ARCHITECTURAL RECORD

EVOLUTIONS IN WOOD-FRAMED EXTERIORS

As wood becomes a more popular and practical building material, there are many conditions and applications for architects and builders to consider. From thermal air and water barriers to structural design challenges and fire-protection, there are products that help architects achieve their design goals. We hope this eBook gives you inspiration and knowledge to design effectively with wood for years to come.

Alex Bachrach, Publisher
ARCHITECTURAL RECORD

Table of Contents

Detailing Barrier Continuity in Building Enclosure

THE ROLE of the building enclosure is to provide proper separation between the building interior and the exterior. Beyond the structural enclosure, separation is accomplished through the use of four primary types of barriers: water-resistant barriers (WRBs), air barriers, thermal barriers and vapor retarders. All of them are intended to restrict or control the passage of a targeted item (water, air, heat or moisture) through a roof, wall or foundation system.

While this can seem straightforward along flat, continuous surfaces, it is the non-continuous conditions that present design and construction issues. These can include transitions from one material to another, penetrations, interruptions caused by planned openings such as windows and doors, or changes in surfaces such as roof/wall junctions or parapets.

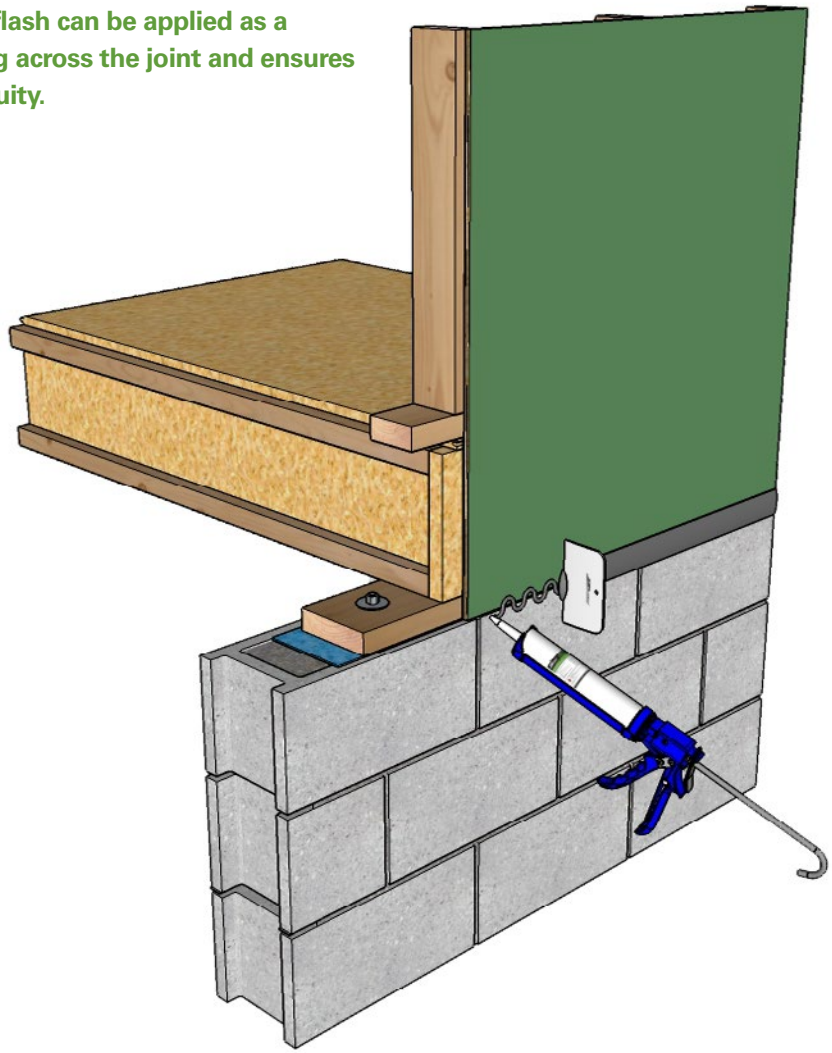
The key to continuity in building enclosure systems is a careful and coordinated approach to consistent detailing. Understanding the choices and developing complete details as part of construction drawings is the best way to ensure continuity of the building's enclosure for an airtight, weather-resistant exterior that promotes energy efficiency and long- term durability.

