

FAS



Building Inspector Virtual World Training Pilot

The Federation of American Scientists
for Lawrence Berkeley National Lab



Why Virtual Training?

Benefits:

- Not geographically bound, allowing remote training
- Interactive and enables scenario-based learning
- Hands on first-person format allows user to manipulate and explore in fashion similar to the real world
- Collaboration and group learning and problem solving
- Demonstrate situations difficult to replicate in the real world (such as a building's reaction to a seismic event)

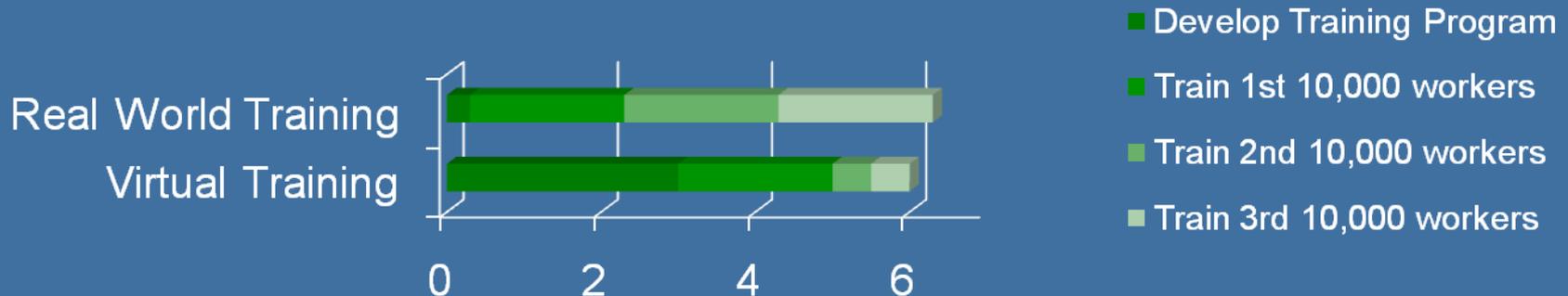
Feasibility of Training Online

- 80% of people in U.S. have internet
- By 2011 80% of internet users will have a virtual world avatar



Long Term Cost Advantage

Cost of Training Module (in millions of USD)



- Cost of full training program development, including independent, web-based platform, one-to-one training areas, virtual world content, and training deployment: ~ \$3 million
- Minimal cost to train each additional worker after initial deployment
- Real world training costs steady and limited by instructor availability

Why Train in Second Life?

Easy to:

- Integrate with a web-based training platform and tools
- Use, to operate, and to build and manipulate content within
- Simulate real world situations and hazards
- Model real world energy and building physics
- Build structurally correct models and building details



The image shows a screenshot of the Second Life WORK website. The top navigation bar includes links for 'Why SL Work?', 'Work Solutions', 'Success Stories', 'Get Started', and 'About Us', along with a 'Contact Us >>' button. The main content area features a large image of a man in a suit standing next to several avatars sitting on a bench. Text on the page reads: 'Second Life: Ready for Work', 'Spotlight on Meetings and Events', and 'Second Life is the leader of virtual meeting, event, training, prototyping, and simulation solutions that catalyze innovation while reducing the cost and environmental impact of travel.' Below this, there is a 'Success Stories' section with a 'Case Study: NOAA' highlighted. The text for the NOAA case study states: 'You can read about a tsunami or you can experience one.' The background of the website features a globe and a periodic table of elements.

Making Virtual Training Work

The screenshot shows the Medulla website interface. At the top, there's a navigation bar with 'Home', 'Not a member yet?', and 'Join Now'. Below that, a search bar and 'Projects' dropdown are visible. The main content area displays a project titled 'Building Inspector SIP Training Pilot' with a 1-star rating. The project description states: 'This training module educates building inspectors on code compliance and constructability issues associated with structural insulated panels (SIPs) and explores the potential for using virtual learning technologies to ease the adoption of advanced building systems and technologies. This proof-of-concept pilot training encourages the use of baseline energy audits as a tool for improving building energy performance and provides interactive training on what a code compliant SIP house looks like.' It lists subject tags like 'building inspection, SIPs, energy audit, construction, building energy performance', a public URI, and a manager named Lindsey Marburger. A 'Virtual Worlds' link points to an 'Introduction and Orientation Area'. Below the description, there's a section for 'Optional Reference Materials on SIPs' with several links to documents like 'About SIPs and CSIPs', 'Questions and Answers about SIPs', and 'Science Engineering and SIPs brochure'.

The screenshot shows a 'Welcome to medulla' message. The text reads: 'Medulla aims to allow any of the leading virtual world platforms to implement access to online data and software tools as services in virtual world for two purposes: create and use. Medulla enables user communities to contribute time and efforts, share digital assets (art, media, documents and software), and collaborate synergistically for creating engaging and informative user experiences in virtual worlds as well as managing and publishing research that can be used for variety of purposes.' Below this, it states: 'Medulla offers a single-point access to open source collaborative toolset that enables users to manage research and learning in virtual worlds. It's named for the control center in the brain that relays nerve signals between brain and spinal cord. Medulla supports new approaches to scholarship and learning and will help subject matter experts, educators and learners effectively use collaborative contextual environments including virtual worlds.'

- Standalone virtual worlds have limited utility for training as they have limited interoperability and lack the capability to manage information or resources
- Medulla is an independent platform that organizes and integrates virtual worlds with web-based tools such as wikis, learning management systems, and digital media and archives



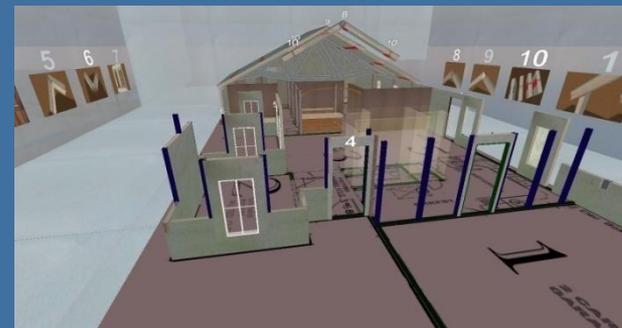
Medulla Capabilities

- Allows collaboration between instructors and users in creating and sharing content, problem solving and organizing materials and information
- Provides user friendly project management tools



Training Building Inspectors Using Virtual World Technology

Tasked to “Develop interactive online training tools for building inspectors”



\$25,000 pilot project funded by Lawrence Berkeley National Lab and the Department of Energy



Specific Objectives of this Pilot

1. Improve knowledge of code compliance and constructability issues related to structural insulated panels (SIPs).
2. Improve understanding of energy performance and energy efficient construction.
3. Demonstrate the value of virtual world technology in training building professionals.
4. Provide interactive environment for independent investigation and formal teaching of code compliant SIP installation



Training Module Timeframe

- 2 months to complete module, including:
 - Learning coding language (Linden Language)
 - Creating all virtual world components and models
 - Writing guidebook and learning activities and collecting supporting materials and media
- 1 hour to train 4 SIP professionals in operating and exploring in virtual world
- 4-20 hours to fully review structural details and code compliance of all virtual world content



Why Use VWs for Technical Training

- Levels of interactivity
- Real-time process learning and assessment
- Good enough real world modeling and simulation
- Create situations that would be difficult, expensive, or dangerous to create in the real world
- Cost effective for hands-on training

