 'One Box' or Revit Architecture, there will be some slight variations in the user interface. We have focused this book on the use of Revit Architecture. If you're using the 'One Box' solution, the variations will be slight and hopefully manageable.

Finally, most of our offices purchase the Revit software on subscription. With subscription comes a host of benefits and add-ons to Revit. This includes tools like the dbLink, which allows you to push and pull non-geometric information into and out of Revit as well as access cloud rendering, storage, and analysis, which we demonstrate in Chapter 9, "Conceptual Design and Design Analysis." You can go here to create an account: http://subscription.autodesk.com.

Who Should Read This Book

This book is written for architects and designers who have had some exposure to Revit and are eager to learn more. It's for architects of any generation—you don't need to be a computer wizard to understand or appreciate the content within. We've designed the book to follow real project

workflows and processes to help make the tools easier to use. The chapters are full of handy tips to make Revit easier to leverage in your day-to-day world.

This book is also for the entire range of architects, from those who are fresh out of school to seasoned project managers. We have endeavored to include content for all walks of the profession so that regardless of your role on a project, you can learn how BIM changes both workflow and culture within a project team. With that, a basic understanding of Revit will make it easier to work through the book. Revit is a very robust tool requiring more than one project iteration to master.

For BIM managers, the book offers insights into the best practices for creating good project or office templates; these managers should also take a sneak peek into the powerful world of building content and Revit families. We've added many time-saving and inspiring concepts to the book, supported by examples from our own projects and the rest of the real world, to help motivate and inspire you on your journey through building information modeling.

What You Will Learn

This book will help you take the basics of Revit and BIM that you already know and expand on them using real-world examples. We will show you how to take a preliminary model and add layers of intelligence to help analyze and augment your designs. We'll show you how to create robust and accurate documentation, and then we'll help you through the construction process.

We go beyond introductory topics. To that end, we won't be starting a project from scratch or teaching you how to build a simple BIM model. If you are interested in learning at that level, we strongly recommend you pick up *Autodesk Revit Architecture 2014 Essentials* (Wiley, 2013) before

plunging headlong into this book. Instead, our book begins with a brief overview of the BIM approach. As you are already aware, BIM is more than just a change in software; it's a change in architectural workflow and culture. To leverage the full advantages of both BIM and Revit in your office structure, you will need to make some changes to your practice. We've designed the book around an ideal, integrated workflow to help you make this transition.

Starting with the project team, standards, and culture, we'll discuss how BIM changes your project approach and how to best build your team around a newer workflow. From there, we'll delve into conceptual design and sustainability studies, continuing through best practices for design iteration and refinement. You'll learn how to use powerful modeling techniques, how to design documentation best practices, how to make compelling presentation graphics, and how to take advantage of parametric design with the Family Editor. We'll explore workflow topics like tracking changes and worksharing as well as some strategies that move beyond traditional concepts of BIM. The book concludes with an appendix on troubleshooting and best practices so you can avoid common pitfalls. Throughout the book we've shared our practical experience with you, particularly in the form of real-world scenario sidebars.

Whether you're studying Revit on your own or in a class or training program, you can use the "Master It" questions in the section called "The Bottom Line" at the end of each chapter to test your mastery of the skills you've learned.

Also featured is a color project gallery containing inspirational Revit projects from friends and colleagues who were generous enough to share their good work with the rest of the world.

Free Autodesk Software for Students and Educators

The Autodesk Education Community is an online resource with more than five million members that enables educators and students 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.

The Mastering Series

The Mastering series from Sybex provides outstanding instruction for readers with intermediate and advanced skills, in the form of top-notch training and development for those already working in their field and clear, serious education for those aspiring to become pros. Every Mastering book includes the following:

- Real-world scenarios, ranging from case studies to interviews, that show how the tool, technique, or knowledge presented is applied in actual practice
- Skill-based instruction, with chapters organized around real tasks rather than abstract concepts or subjects
- Self-review test questions, so you can be certain you're equipped to do the job right

What to Expect

Mastering Revit Architecture 2014 is divided into five parts, each representing a milestone in your progress toward becoming an expert Revit user. Here is a description of those parts and what they will show you:

Part 1: Fundamentals

While this is designed to not be a book for novices, we recognize that not everyone will know how to find every tool or have a complete understanding of the workflow. The chapters in Part 1 will help to build a foundation of essential tools and knowledge.

Chapter 1, “Introduction: The Basics of BIM” covers principles in building information modeling within your office or project environment.

Chapter 2, “Principals: UI and Project Organization” details the Revit interface and general organization.

Chapter 3, “The Basics of the Toolbox” explores the commands and tools within Revit giving you an overview of where to find them and leaving the deep dive into their use for the chapters ahead.

Part 2: Understanding the Workflow

Part 2 sets you on the path towards using Revit on a team or through out your firm and takes a deep dive into a successful BIM workflow.

Chapter 4, “Configuring Templates and Standards” discusses the tools you’ll need to develop and manage graphic standards in a project template.

Chapter 5, “Understanding Worksharing” discusses the critical tools to working with Revit in any project team.

Chapter 6, “Working with Consultants” covers the basics of working with team members outside your office.

Chapter 7, “Interoperability: Working Multiplatform” details the tools you’ll need to share your Revit files with other team members who don’t use Revit as a design tool.

Part 3: Modeling and Massing for Design

In this section, you'll delve into the use of Revit starting from the early stages of design through analysis, iteration, and visualization.

Chapter 8, "Advanced Modeling and Massing" details the creating of forms and shapes with the conceptual Revit toolkit.

Chapter 9, "Conceptual Design and Analysis" will give you an overview of conceptual Revit tools and using those in energy analysis.

Chapter 10: "Working with Phasing, Groups, and Design Options" takes the next step after the initial design and analysis: iteration.

Chapter 11: "Visualization" takes the design work you've created and shows you how to create stunning renderings and imagery of your design.

Part 4: Extended Modeling Techniques

Part 4 will take the conceptual forms you create in Part 3 and expand them to the real world using walls, floors, roofs, and other building components to create the elements behind a building.

Chapter 12: “Walls and Curtain Walls” delves into the use of the Wall and Curtain wall tools.

Chapter 13: “Floors, Ceilings, and Roofs” will demonstrate a variety of ways to work with the horizontal components of a building: floors, ceilings, and roofs.

Chapter 14: “Family Editor” will show you how to work with parametric families to create a host of content for the building design.

Chapter 15: “Stairs and Railings” demonstrates a variety of ways and techniques to use the stair and railing tool – for it’s intended purpose and for others.

Part 5: Documentation

Once the building is designed, it becomes necessary to create the views and documents needed to build the project. This section will show you how to detail, document, and annotate the design.

Chapter 16: “Detailing Your Design” works with the building design you created in previous chapters to add 2D components for documentation.

Chapter 17: “Documenting Your Design” will work with the newly created views and help you organize them on sheets.

Chapter 18: “Annotating Your Design” takes the next step in the documentation process and works with keynoting and dimensioning.