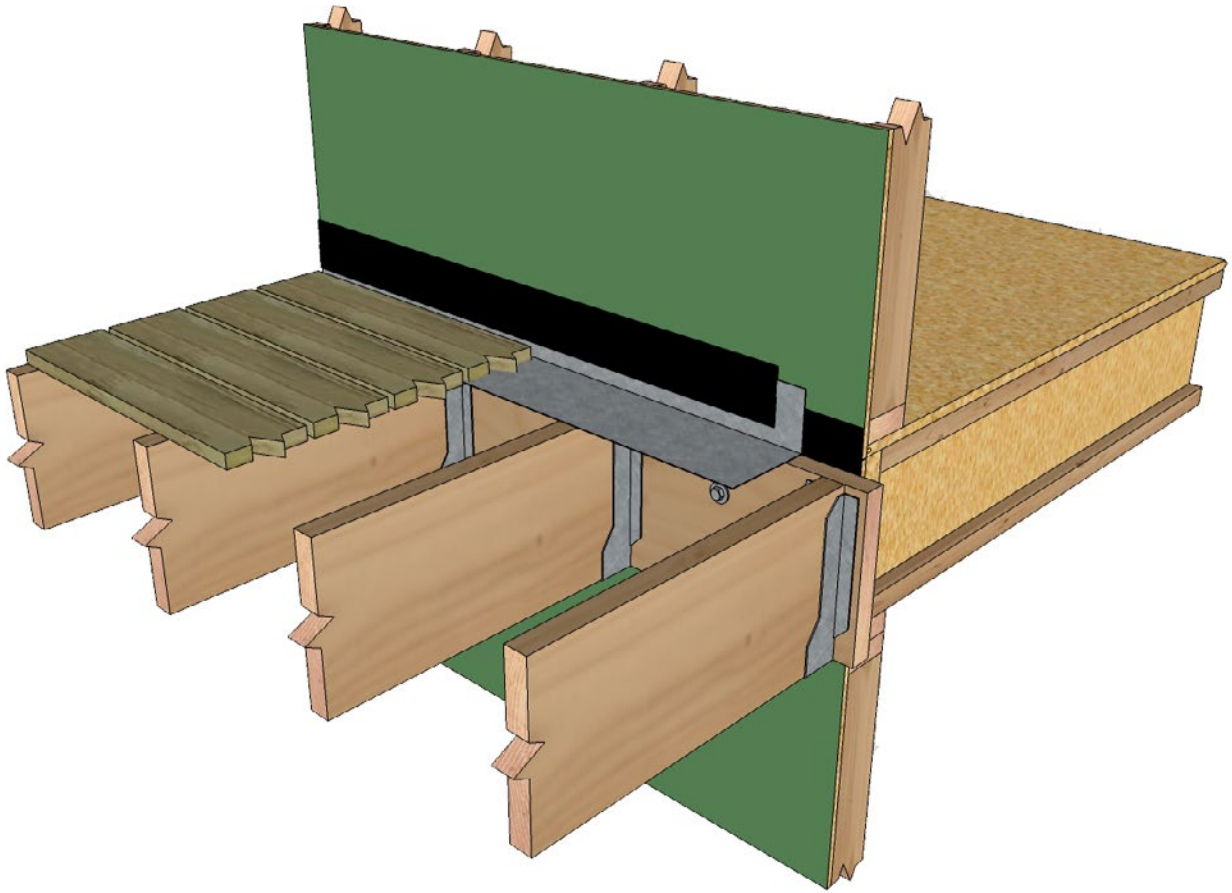
Choices in Barrier Systems

As with most design and construction systems, there are choices available for how to achieve each of the four barriers and ensure their continuity on and around a structural framing system.

The conventional approach is to use a multi-product, multi-layer design, in which each of the four barriers is specified and

The joint where the wood framing meets the foundation wall needs attention to be sure that any wayward air or water does not penetrate. In this case, ZIP System™ liquid flash can be applied as a coating across the joint and ensures continuity.





For decks and balconies, once the ledger board is in place, the joint between it and the wall needs to be addressed to be sure that the barriers remain protected. Metal flashing that extends from the wall and under the decking or above balcony flooring should be covered at the top with ZIP System™ flashing tape for continuous protection.

installed as a separate layer in an assembly. This requires specifying multiple products that need to be compatible. Each serves a single function and has individual installation requirements, often performed by different trades during construction, which can raise the risk of delay or incorrect installation, increasing the need for coordination. Further, to be sure that their installed performance will be satisfactory, the particular combination of products needs to have been tested to ensure they meet all of the water, air and thermal thresholds required for the assembly. There also needs to be proper detailing between the materials to ensure the total system will work as intended.

As an alternative, there are integrated sheathing product solutions that have become available. One of the most common transition design and build teams are making is replacing the sheathing-plus-housewrap assembly with ZIP System® sheathing and tape, eliminating the need for housewrap.

The newest addition to the ZIP System brand of products is ZIP System® R-sheathing, whichadditionally incorporates built-in polyisocyanurate foam exterior insulation.

A revolutionary new approach to building enclosures, ZIP System sheathing and tape products streamline the weatherization process with an integrated air and water- resistive barrier and advanced-acrylic tape for panel seams and flashing details that delivers moisture and air protection in one easy-to-install system.

This means that a single, high-performing engineered wood sheathing product can be specified, used as the basis of design, and installed by a single trade to achieve water, air and thermal barriers. This online course will show detailed specifications for critical transitions in places like windows, doors and wood-to-masonry when specifying wall assemblies using ZIP System sheathing and tape with integrated an water-resistive barrier onto the surface of the engineered wood sheathing.

The 2015 IRC now includes prescriptive requirements for exterior continuous insulation in certain climate zones. ZIP System® R-sheathing includes a thermal barrier of continuous insulation in a variety of thicknesses to help achieve the right R-value for your wall design. Installed with the exterior wood panel with the integrated weather-resistive barrier to the outside, it creates a solid, nailable, easy-to-flash base for exterior cladding systems and transitional areas. The pre-applied continuous foam insulation is on the back of the sheathing and is installed against studs using manufacturer-prescribed fastening schedule and screws, per ZIP System R-sheathing installation, to achieve necessary shear strength. To ensure the best continuity of air, water and thermal barriers with ZIP System sheathing products, this course reviews how to detail areas such as joints, penetrations and openings using ZIP System™ flashing tape, ZIP System™ stretch tape and ZIP System™ liquid flash.

The full CEU course will explain in-depth the continuity issues of the four primary barriers and review a series of drawings and details that can help accomplish a continuous building enclosure system on critical transitions. Learn more about ZIP System sheathing and tape by visiting ZIPRevolution.com. ■

Contact your local Business Development Manager to schedule an on-site presentation of this course today.

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SHEATHING & TAPE

In the Cause of Architecture, IV: The Meaning of Materials—Wood

An essay from May, 1928, by Frank Lloyd Wright.

From *Architectural Record,* May, 1928. Read a PDF of the original article here.

FROM THE fantastic totem of the Alaskan – erected for its own sake as a great sculptured pole, seen in its primitive colors far above the snows – to the resilient bow of the American Indian, and from the enormous solid polished tree-trunks upholding the famous great temple-roofs of Japan to the delicate spreading veneers of rare, exotic woods on the surfaces of continental furniture, wood is allowed to be wood.

It is the most humanly intimate of all materials. Man loves his association with it, likes to feel it under his hand, sympathetic to his touch and to his eye. Wood is universally beautiful to Man. And yet, among higher civilizations, the Japanese understood it best.

They have never outraged wood in there are or in their craft. Japan's primitive religion, "Shinto," with its "be clean" ideal, found in wood ideal material and gave it ideal use in that masterpiece of architecture, the Japanese dwelling as well as in all, that pertained to living in it.

In that architecture may be seen what a sensitive material, let along for its own sake, can do for human sensibilities.

Whether pole, beam, plank, board, slat or rod, the Japanese architect got the forms and treatments of his architecture out of tree-nature, wood-wise, and heightened the natural beauty of the material by cunning peculiar to himself.

The possibilities of the properties of wood came out richly as he rubbed into it the natural oil of the palm of his hand, ground out the soft parts of the grain to leave the hard fibre standing – an "erosion" like that of a plain where flowing water washes away the sand from the ribs of stone.

Now western peoples ever used wood with such understanding as the Japanese did in their construction – where wood always came up and came out as nobly beautiful.

And when we see the bamboo rod in their hands – seeing a whole industrial world interpreting it into articles of use and art that ask only to be bamboo – we reverence the scientific art that makes wood theirs.

The simple Japanese dwelling with its fences and utensils is the revelation of wood.