Training Module Contents



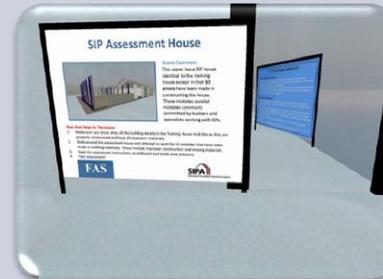
Introduction and Orientation Area

- Includes animated educational models and an informative presentation about structural insulated panels (SIPs) and energy efficiency concepts



Training Area

- Includes a full scale demo house modeled from real architectural drawings
- House contains over 20 structural and architectural details based on detailed CAD drawings



Assessment Area

- Includes a full scale house assessing understanding of key concepts through multiple choice questions
- 10 details have been altered to demonstrate common construction mistakes



Medulla Platform

- Includes an orientation activity, learning and activity guides, supporting media, documents, and references, and description and CAD drawings of building details



Orientation and Introduction Area

SIP Instruction and Training Island Orientation



Content:

- An Introduction to SIPs
- Purpose of the Training Island
- Scenes and Activities on the Island
- Video Guide to Instructional Island

In order to view presentation, navigate using arrows to the side

SIP Instructional Island

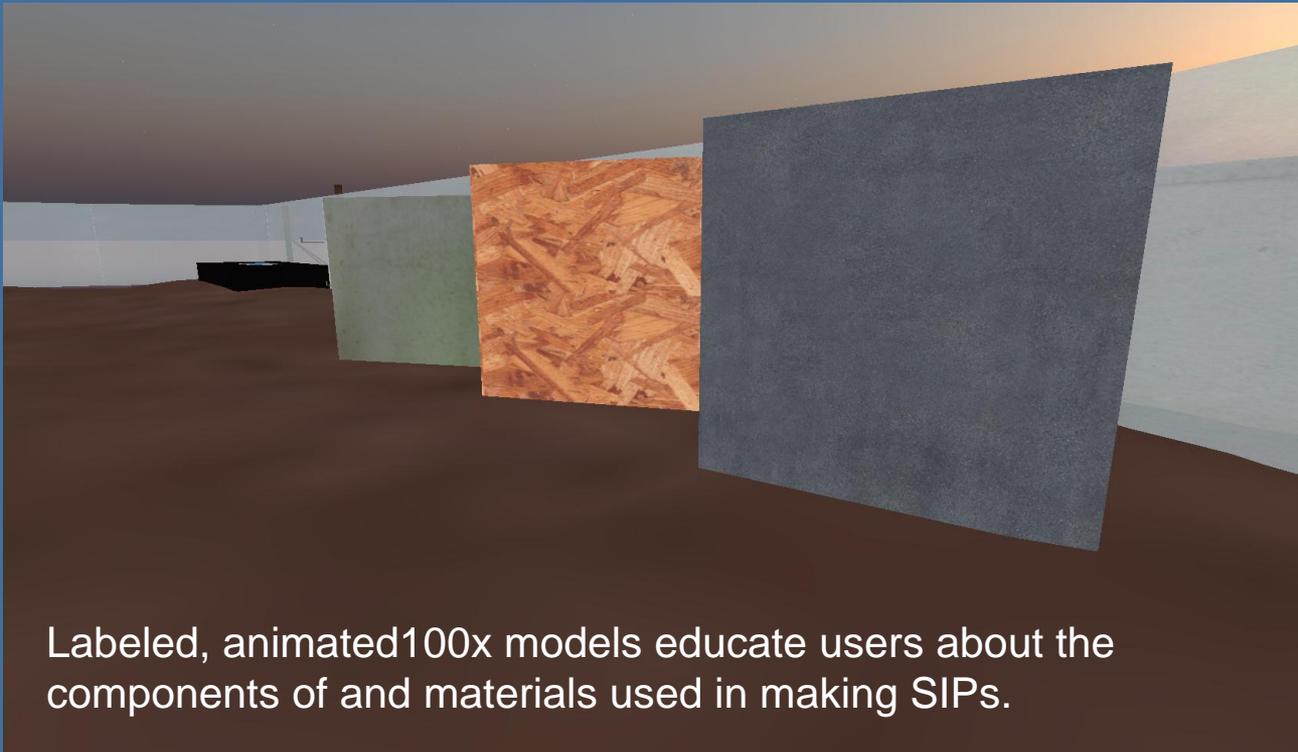


Introduction:
The SIP Instructional Island educates building inspectors on code compliance and constructability issues associated with structural insulated panels (SIPs) and explores the potential for using virtual learning technologies to ease the adoption of advanced building systems and technologies. For an orientation to SIPs and to the features of this instruction and training module, see the presentation at left.

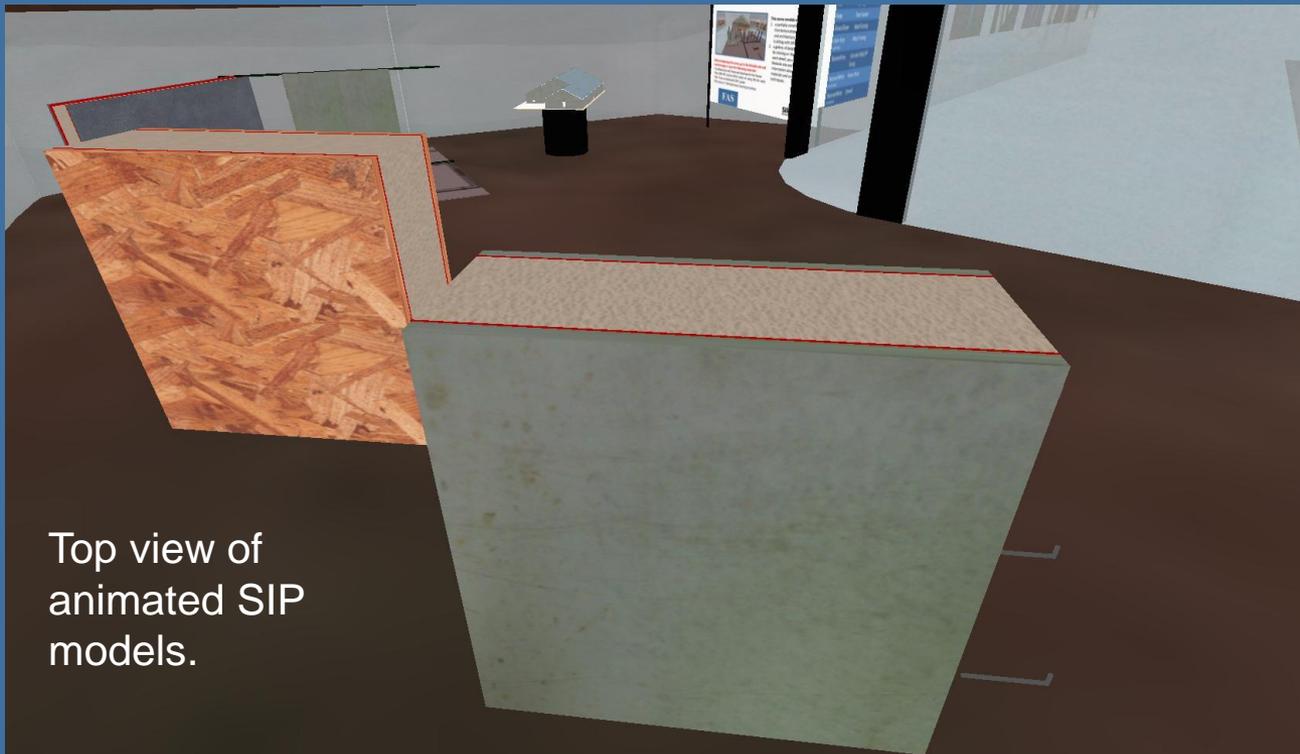
For an introduction to the training island, guides to the island's scenes and training activities, instructional materials and directions on how to operate in the Second Life virtual world, [click on this slide](#).

