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What Are Precast Sandwich Panels?

Precast sandwich panels are a precast solution to an age-old problem: how to build more efficient and economical buildings. True to their name, these nifty precast concrete wall panels are concrete and insulation sandwiches, where the concrete is the bread. They can take the place of structure, insulation, moisture barrier, and finishes – all in one precast element. The precast panels are cast in controlled conditions off-site, and then transported to the job site for immediate erection with minimal labour.

If you are a structural engineer and you have never designed precast sandwich panels before, I bet you have a lot of questions. How do I sandwich a layer of insulation between two concrete walls? Can I achieve composite action without compromising insulation? How do I deal with openings and depressions in the wall? What about the trucking and handling loads? Until the early 1990s,

you designed precast sandwich panels with your concrete handbook, many pages of hand calculations, and a lot of phone calls to more experienced colleagues. But then came Ed Losch, a licensed engineer and architect out of Illinois, with a program called LECWall.

The Early Days of LECWall

In the 1970s, Illinois State University had a proud tradition of turning architects into structural engineers. Ed Losch fit the mold perfectly; an architecture grad student who used his Radio Shack TRS-80 computer – which had 1/1,000,000 the RAM of today's computers – to write programs that did his homework for him. He said this when we spoke last month: "I saw what Bill Gates was doing with software, and he was my age so I thought, 'Well I could do that.' The professors were fine with it as long as I coded the program that crunched the numbers and spit out the answers." Eng-Base approves, Ed.

Ed became both a licensed architect and a licensed engineer and in 1993, he joined the PCI sandwich wall panels committee. While on this committee, Losch had a key insight that led him to start building software for professional engineers. "[Sandwich wall panels] were probably the most complicated product you could design. . . . [Y]ou had flexure, you had axial compression, temperature strains, wind-loads, and then the handling and shipping and trucking on top of that. There's a lot to check. Plus all the design tools at the time assumed a simple prismatic section, when in the real world these walls had openings in them, they had reveals coming to the face which affected their structural capacity."

When faced with repetitive and complicated design calculations, the structural engineer will usually get to work on a killer Excel spreadsheet. Good automation is hard, however, when having to stay within the constraints of a spreadsheet program. Visual representation of the problem can also be challenging. What Losch saw was an opportunity to do much more.

"I determined that I would create design software that would take into account all these wrinkles, because that's what I would want in my practice. I would want to be able to handle openings and reveals; to automatically cut strands and reinforcement at the openings so I don't have to remember to do that; a program that was optimized for wall panel design." So Losch did what any rational engineer would do when faced with a tantalizing problem. He quit his job and he built the solution.

LECWall Today

After finishing writing LECWall, almost all of Ed's colleagues on the precast sandwich panels committee became customers. Over the years, as these first customers moved from firm to firm, they brought LECWall with them. Losch once sold LECWall to one engineer four times at four different firms. Today, hundreds of engineers all over the United States, Canada, and the world use LECWall.

Wall Panel Openings

A	B	Opening A:	X1 (in): <input type="text" value="101"/>	Opening through:	
C	D	<input type="button" value="Update"/>	X (in): <input type="text" value="88"/>	Top wythe: <input checked="" type="checkbox"/>	
E	F	<input type="button" value="Delete Opng"/>	Y1 (in): <input type="text" value="23.5"/>	Bottom wythe: <input checked="" type="checkbox"/>	
G	H	<input type="button" value="Edit Reveals"/>	Y (in): <input type="text" value="108"/>	Stem(s): <input type="checkbox"/>	

Member Length = 545 in. Width = 155 in.

Looking at in-place interior surface (top surface as-cast)
Bottom surface (form face) is on far side as shown in this view

Warning: Overlapping openings through the same wythe can cause inaccurate results.

LECWAll's graphical interface makes visualization easy. Dimensions are input using coordinates.

There are a lot of reasons to like Ed's program. We'll give you some of the highlights. LECWall can analyze handling loads on the wall so it can safely withstand trucking to the site, and erection once on-site. It will cut rebar and prestressing strands at the openings you specify, and then automatically adjust their development lengths. When analyzing the precast sandwich panels, LECWall let's the user specify the percentage of composite action to anywhere between 0% and 100%. As a bonus, you can also design hollow core and double tee panels, as well as concrete columns in LECWall.

A Real User

We reached out to a pro engineer to see how he is using LECWall.

"The precast industry is not a big industry. . . . You know Ed. You know who he is, and what he does." These are the words of Kim Sorensen, an independent consulting engineer in Wells, Minnesota. He uses LECWall often in his practice. He continued: "One thing that really put him ahead of a lot of the competition was the multi-story analysis. If you go back years ago, [...] with wall panels getting to be two or three stories high, you'd have to design the top panel, then input that load into the next panel down, and then into the next panel down." LECWall can handle panels spanning multiple stories by allowing the user to apply loads at any point on the panel. "For a practicing engineer to be able to sit down and input the wall in one section; it saves time, effort, and it saves errors."

Kim began using LECWall after his previous design and analysis software was sold to a larger company. "Customer service was lacking. The company was sold and they weren't servicing their software." The engineers we speak to often tell us about the importance of good support and training resources. Kim is no different. "Ed's got a good product and he's got good customer service. . . . I emailed him a question on a Sunday evening, and I got an answer. . . . As a consultant, you don't work from eight to five, you work when the work is there. To get an answer on a Sunday evening is just tremendous."

Losch sees a bright future for LECWall. He would like to add features like plug-ins for proprietary wall sections, and additional products to help automate precast concrete connection design. We'll be keeping track, and so can you, by visiting the LECWall profile page on Eng-Base.

[Go To LECWall Profile](#)

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