Nowhere else may wood be so profitably studied for its natural possibilities as a major architectural material.

Material here feel into artistic hands – a religious sentiment protecting it, in all reverence for simplicity.

Sometimes in the oak-beamed and paneled rooms of Old England, when "carpentry" was restrained, oak was allowed to be something similar as is seen in oak-timbering of the Middle Ages. In the veneering of later periods the beauty of wood came out – but the carpenter-forms of the work invariably did violence to the nature of wood. The "cabinet-maker" had his way with it.

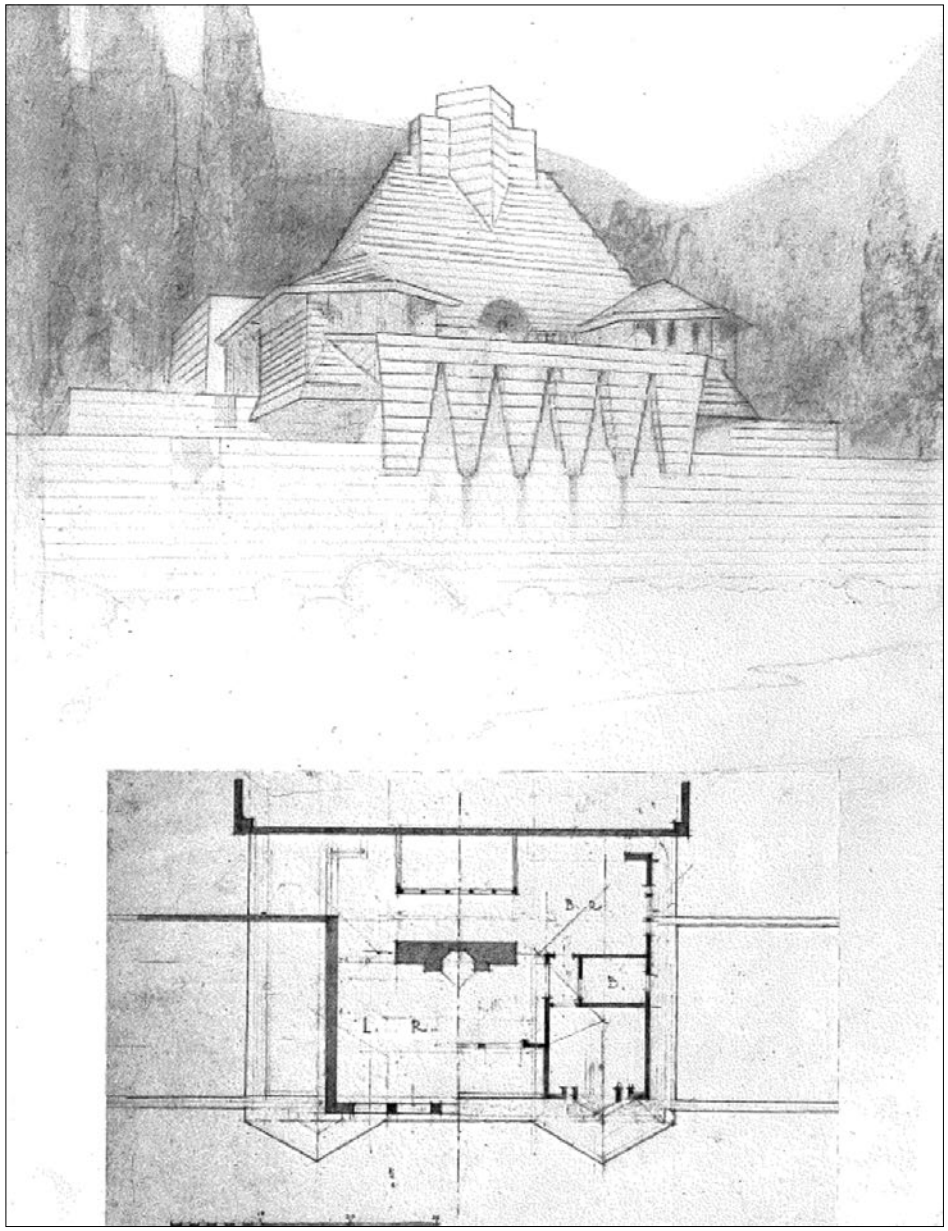
Woodwork soon became what we learned to call carpentry; more or less a make-shift. Paneling was its sum and substance where the pilaster would not stick nor the cornice hand.

All wooden joinery of the periods, soon or late, fell to pieces, and the interruption by too many ingenious "members" frittered away wood-nature in confusion or in contortions of an ingenious but false or inferior "taste."

Outside primitive architectures, sympathetic use of wood in beautiful construction would be found far north or far south – among the Norsemen, or among the South Sea Islanders.

Because of wood we have – the carpenter.

The carpenter loved wood in feeble ways – but he loved his tools with strength and determination. He loved his tools more. Good wood is willing to do what its designer never meant it to do – another of its lovable qualities – but therefore it is soon prostitute to human ingenuity in the makeshift of the carpenter. Wood, therefore, has more human outrage done upon it than man has done, even upon himself.



Tahoe Cabin, "Shore Type"
Frank Lloyd Wright, Architect

It has suffered more – fare more than any of the materials in our category.

Where and when it is cheap and, so, become too familiar as it nearly always does in a new country, it soon falls into contempt. Man's longing for novelty tries to make it something else. To the degree that the carpenter-artist has succeeded in doing this – one might thing – is he the artist-carpenter.

In his search for novelty, wood in his hands has bene joined and glued, braced and screwed, boxed and nailed, turned and tortured, scroll sawed, beaded, fluted, suitably furbelowed and flounced at the carpenter's party – enough to please even him. By the aid of "modern" machines the carpenter-artist got it into Eastlake composites of trim and furniture, into Usonian jigger porches and corner-towers eventuating into candle snuffer domes or what would you have?; got it all over Queen Anne houses outside and inside – the triumph of his industrious ingenuity – until carpentry and millwork become synonymous with butchery and botchwork.

Queen Anne! What murder!

And even now – especially now – in the passing procession of the "periods" I never see orderly piles of freshly cut and tried timber disappearing into the mills to be gored and ground and torn and hacked into millwork without a sense of utter weariness in the face of the overwhelming outrage of something precious just because it I by nature so kind, beneficent and lovely.