FAS SIPA
Structural Insulated Panel Association

Introductory billboard and presentation educate users about SIPs and energy efficiency concepts.



Labeled, animated 100x models educate users about the components of and materials used in making SIPs.



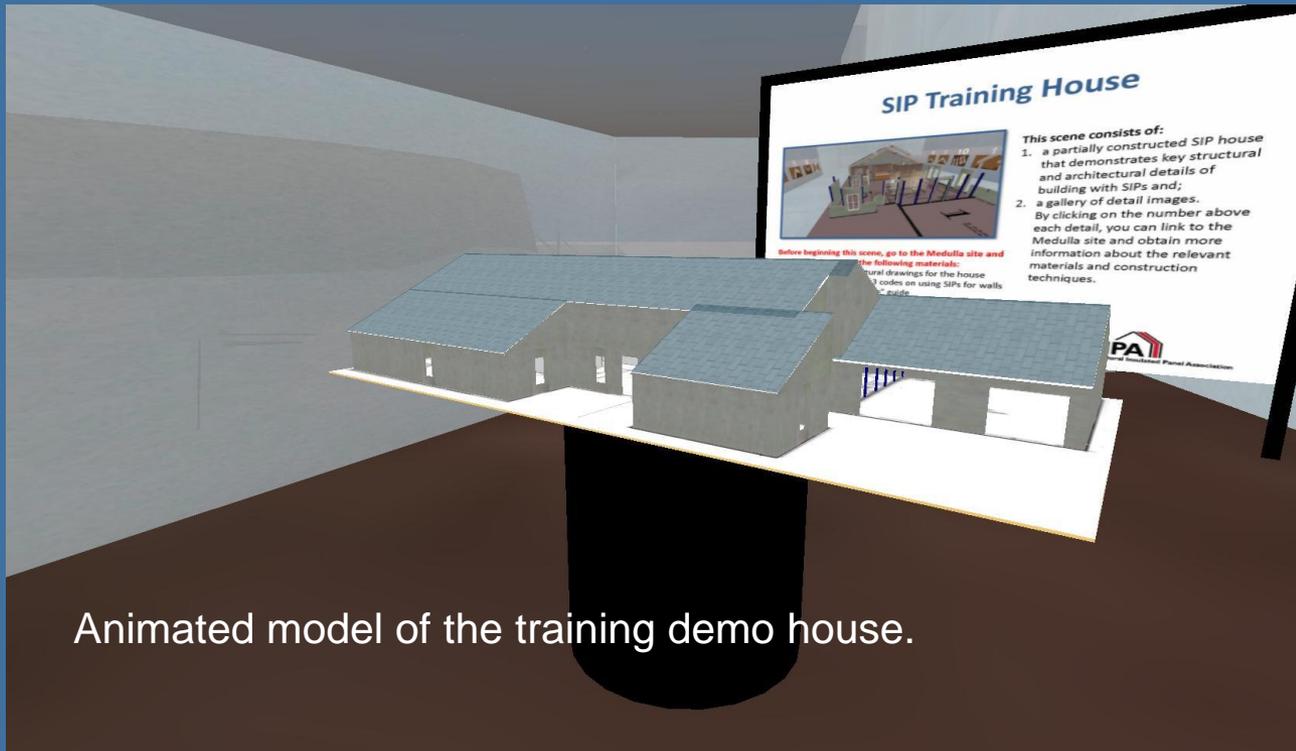
Top view of
animated SIP
models.



Animated model allows user interaction and demonstrates the process of properly installing a panelized wall system. Components shown include splines, headers and footers, and panels.



Training Area



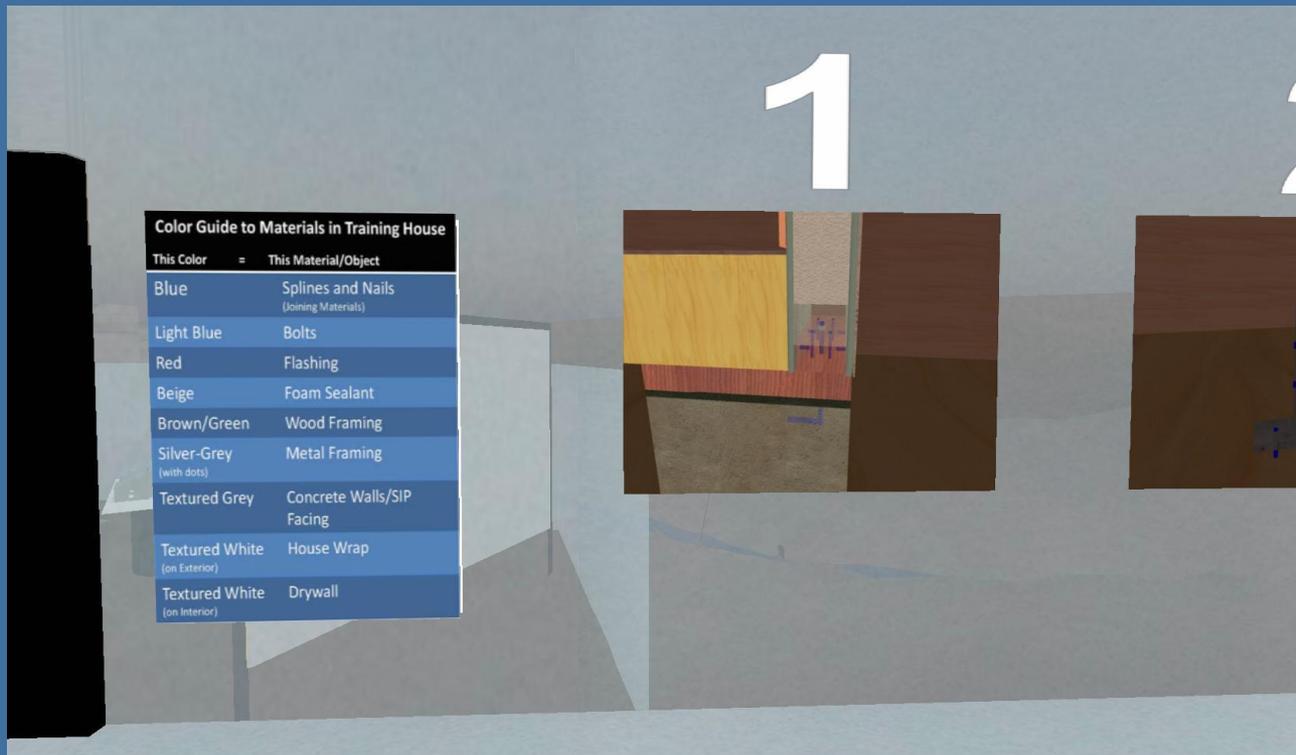
Animated model of the training demo house.



Entrance to the primary training area.



The color guide aids users in differentiating between various materials in the training demo house while the training gallery visually indexes the key building details and components.

