

Eddy Krygiel
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Mastering Autodesk Revit Architecture 2015



Mastering

Autodesk® Revit®
Architecture 2015

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Eddy Krygiel

James Vandezande

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Best regards,

A handwritten signature in black ink, appearing to read 'Chris Webb', with a stylized, cursive script.

Chris Webb
Associate Publisher, Sybex

Acknowledgments

Ah, acknowledgments. While all the glory of writing a book is consumed by the authors, it takes so many more people than just us to actually make this happen. Just like building design, the process of writing and publishing a book is truly a team sport—and without the hard work, dedication, and willingness to put up with the authors, this book would have never happened.

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Also, a big thanks to our technical and production 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, Jennifer Leland, for putting up with our drama (no one can ever say we're boring); to copy editor Linda Recktenwald for taking our school-yard grammar and making it into whole sentences; and to production editor Christine O'Connor 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 work on the honey-do list on weekends during "Book Season." A huge thank-you to David Light, technical editor, who has given a careful and detailed eye to all of our Revit workflows in both Imperial and the Queen's units, and to our excellent support team at Sybex, who helped us develop this foxy content. And a big thank-you to Willem Knibbe, who started us on this journey in the first place. We're going to miss working with you.

The building image on the cover, of the Baldivis Secondary College in Baldivis, Western Australia, was provided by the architectural firm JCY. A huge thanks to Brooke Randall for providing the image.

ABOUT JCY AND THE BALDIVIS SECONDARY COLLEGE

JCY, originally established in 1986, has created an outstanding body of work founded on a dynamic culture of research, collaboration, inventiveness, and excellence. Their office, with an operating staff of approximately 50 people, works on projects with a construction cost between \$1M and \$700M.

The scope of their work is extensive as are their clients, resulting in an exciting and diverse portfolio of projects reflecting their knowledge and our desire to express the uniqueness of people, environment, and vision. Their philosophy is to LISTEN first and then respond. JCY has worked in urban, rural, and remote areas of Australia as well as in Malaysia and New Zealand, where their skills and design excellence have been sought by numerous clients. Services range from feasibility studies, master plans, urban design, and architectural design from inception to completion including interior design, graphics, and signage.

Baldivis Secondary College was constructed on a brownfield site, requiring significant site remediation and clearance of acid sulphate soils as well as endemic subsoil water issues, and located in a community historically based around industrial and agricultural development. The aim was to create a sustainable school environment locating the buildings within a reinstated bushland setting in recognition of the area before agricultural use decimated it. While a new school in a new subdivision, Baldivis Secondary College is located within an established and historic community, which has traditionally been focused on market gardening and industry and has developed a strong focus on sustainability and community. It is this contextual setting that developed the architectural language for the school, conceived of as a contemporary reimagining of the archetypal Australian industrial “shed” set within a reinstated native bush landscape.

For more information on the Baldivis Secondary College project, visit <http://www.jcy.net>.

About the Authors



Eddy Krygiel is a registered architect, LEED professional, and the Chief Technology Officer at BNIM Architects, 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 the use of technology within his firm, including implementing BIM and also consults for other architecture and contracting firms around the country looking to implement BIM. He teaches 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 building SMART 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, the VisMasters Design, Modeling and Visualization Conference, CMAA BIM Conference, McGraw-Hill Construction, and the AIA/NYS Convention. He is a cofounder of the NYC Revit Users Group (www.meetup.com/nyc-rug) and has been an adjunct lecturing professor at the NYU School for Continuing and Professional Studies as well as the Polytechnic Institute of NYU.

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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/masteringrevit2015.

Don't have a copy of Revit 2015? 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.

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 access to 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 2015 Essentials* (Wiley, 2014) 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.

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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's New?

The Autodesk Revit team works continuously to improve the software, add new features, and eliminate bugs. It's a constant evolution. Following you will find a list of the items that have been added or enhanced in the 2015 release.

Sketchy Lines Use the new Sketchy Lines feature to apply a hand-sketched graphic style to the current view or define the settings in a view template to apply the style to multiple views.

Anti-Aliasing In the Options dialog, the Use Anti-Aliasing option has been changed to Smooth Lines With Anti-Aliasing. You now have the ability to enable anti-aliasing for all views in the project or for selected views. Corresponding settings in `Revit.ini` allow you to predefine these options for users.

Ray Trace Usability Improvements The Ray Trace interactive rendering visual style for views has been enhanced to provide a faster, higher-quality, smoother rendering as well as improved color accuracy and improved shadows with all backgrounds.

Added Formulas You'll find the following enhancements to formulas:

- ◆ $\exp(x)$: In formulas in prior releases, the software evaluated $\exp(x)$ as 10^x . Starting with this release, the software evaluates $\exp(x)$ as e^x .
- ◆ $\ln(x)$: Starting with this release, you can represent natural logarithm (logarithm base e) in formulas as $\ln(x)$.

Hidden Lines These have the following enhancements:

- ◆ You can now display all hidden lines automatically in 3D views.
- ◆ In View Properties, use the new Show Hidden Lines parameter to control the display of hidden lines in the current view. You can also define this parameter for view templates.
- ◆ To support the new Show Hidden Lines parameter, the Hidden Lines subcategory has been added to the following categories: Structural Connections, Structural Rebar, and Structural Stiffeners.
- ◆ In previous releases, the Discipline view parameter controlled whether hidden lines displayed in a view. In the 2015 release, the Discipline parameter and the Show Hidden Lines view parameter can act independently of one another.

Revision Clouds These have the following enhancements:

- ◆ Use standard draw tools, such as a line or rectangle, to sketch the revision cloud shape. Press the Spacebar to flip the arc direction in the cloud shape.
- ◆ You can specify the minimum arc length for revision clouds in a project on the Sheet Issues/Revisions dialog.

IFC Imports The importing and handling of IFC files are enhanced as follows:

- ◆ Link IFC: To link an IFC file to the current project, use the new Link IFC tool on the Insert tab.
- ◆ When opening an IFC file, you can specify whether elements join automatically (walls to walls or walls to columns). In the Open IFC File dialog, the Auto-Join Elements option is turned on by default. Turning off this option provides more control over the results and may improve performance during the import process.
- ◆ In the Import IFC Options dialog, column headings have been revised to improve clarity.
- ◆ Enhancements to improve the quality of linked IFC data result in increased visual fidelity and improved performance during the import process.

Schedules/Material Takeoffs The following parameters can now be included in a wall schedule or material takeoff:

- ◆ Base Constraint
- ◆ Base Offset
- ◆ Top Constraint
- ◆ Top Offset
- ◆ Unconnected Height

You can specify custom text to display for the Grand Totals title in the Custom Grand Total title field on the Sorting/Grouping tab of the Schedule Properties dialog.