Man has glorified the Tree in the use he made of the Stick – but that he did long before the Louis, or the Renaissance got by way of Colonial and Eastlake – or was it Westlake – to Queen Anne; and then by way of the triumphant Machine to General-Grant-Gothic and the depths of degradation that soon came in the cut-and-butt of the fluted "trim," with turned corner-block and molded plinth-block.

This latter was the fashion in woodwork when I found the uses of wood I shall describe.

Machinery in that era was well under way and ploughed and tore and whirled and gouged in the name of Art and Architecture.

And all this was so effectually and busily done that the devastation began to be felt in the "boundless" Usonian forests. Conservative lumber-men took alarm and made the native supply go a little further by shrinking all the standard timber-sizes first, one-eighth of an inch both ways – then a little further on one-eighth inch more both ways – now still a little further – until a stud is become a bed-slat, a board kin to a curling veneer.

All standardized sticks great and small are shrinking by a changing standard to meet the deadly facility which the Machine has given to man's appetite for useless things.

Usonian forests show all too plainly terrible destruction and – bitter thought – nothing of genuine beauty as Usonia to show for it.

The darkness of death is descending on wood by way of unenlightened architecture.

The life of the tree has bene taken in vain as the stick, the substance of the shapely stick to become imitation-a-la-mod; the precious efflorescent patterns of wood, to be painted out of sight; its silken textures vulgarized by varnish in the misshapen

Walls of wood, unpainted, "let alone as wood"

monstrosities of a monstrous "taste."

The noble forest is become ignominious scrap-heap in the name of Culture.

The Machine, then – was it – that placed this curse on so beautiful a gift to man? So friendly a material – this brother to the man – laid thus low in murder.

No.

Unless the sword in the hand of the swordsman murdered the man whose heart it ran through.

The Machine in only a tool. Before all, the man is responsible for its use.

His ignorance became devastation because his tool in callous hands became a weapon effective beyond any efficiently such hands had ever known before, or any sensibilities he ever had. His performance with his Machine outran not only his imagination which, long since, it vanquished, but the endurance of his own sensibilities as human.

No. Blame the base appetite the Machine released upon the forest, for its devastation. Blame the lack of imaginative insight for the scrap-heap we have now to show for the lost trees of a continent – a scrap-heap instead of a noble architecture.

What should we have had to show were it otherwise? Vain speculation. What may we have to show for what is left – if base appetite becomes enlightened desire and imagination awakes and sees?

Well – we may have the nobility of the material if nothing else.

We may have simple timer construction, at least over-head, as a scientific art, free of affectation. The wood let alone as wood or as richly ornamented by hand in color or carving.

We may have satin-boarded wainscots – polished board above polished board, the joints interlocked by beaded insertion, so that shrinkage is allowed and the joint ornaments the whole in harmony with its nature, individualizing each board.

We may have plaster-covered walls banded into significant color-surfaces by plain wood-strips, thick or thin, or cubical insertion, wide or narrow in surface.

We may have ceilings rib-banded in rhythmical arrangements of line to give the charm of timbering without the waste.

We may use flat wood-strips with silken surfaces contrasting as ribbons might be contrasted with stuffs, to show what we meant

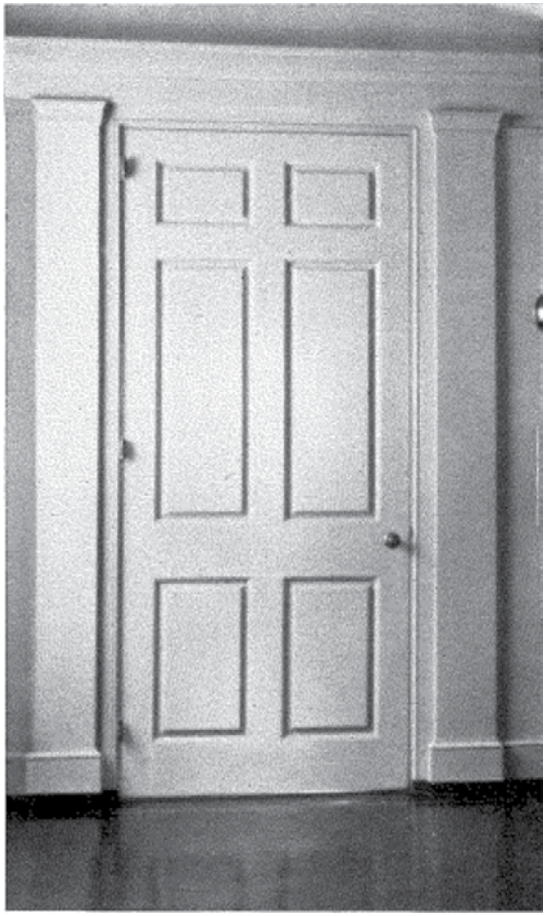
in arraign our surfaces, marking them by bands of sympathetic flat-wood.

We may use a plastic system of varying widths, weights of finely-marked wood rib-bands to articulate the new plastic effects in construction never dreamed of before. The flat-strip came so easily into our hands, by way of the machine, to give us – the "backband" that follows all outlines even in an ordinary dwelling, by the mile, for a few cents per tool.

We may compound composite-slabs of refuse lumber glued together under high pressure and press into the glue, facings of purest flowered wood veneer on both sides – making slabs of any thickness or width or length, slabs to be cut into doors, great and small, tops thin or thick – persevering the same flower of the grain over entire series or groups of doors as a unit, (see page 488).

We may mitre the flowered slabs across the grain at the edges of the breaks to turn the flowering grain around corners or down the sides and thus gain another plastic effect from the continuity of the flowering.

We may economically split a precious log into thin wide veneers and, suitably "backed," lay each to each, opening one sheet to lay it edge to edge with the sheet beneath it, like the leaves of a book so the pattern of one becomes another greater pattern when doubled by the next.



Wood encased in an armor of paint

We may cross-veneer the edges of top-surfaces so that the grain of the top carries the flower unbroken down over the ends as it does on the sides.