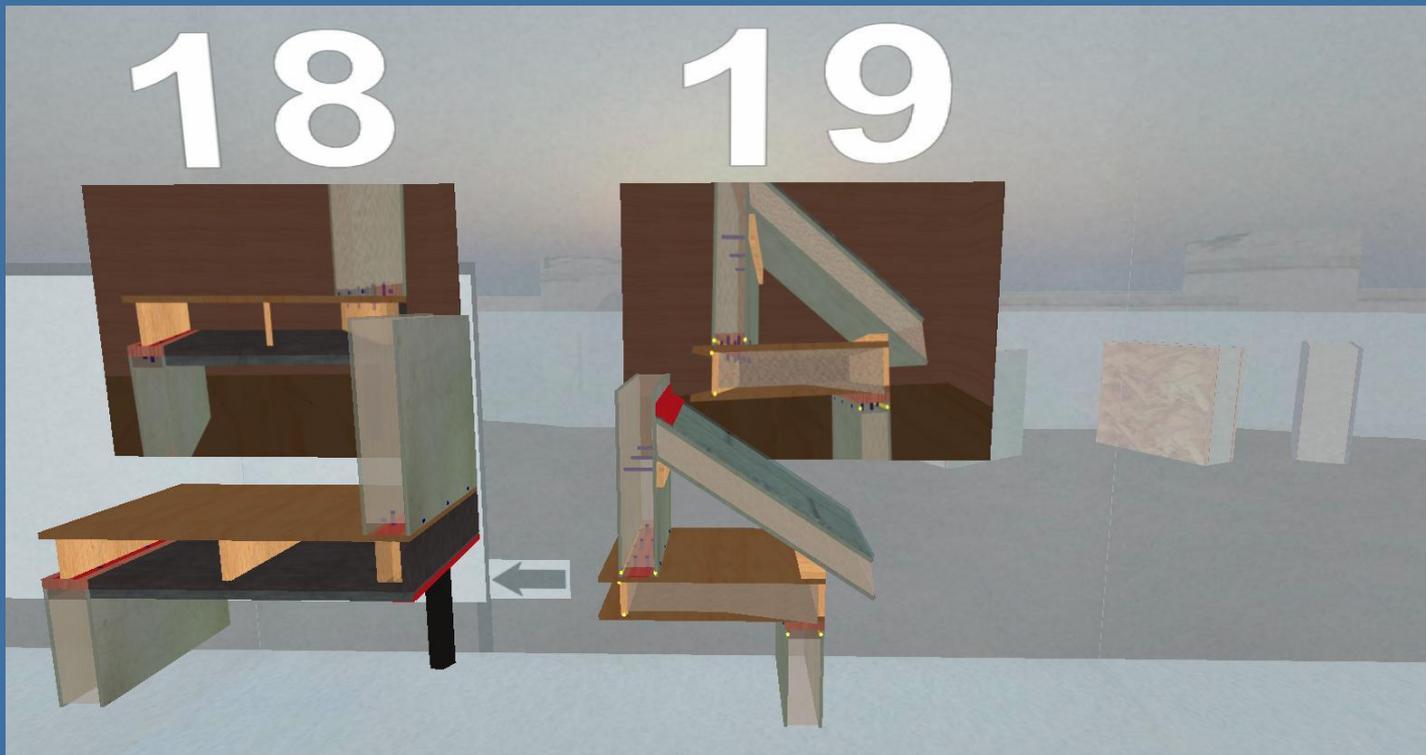


Color Guide to Materials in Training House

This Color	=	This Material/Object
Blue	=	Splines and Nails (Joining Materials)
Light Blue	=	Bolts
Red	=	Flashing
Beige	=	Foam Sealant
Brown/Green	=	Wood Framing
Silver-Grey (with dots)	=	Metal Framing
Textured Grey	=	Concrete Walls/SIP Facing
Textured White (on Exterior)	=	House Wrap
Textured White (on Interior)	=	Drywall



In addition to screenshots of the training demo house's key details, the gallery also includes models of SIP building details that are not included in the house, but which are essential for building inspectors to be familiar with.





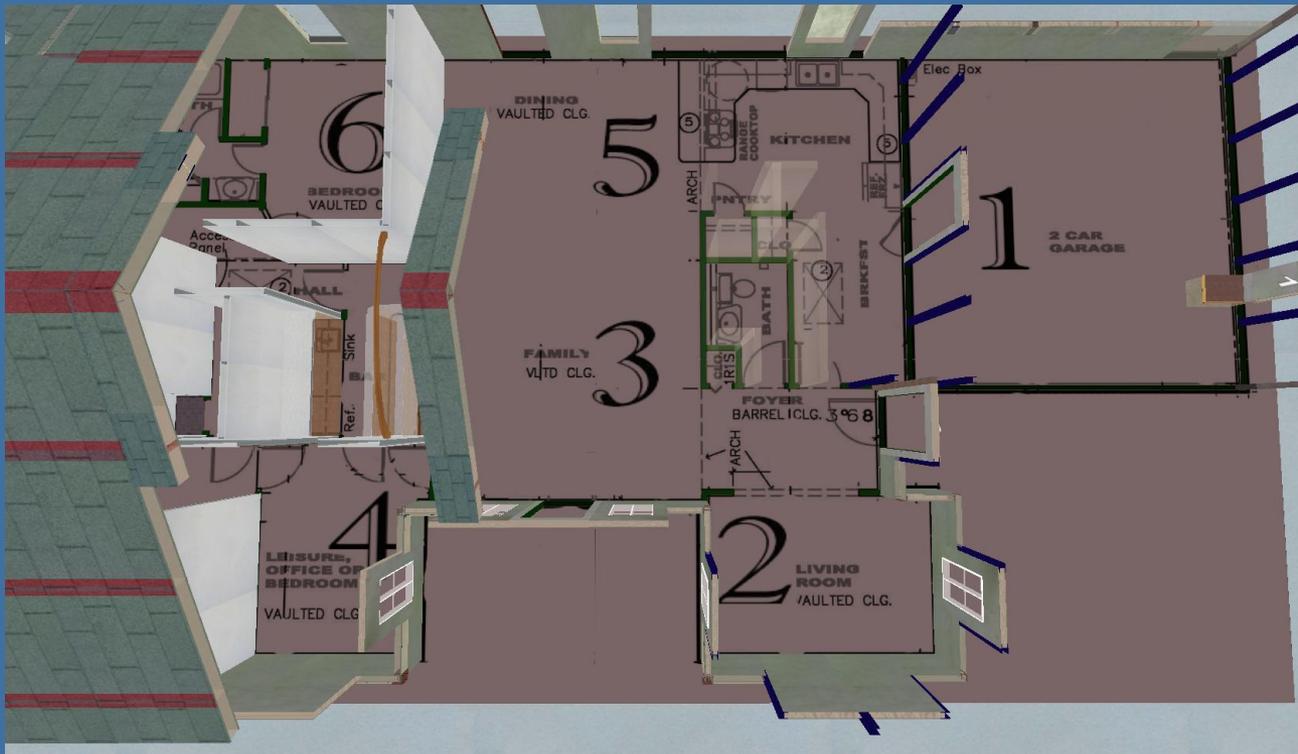
Front view of the training demo house.



Flying view of the training demo house and gallery.

