Know the ROPES

Two must-read SIPs-specific manuals showcase the science so that design professionals can successfully install structural insulated panels.

Written by Joseph Lstiburek from Building Science Corporation and published in 2008, the Builder’s Guide to Structural Insulated Panels (SIPs) for all Climates is a critically important document for all those interested in the science and practice of installing SIPs. In fact, the guide is so popular that it was reprinted in 2015 due to its high demand within the industry.

Lstiburek originally put out four different manuals that covered essential building information for the four fundamentally different U.S. climate zones: cold, hot-humid, hot-dry/mixed-dry, and mixed humid climates. Recognizing that SIPs perform differently depending on the climate zone where they are used, the 354-page guide is a compilation of those four building manuals which modifies the building information in relation to SIPs construction.

“The failures that we have seen with SIPs are usually because of improper installation and issues with moisture that stem from the poor installation,” says Bill Chaleff, Partner at Chaleff and Rogers, Architects. “The Building Guide helps to address this possible point of failure; that is, having installers with no understanding of simple building science, condensation, where it is likely to occur, or how to avoid it.”

SIPs have tremendous mechanical properties in the applications that they are typically used for, primarily conventional single-story or two-story housing, and are able to handle up to three times the load and stress than those applications apply to the material. Not having access to the information found within the Design Guide on hand could potentially pose a safety issue, threatening deterioration of the product’s structural skins and risking a critical
failure. This is particularly true when you are building a product like a house that will last a century, and the climate is quickly changing around you.

“When Lstiburek first wrote his manuals, the impact we are now seeing from climate change was barely perceptible,” says Chaleff. “What has happened since the publication first came out is that weather patterns have shifted quite a bit and the boundaries of the old climate zone maps have crept further and further north. Yet, while the concrete yes or no answers as to how SIPs will perform over time may be changing because of climate change, if you read the guide and comprehend the principles of how everything works, then it will never be out of date.”

The guide is the most benefit to those builders and designers who operate in different parts of the country or across the globe. Although geared towards projects in the U.S. market, the guide provides the basic science required to build in any climate and the information can be applied to any part of the world once the basic science is understood.

“If the buildings that you are putting up are all near your main office, then the guide may not be a necessity for you,” says Chaleff. “You won’t have to do the simple dew point calculations for your climate zone each and every time for each building you construct since those calculations are not a function of the geometry or the configuration of any particular building. Rather, they are a function of the different climates across the country and the different seasonal conditions we experience, such as wind, humidity and temperature. Once you have done a few dew point calculations for a few projects, you basically know what you’re doing for that climate zone.”

Another valuable tool for designers and builders using SIPs will be SIPA’s Structural Insulated Panel Engineering Design Guide, which will be launching later this summer along with online software for panel load and physical property.

As a product, SIPs have been in use for decades but have not had a single set of agreed upon industry wide rules governing the design of SIPs construction. As a result, SIPs users had no consistent way of knowing what the actual performance or mechanical properties of these panels were and had to simply trust that the manufacturer’s literature on the product was true.

The most important feature of the Design Guide is that it sets a minimum standard that helps guarantee that if you purchase from a SIPA member, you can be assured that the panels you are using will contain certain mechanical properties that you can count on and be able to design and build with. It also gives engineers a degree of certainty in regard to product literature by SIP manufacturers, supporting that information with data-based calculations that engineers can then check and confirm.

“Engineers are big fans of calculations and they like to be able to verify numbers and look at the equations,” says Tom Moore at Pinnacle Engineering, Inc. “That’s precisely what this guide does; it provides a set of calculations and equations that engineers can go in and manipulate, play with, and figure out how things are working and where the results are coming from, rather than just taking what a manufacturer says on blind faith.”

The Design Guide will also be an important step in providing SIPs a greater acceptance from code officials and the engineering community as a whole. Over time, SIPs have tended to be very slow to be recognized and adopted into everyday practice simply because engineers are reluctant to use products that are not considered conventional. The Design Guide will help to alleviate this by giving engineers a piece of software they can turn to and find code-like information for SIPs.

“You will still use the code reports, code listings, span charts, and the things provided by the manufacturer, but you will use them alongside the Design Guide to check for what you are doing,” says Moore. “Certain thicknesses of panels have spans of up to 10 or 12 feet; if you want to span that panel to 16 feet, what is the value? There currently is none. The Design Guide is intended to help fill in the blanks as to what the manufacturer’s literature doesn’t tell you. It is going to be extremely helpful in these kinds of scenarios.”