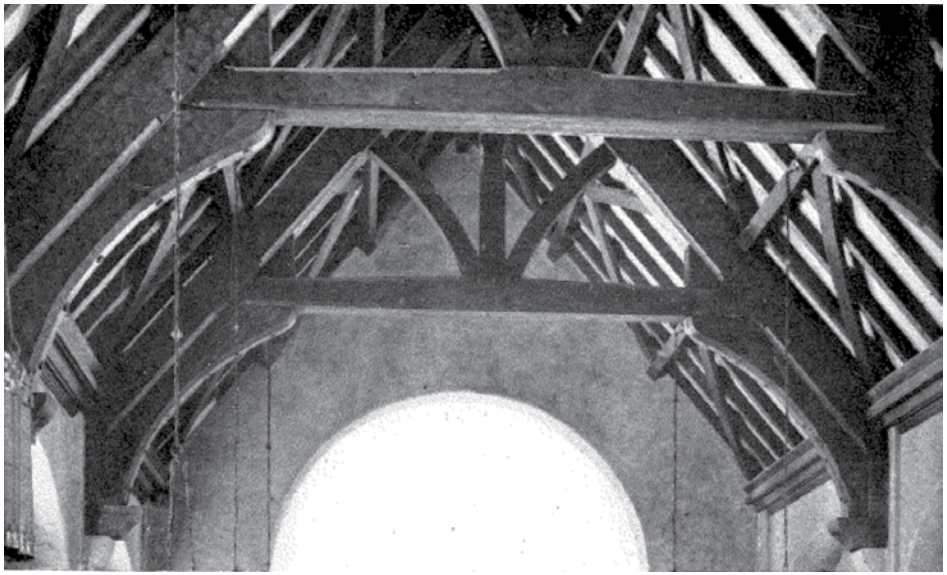
There is the flat fillet (it happens to be true to wood) to "talk" with – if one must "explain."

We may use the plain-spindle alternating with the thin flat-slat or square or round ones in definite rhythms of light and shade – allowing the natural color and marking of the wood to enrich and soften the surface made by them as a whole. With this we may bring in the accent block.

We have the edgewise and flatwise-strip or cubicle stick and accent-block to "ingeniously" combine into screens for light-filters or for furniture.

These treatments all allow wood to be wood at its best and the machine can do them all surpassingly better than they could be done by hand – a thousand times cheaper.

Thanks to the machine we may now use great slabs compounded under heat and pressure, where rotary-cut veneer unrolled form a log in sheets ten feet long as wide as the circumference of the log will yield, in thicknesses of one-thirty-second of an inch, wood wall-paper. And we may lay these sheets,



Timber, rough hewn from the log and used structurally

against various compounds, on ceilings – with any manipulation of the efflorescence, now exaggerated by the rotary cut, but still true to wood, and do this to any extent.

The finer properties of wood have been emancipated by the machine.

Observe that, naturally, all these are plastic effects. That is, used for the sake of the surfaces and lines of their "wood-quality" in contrast to other materials.

Carving has a small place in the grammar of these effects, except as an "insert."

There is always the limiting frame or border, constricting surfaces – the most obvious of all uses to which wood is put. And there is always a use of the solid wood stick to be made into honest furniture. There is the wooden frame to be overstuffed for deep comfort – wood showing only at extremities. In light stick-furniture wood combines well with plaited rattan or raffia.

In other words the beauty of wood as silken-texture or satin-surfaces upon which nature has marked the lines of its character in exquisite drawing and color qualifying flat-surfaces and rib-bands of infinite delicacy, in all variety – because we work with the machine, understanding wood, is more liberally ours.

Another opportunity is wood-inlay. There is the chequered turning of the grain to crossgrain in the same wood.

There are the patterns of inlay in contrasting woods.

There are the cunningly cut, denticulated or machined strips to be inlaid between boards or used as edging flat surfaces of veneer: the denticulations to be picked out by polychrome in transparent bright stains, perhaps.

There is the whole gamut of transparent color stains from brilliant red, green, yellow and blue, to all hues in between, to aid and intensify or differentiate these uses of wood.

And for exterior work there are characteristic board-and-batten effects – horizontal, vertical, diagonal or checkered, got out of planks or boards with surfaces rough from the saw to be color-stained or allowed to weather.

There are roofs boarded lengthwise of the slope, likewise inlaid between the joints but with properly devised ornamental copper flashing to come up over the edges and the ends.

There are brilliantly decorative treatments of poles, free standing as the Alaskan totem stood, or in rows, horizontal or vertical. Palisaded walls.

There are combinations of slender pole and square-tick and the spindle-rod, alternating with the slat or the board in endless rhythmic variety.

All these undressed-wood, plastic treatments, are much the same as for inside work, allowing wood to be wood but coarser in scale with an eye to weathering in the joiner.

And finally after we have exhausted the board and machined inlaid-batten, and the spread of the figure of the wood-flowering over flat surfaces, and the combinations of the following back-bank and the varying rib-band – the spindle-stick, the flat-slab and the rod, the marking-strip and the accent-block, the ornamental-pole – rectangular timbering ornamentally planked, the undressed, interlocking boards on walls and roof slopes – then –

We have combinations of all these. A variety sufficient to intrigue the liveliest imagination for as long as life lasts – without once missing the old curvatures and imaging of organic-forms; the morbid twists and curious turns, the contortions imposed on wood in the name of the "Styles" mostly using wood as a makeshift – or, if not, as something other than wood.

A most proper use of wood, now that we must economize, are these treatment suing marking-bands or plastic-ribbons, defining, explaining, indicating, dividing, and relating plaster surfaces. It is economy in the material, while keeping the feeling of its beauty. Architectural-articulation is assisted and sometimes had alone by means of the dividing lines of wood.