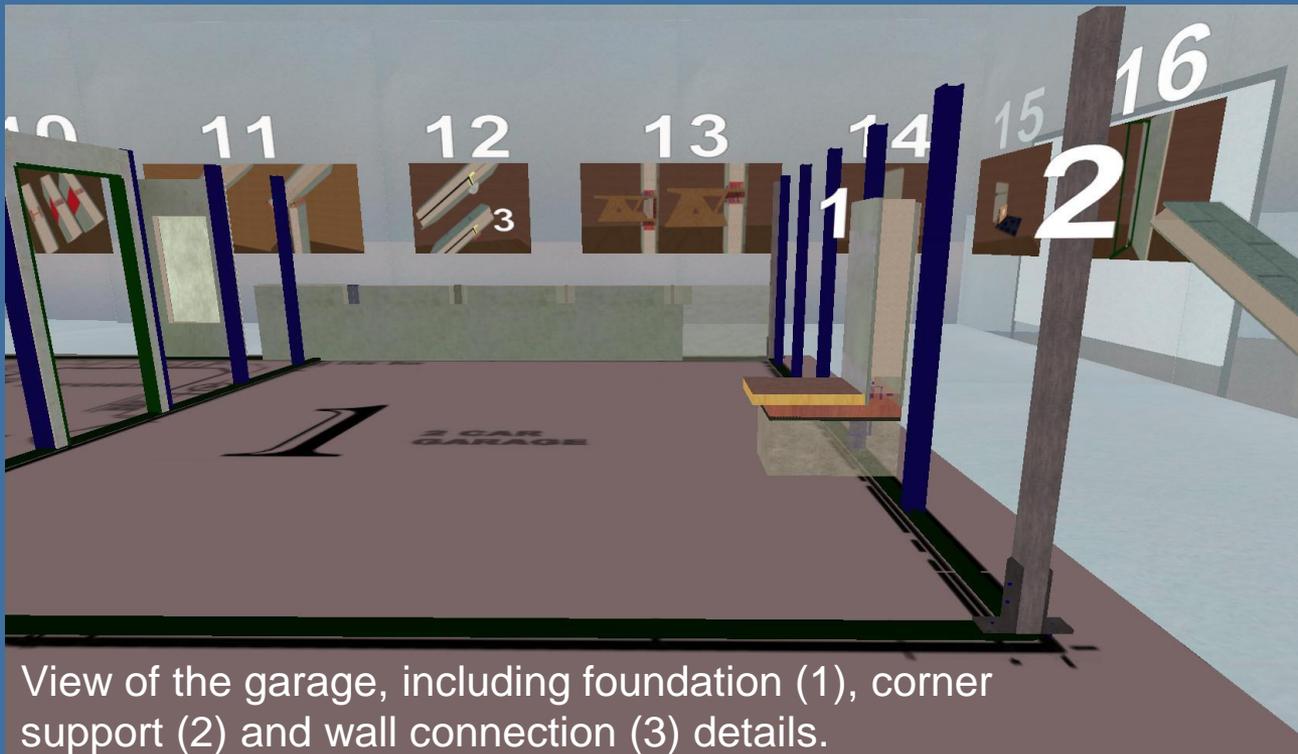


The training house was modeled and constructed based on architectural and structural drawings from an existing house. As such, each detail demonstrates code compliant construction and installation practices and has links to the architectural drawings and descriptions





Front view of house and garage.



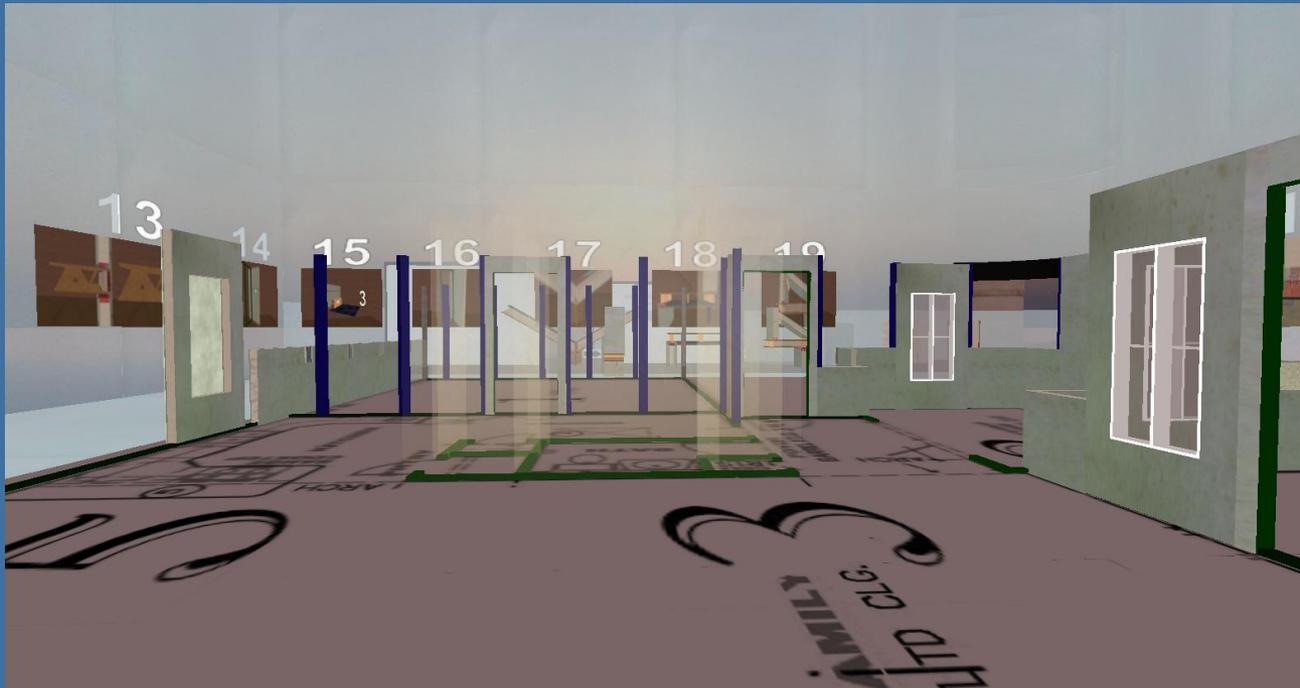
View of the garage, including foundation (1), corner support (2) and wall connection (3) details.

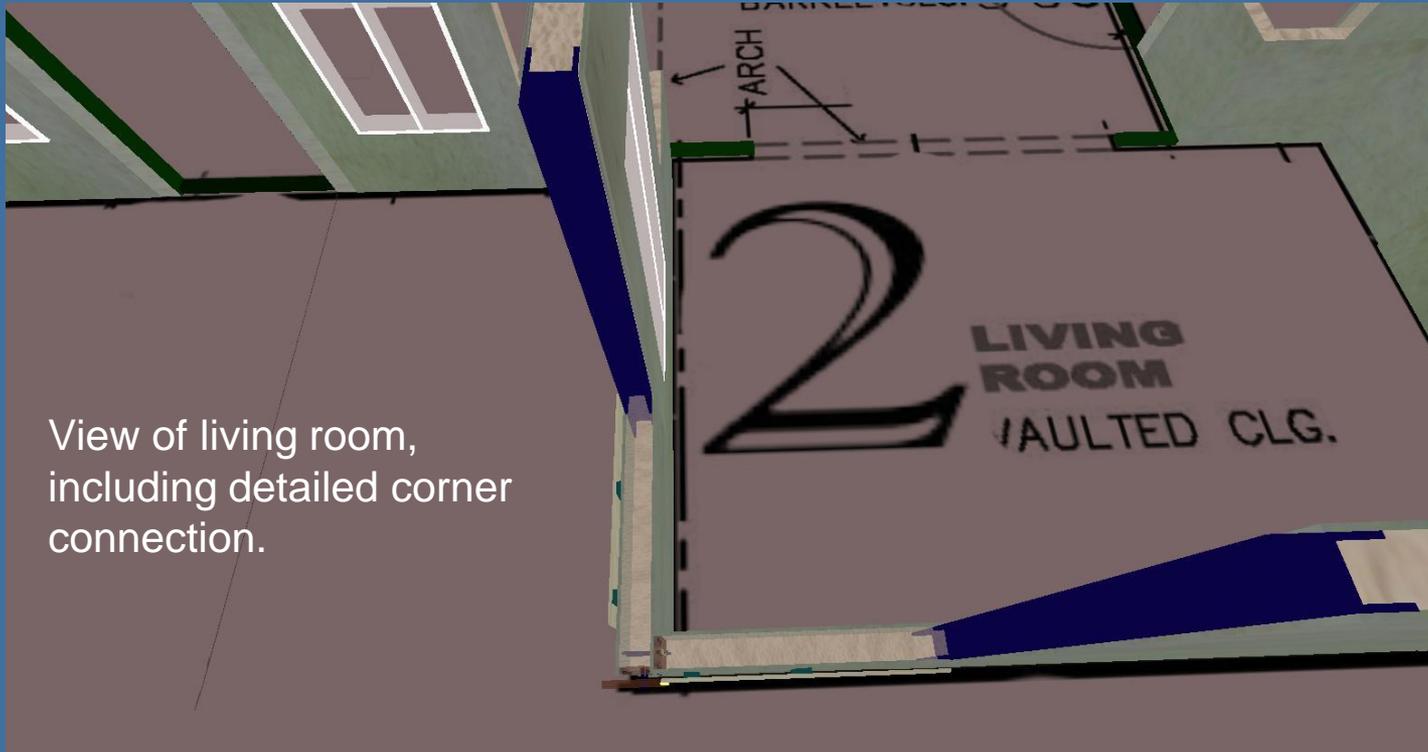


Close-up view of the foundation-wall connection. To learn more about a detail and see CAD drawings, click on the white number (1) above.



View from family room back toward the garage. Note the interior walls, which are translucent and can be walked through. These features and many others can be easily and quickly created using existing virtual world tools.





View of living room,
including detailed corner
connection.



A close-up view of the corner connection shows proper, manufacturer and code compliant placement of SIP screws, exterior cladding, flashing, and sealant .



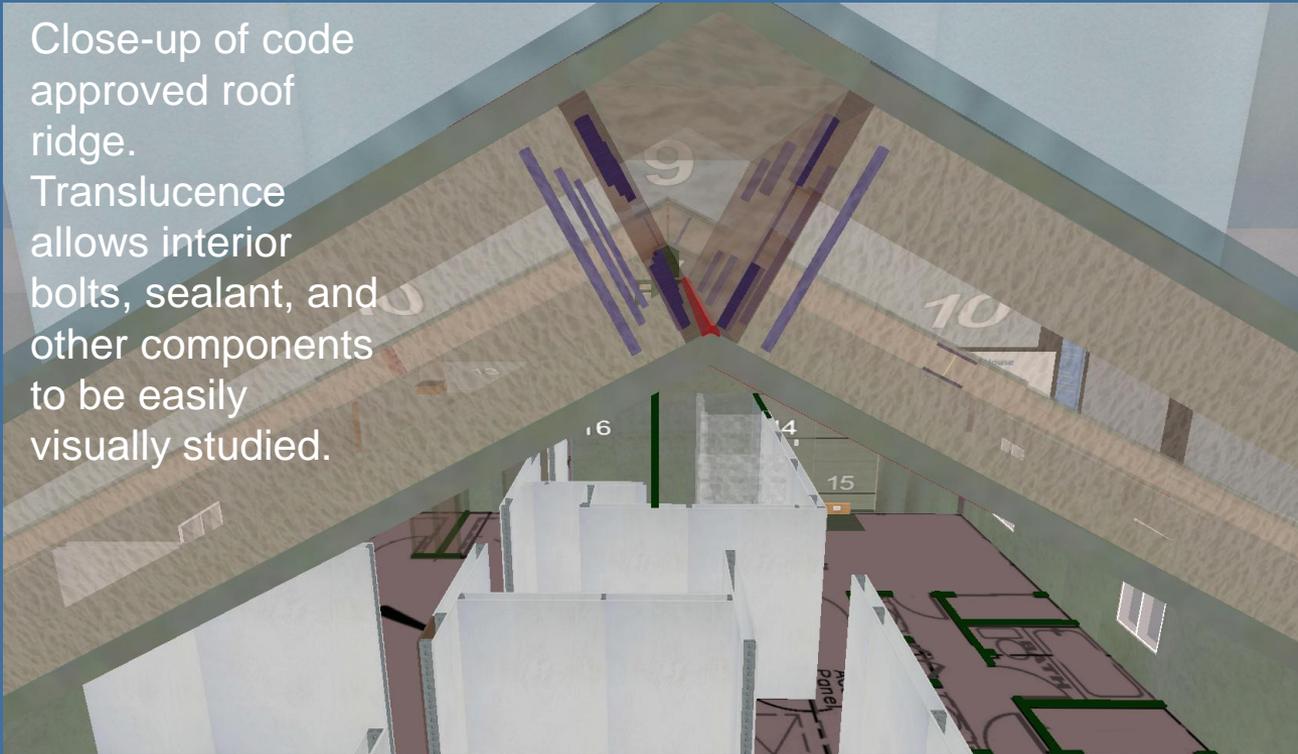


View of the back half of the house, including roofing details.



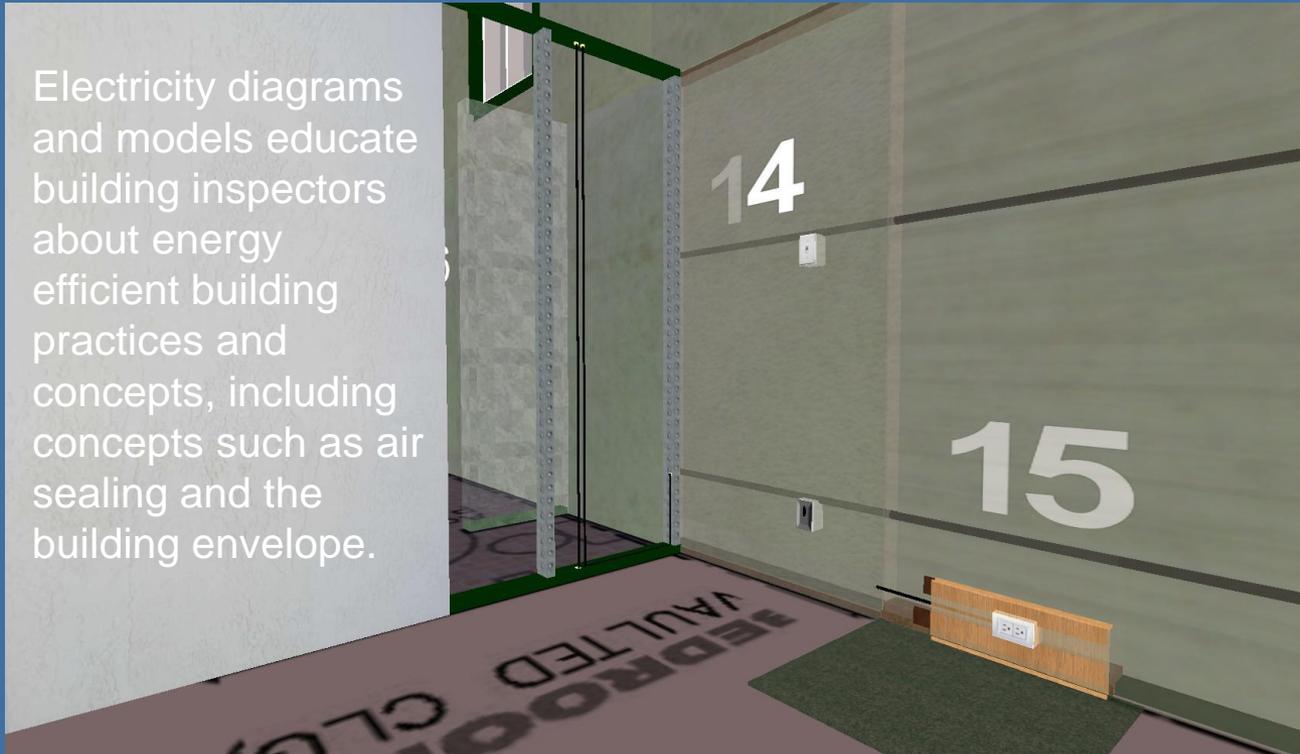


Close-up of code approved roof ridge.
Translucence allows interior bolts, sealant, and other components to be easily visually studied.