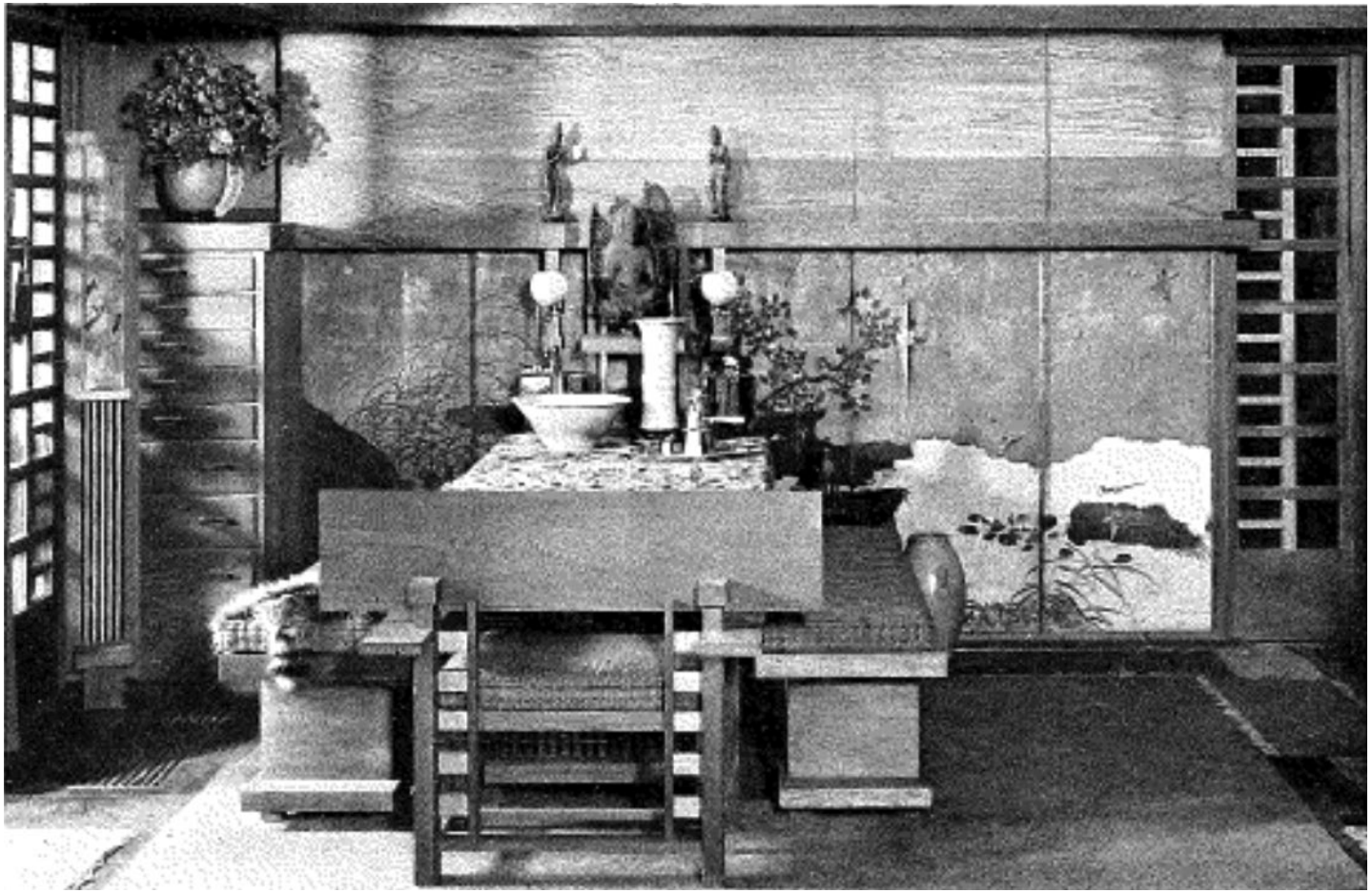
In these plastic treatments – using wood gently banded or in the flat allowing tis grain and silken surface even in the spindle-screens to assert itself and wood-quality to enter into effect of the whole, we have found the Machine a willing means to a simple end. But for the Machine this free plastic use of wood either in rib-bands or extended flowered surfaces would be difficult, uncharacteristic and prohibitive in cost.

Moreover this is true conservation of wood because in these effects it is used only for its qualities as a beautiful material. The tree need no longer be lost.

In these papers we are not speaking of "building" as a makeshift, but of building as the Art of Architecture. And while all building, as things are, cannot be architecture but must make shift – architecture should hold forth such natural ways and means for the true use of good materials that, from any standpoint of economical realization of the best the material can give to structure, architecture would put mere building to shame. Stupid waste characterizes most of the efforts of mere builders, always – even or epically when, building for profit.

Wood grows more precious as our country grows older. To save it from destruction by the man with the machine it is only necessary to use the machine to emancipate its qualities, in simple ways such as I have indicated, and satisfy the man.

There is no waste of material whatever in such uses, either in cutting up the tree or adapting the cutting to the work done when it is of the character described. The machine easily divides, subdivides, sands and polished the manifold surfaces which any single good stick may be made to yield by good machine methods.



Wood can never be wrought by the machine as it was lovingly wrought by hand into a violin for instance, except as a lifeless imitation. But the beautiful properties of wood may be released by the machine to the hand of the architect. His imagination must use it in true ways – worthy of its beauty. His plastic effects will refresh the life of wood, as well as the human-spirit that lost it – as inspiration – long since. ■

The five doors of the cupboard above the table were cut from a single cypress veneered slab. Living room, Taliesin; Frank Lloyd Wright, Architect

‘The Quarter’ Is Transforming a Thriving Urban Neighborhood in Cleveland

Next-gen sheathing system integrates air, water and thermal layers.

ACROSS AMERICA, old is becoming new again. Neglected urban centers are getting a second chance through renewed interest in the character and charm of historic areas. Ohio City is a prime example. The Cleveland, Ohio, neighborhood is undergoing rapid revival, adding retail, restaurants and residences to the industrial area.

Demand is high for access to this real estate, so to meet expectations; real estate must become available as soon as possible. Ohio City is poised to see an influx of affluent residents and shoppers, and developers are pursuing not only fast-paced construction cycles, but also modern designs that meet high-performance building enclosure standards. When Snavely Group began construction on a mixed-use project in late 2016, they knew the project needed to be timely without sacrificing quality. Working with the North Eaton location of 84 Lumber in Columbia Station, Ohio, they chose ZIP System® R-sheathing and tape for exterior walls because of its built-in weather barrier, rigid air barrier and exterior continuous foam insulation.

"The building, called The Quarter, has 194 market-rate apartments and 10,000 square feet of leasable space," said Greg Osborne, vice president of project management with Snavely Group. "One of our tenants on the first floor is The Music Settlement, a local inner-city school dedicated to serving the community through arts education, and another is a small grocery store."

As the general contractor and developer of The Quarter, Snavely executives kept the needs of a diverse range of tenants in the

podium-style project top priority as they worked with 84 Lumber to specify materials.

"We've had a long relationship with 84 Lumber," Osborne said. "Knowing that this would be a wood frame building, we brought them in early to consult on how to build, materials to use and to get their expertise. It also helped to get early cost estimates so we knew where it was going. It just made sense to bring them to the table."

Through meetings with the architectural and engineering team, Snavely opted for the best performing products for the job, among them ZIP System R-sheathing and tape. Snavely also decided to have the ZIP System® panels incorporated into

prefabricated wall panels to accommodate the tight scheduling strategy.

"We chose ZIP System insulated R-sheathing," Osborne said. "We had used OSB on other buildings that we then had to go back and waterproof. Why not put up something with integrated waterproof coating to save labor? It also made sense in terms of time and energy, and it helped us achieve code requirements for continuous exterior insulation."