Electricity diagrams and models educate building inspectors about energy efficient building practices and concepts, including concepts such as air sealing and the building envelope.



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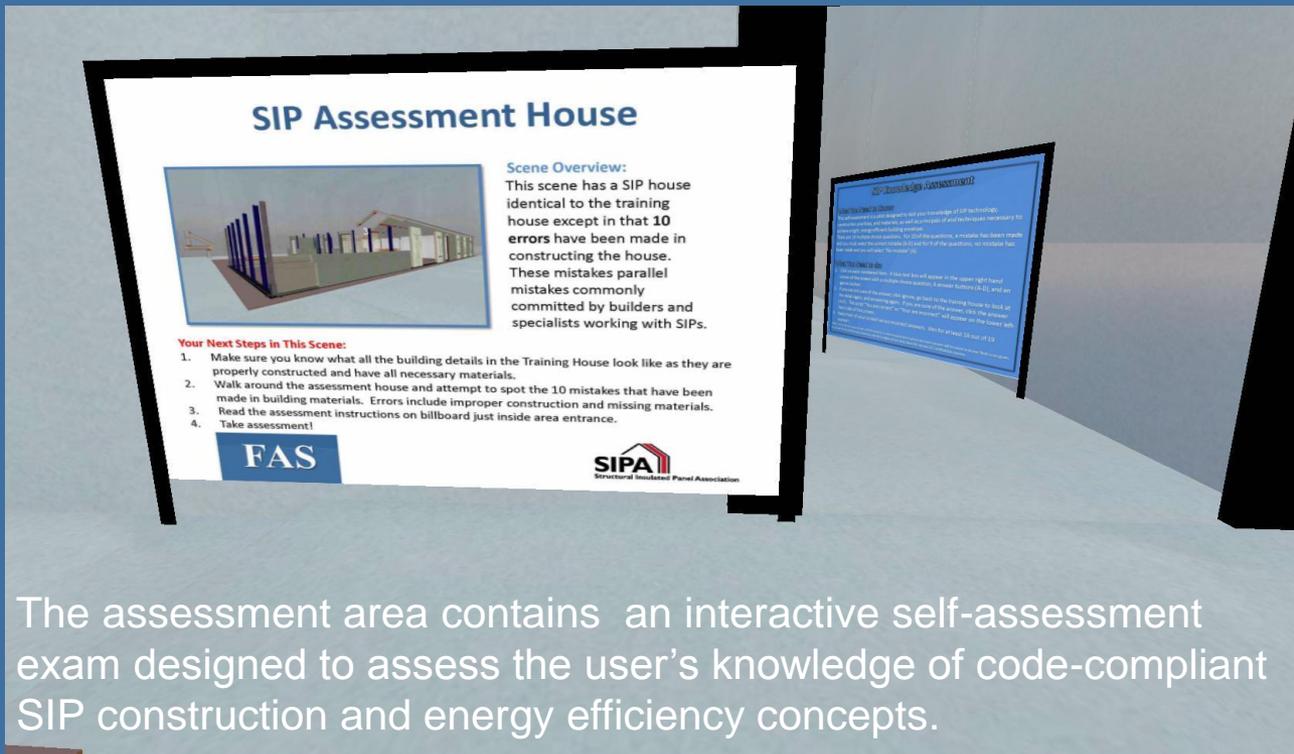
This series of window diagrams visually demonstrates proper step-by-step installation of windows and allows users to independently practice installing energy efficient, watertight windows.





Step-by-step window installation diagrams and assessment area introductory billboard.

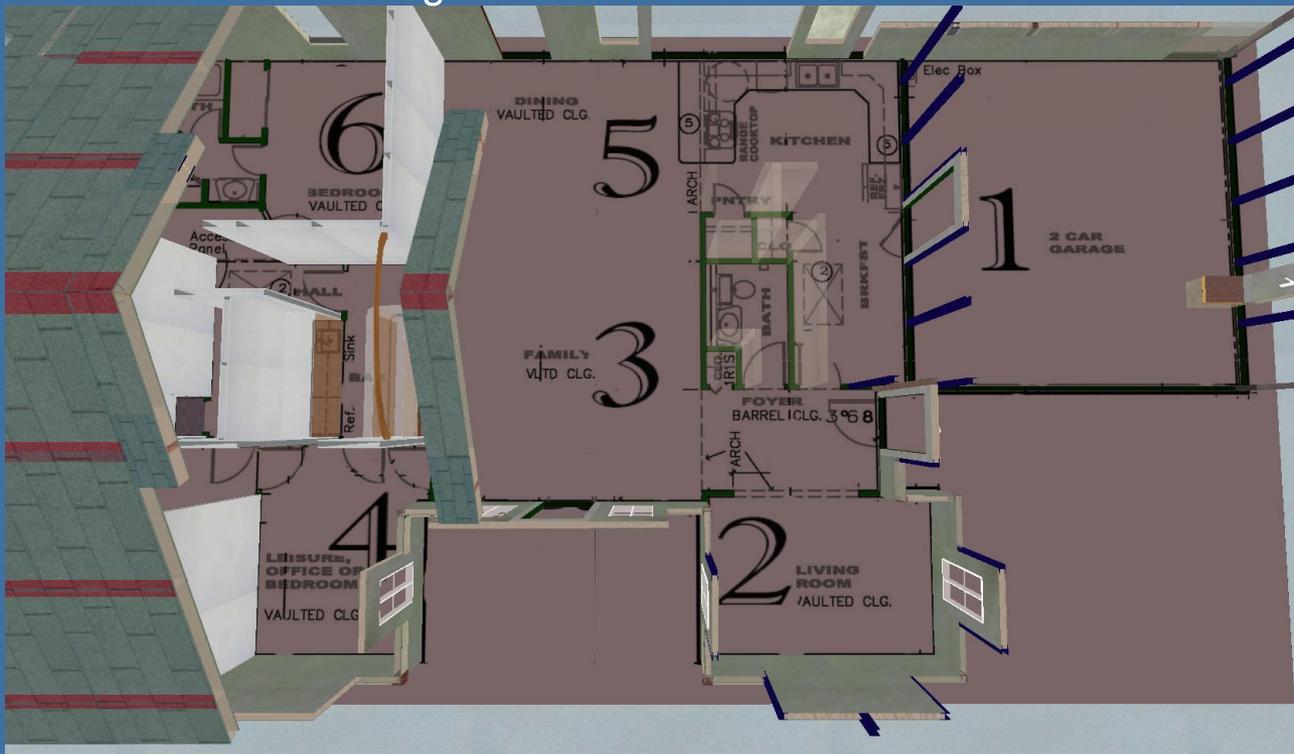
Assessment Area



The assessment area contains an interactive self-assessment exam designed to assess the user's knowledge of code-compliant SIP construction and energy efficiency concepts.



Excepting the 10 deliberate mistakes in the assessment house, it is identical to the training demo house.





To begin the self-assessment the user carefully studies a building detail to determine if a construction mistake has been made.

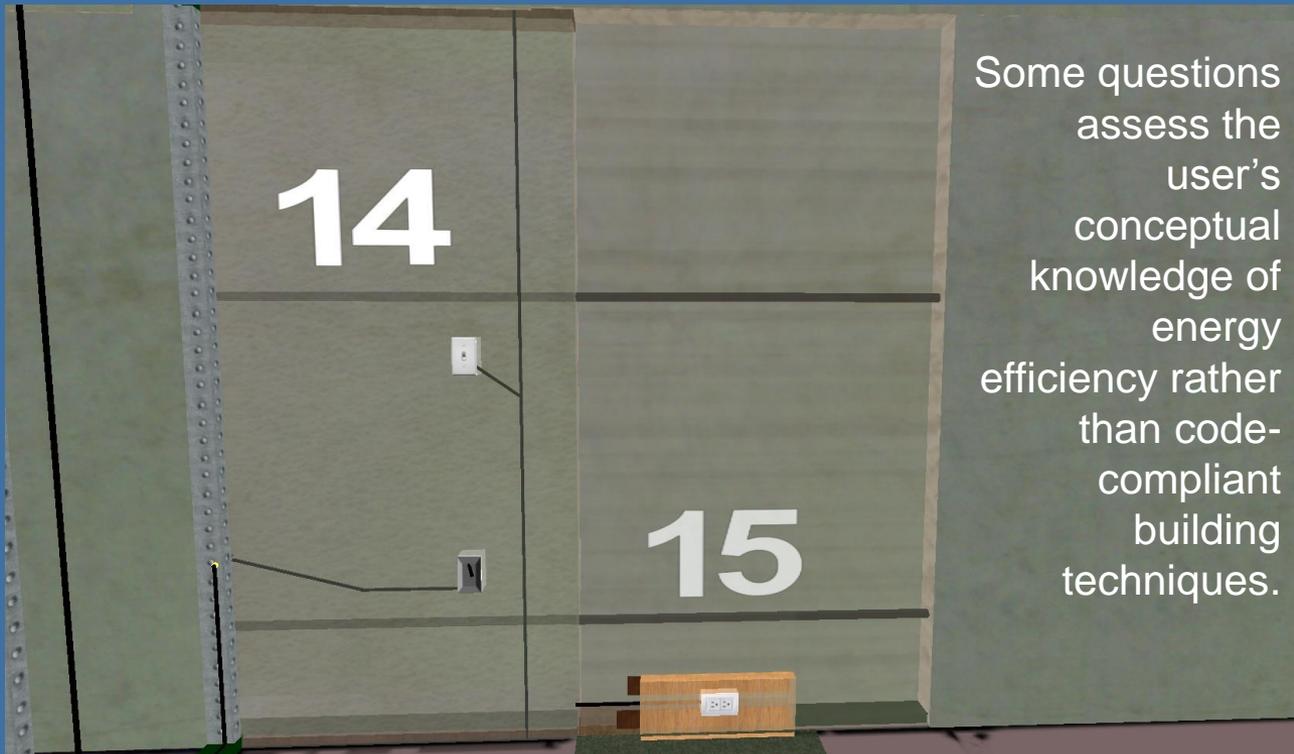


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If a mistake has been made, the user clicks on the white number above the detail and a multiple choice question appears on the screen. The user selects an answer (A-D) and receives immediate feedback on whether they are correct or incorrect.

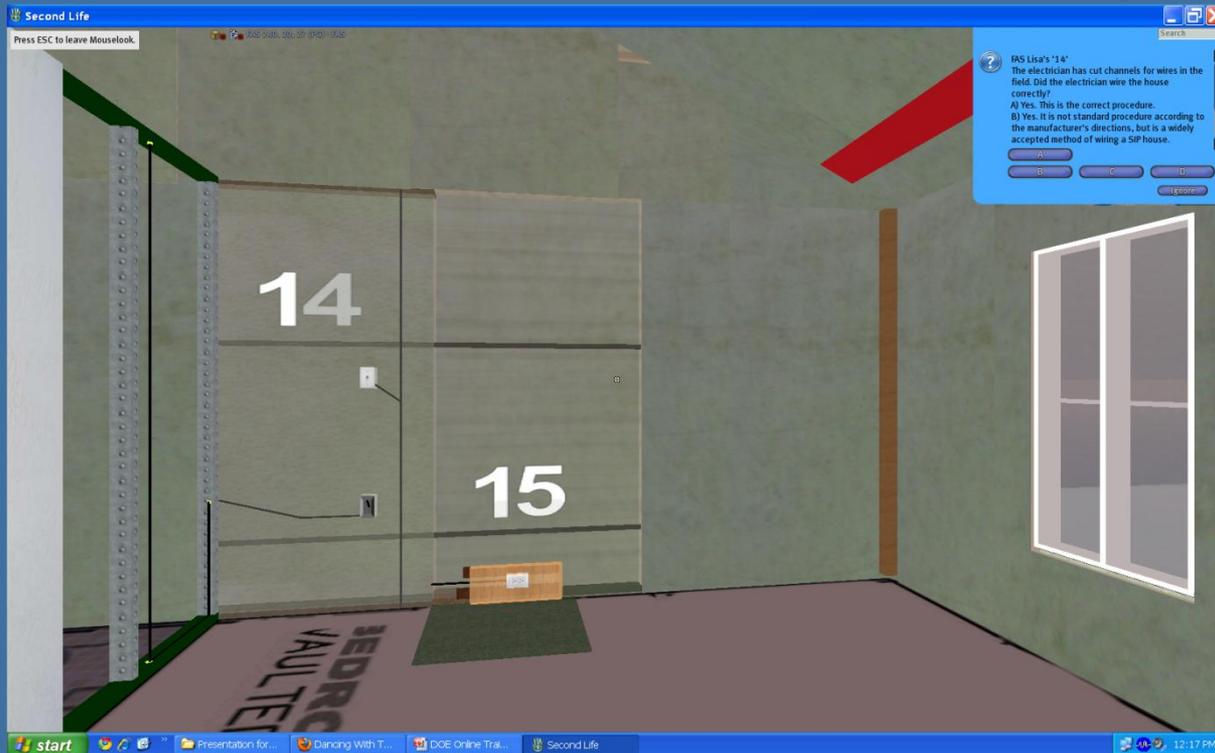




Some questions assess the user's conceptual knowledge of energy efficiency rather than code-compliant building techniques.



Building detail 14, for example assesses the users knowledge of thermal bridging and limiting penetration of the thermal envelope.





The Building Inspector Virtual World Training Pilot can be accessed
online at:

https://www.medullaweb.org/registry/public/building_inspector_sip_training_pilot

Or in the Second Life virtual world at:

<http://slurl.com/secondlife/FAS/141/16/27>

Acknowledgements:

Informational materials and diagrams were provided by the Structural Insulated
Panel Association (SIPA).

Text of The International Residential Code Section R613 was provided by the
International Code Council (ICC).