Mark McClaine, sales manager with 84 Lumber, said the walls of the project were panelized at the company's panel facility and put together by 84 Lumber's installed framing services.

"When we are weatherizing a building, product integrity is vital, and that's especially true with the West 25th project," McClaine said. "The building is large, about 270,000 square feet and five stories high, and there is limited access. When we were framing and installing panels, we could only do two-thirds of the building. After the roof was installed, we came back to do the last one-third."

Osborne added that in addition to the energy efficiency benefits offered by the built-in continuous insulation and air barrier with ZIP System R-sheathing, the panels are completely weatherized. Instead of using traditional OSB and having a water proofer come out to the site, the panels could be installed without the worry or hassle of additional steps, saving his team time and money.

"ZIP System R-sheathing is not only a top-quality product. It's a huge schedule saver," he said. "Time is a factor with every job now. In the apartment market, it's a race. Every month you aren't leasing is big money lost. At the end of the day, ZIP System panels were always going to be part of the project." ■

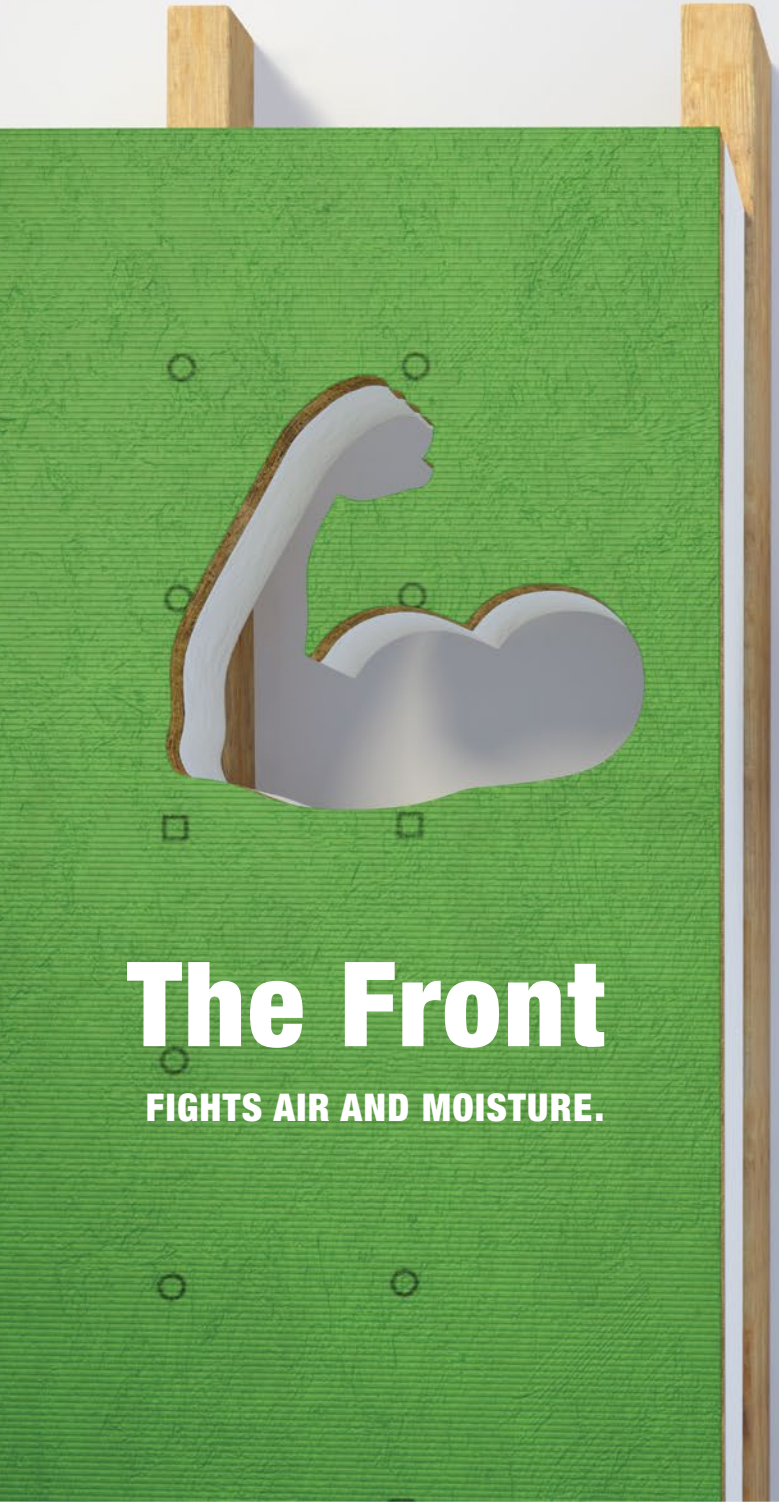
Learn more about revolutionary ZIP System® sheathing and tape at ZIPRevolution.com

Want to know more?

Interested in more details on how panelization can help streamline your multifamily projects? See Modular Panelization for how ZIP System sheathing and tape is a perfect fit for this type of construction process.

See Continuous Insulation in Framed Exterior Walls in the Continuing Education Center for more on using continuous insulation in different climate zones, along with principles and choices related to proper moisture management.

ZIPsystem™ R-SHEATHING



The Front

FIGHTS AIR AND MOISTURE.

The Back

FIGHTS HEAT AND COLD.

Together, they knock out the elements.

ZIP System® R-sheathing is the simple all-in-one structural panel with built-in exterior insulation. Featuring integrated moisture, air and thermal protection, ZIP System R-sheathing completely reimagines traditional wall assemblies by streamlining the weatherization process. Learn how to protect your next project at **InsulateYourBuild.com**.

IMAGE COURTESY LANG WILSON PRACTICE IN ARCHITECTURE CULTURE

Upcoming Multifamily Project in British Columbia Combines Passive House and Mass Timber

▶ RETURN TO CONTENTS

PREVIOUS ARTICLE ◀ ▶ NEXT ARTICLE

IN BRITISH Columbia's capital regional district, where housing prices are among the least affordable in all of Canada, the municipality of Esquimalt has given the go-ahead to a development that will offer community-oriented, Passive House–certified, market-rate condominium housing at prices middle income households can contemplate. To achieve its affordability, sustainability, and liveability trifecta—garnering an associated height and density bonus from the municipality—the 83-unit, twelve-story development will combine prefabrication with mass-timber construction, topping out as one of the tallest wood buildings in North America.

"The goal is sustainable, attainable, liveable, community-

IMAGE COURTESY LANG WILSON PRACTICE IN ARCHITECTURE CULTURE

oriented housing that empowers the end user," says Oliver Lang, a principal at Vancouver-based Lang Wilson Practice in Architecture Culture (LWPAC), the project's architect.

Located beside a naval base and named after a small, swift ship, Corvette Landing will consist of cross-laminated timber (CLT) wall, floor, and ceiling panels pre-fabricated to include electrical and plumbing services. These will be craned onto a site-cast concrete foundation comprising three levels of below-grade parking, then be bolted to an engineered wood frame. CLT-based modular cladding panels, which will arrive on-site complete with ten inches of insulation, windows, and a metal skin, will make the thermal envelope so tight the equivalent of a towel heater will heat an entire home.

The use of prefabrication is expected to lop ten months off the 26- to 28-month construction schedule that a comparable building in site-cast concrete would have needed. The carbon-sequestering wood structure will weigh about a quarter of its concrete equivalent, use less energy and produce fewer emissions in construction, and offer advantages in quality control, safety, and risk management through off-site construction. The faster, lower-cost prefabrication process (with the potential to replicate the approach across the portfolio of the developer, Standing Stone Developments), a 25 percent reduction in building size due to a corridor-free configuration, reduced operating costs, and design for hundred-year durability add up to "a value equation that's very attractive," says Lang.

Because the industry is still getting comfortable with mass-timber construction, the project is using panels rather than spatial modules (which would have increased efficiencies even further). And even though mass timber is not as susceptible to fire as stick framing, the timber panels will be encased in gypsum wallboard (and sprinklered) to facilitate regulators' acceptance.

Winner of a 2017 LafargeHolcim Award, Corvette Landing stems from LWPAC's decade-plus study of strategies for improving housing through streamlining the construction process. The project's underlying paradigm, which LWPAC has branded Platforms for Life, uses specially developed design-to-fabrication software to explore multiple scenarios, provide feedback for livability, environmental performance, and critical project data, integrate engineering, and communicate directly with CNC and robotic fabrication equipment. "The platform challenges the conventions of how buildings have been delivered to date," says Lang. ■

ZIP System® Sheathing and Tape Transforms Multifamily Apartment Project

Missouri architect 'would never recommend going back to housewrap' and thermal layers.

MIKE REARDON was attending a lunch-and-learn program for builders and architects in 2014 when the presenter began using "innovative" and "integrated" in the same sentence to describe an alternative to housewrap. It was a lightbulb moment for the Missouri architect and a turning point in how he would approach weather-resistant barriers for his firm's multifamily projects.

"Housewrap issues are a constant challenge on job sites," said Reardon, project manager for M.W. Weber Architects, an architectural design firm that specializes in multifamily, commercial and retail projects. "Housewrap is hard to install and can make dry-in difficult. This is not what you want on a job site.

"In addition," he continued, "I was adding square footage to my own home at the time and was using housewrap. I was experiencing firsthand just how difficult it can be, in terms of usability and making a project airtight."

ZIP System® sheathing and tape is an innovative structural roof and wall system with an integrated water- and air-resistant barrier that streamlines the weatherization process, while providing a continuous air barrier to reduce air leakage. Following the lunch-and-learn presentation on ZIP System sheathing and tape, Reardon was convinced the system could prevent the infiltration of air and water better than housewrap.

"I knew right away I wanted ZIP System sheathing and tape for our firm's projects, and it didn't take much to convince people to switch," he said. "The contractor for our next apartment project was initially sold on housewrap, but once we demonstrated how ZIP System sheathing and tape installs quicker, he was convinced."

Bramblett Hills Apartments is a luxury apartment complex in O'Fallon, Missouri west of St. Louis. The project includes 218,000 square feet of ZIP System panels in 204 apartments in 17 three-story buildings, 87 garages and a clubhouse.

"ZIP System sheathing and tape transformed the Bramblett job site with a two-step installation process – install the panels and tape the seams," said Eric Gowin, president of Contegra Construction, the general contracting firm. "Taping became a one-man job, and that's not possible with housewrap. We have an aggressive construction schedule – completing a new building every 30 days – and this schedule would not be possible without using products designed to perform."

Reardon said another benefit to using a structural sheathing system with built-in moisture protection is that it can be put in place regardless of the time of year. It's a promise the manufacturer, Huber Engineered Woods LLC, backs with a 180-day exposure guarantee.1

"The ZIP System does not appear to be negatively affected by weather during or after installation," he said. "Once the panels are in place the structure is airtight, which is critical to preventing mold and water vapor from penetrating the building. I would never recommend going back to housewrap."

Tim Breece, president of Propper Construction Services, which along with TriStar Development are the owners of the project, said faster dry-in times and more predictable construction schedules are the hallmarks of ZIP System sheathing and tape. Propper also plays a secondary role as construction managers over the development.

"ZIP System sheathing and tape is more reliable than housewrap," Breece said. "The product's water-resistant capabilities and its ability to hold up under extreme weather conditions are especially important to us.

"The continuous air barrier also is a plus, as well as fewer man hours needed to install the product," he added. "The seam tape is an obvious plus too, especially given how unpredictable Mother Nature can be in the Midwest."

Bramblett Hills was completed 2016, and Breece is already looking ahead to his next project using ZIP System sheathing and tape. Propper Construction has more than 450 multifamily units under construction in the St. Louis area.

"ZIP System sheathing and tape has been a great problem-solver for us," Breece said. "It is almost foolproof to install and its ease of installation keeps our projects moving forward with no callbacks. It would be an understatement to say we are bullish about using the system in other multifamily projects." ■

Want to know more?

Interested in more details on how ZIP System sheathing and tape helps streamline the installation process? See Manufacturer Jobsite Training Mitigates Risk for how Huber Engineered Woods' Product Engineering team provides installation training courses.

See Code-Compliant Exterior Systems for Wood-Framed Building Envelopes in the Continuing Education Center for more on how ZIP System sheathing and tape's next-generation integrated solutions can simultaneously provide protection against moisture penetration and air leakage.

See Mitigating Water Leaks around Windows in Wood Framed Walls in the Continuing Education Center for minimizing the likelihood of water leaks through more successful window sealing though the appropriate use of flashing.

At nearly 100 feet, the Wood Innovation Design Center, in Prince George, British Columbia, is the tallest timber-supported building in the world.

IMAGE COURTESY MICHAEL GREEN ARCHITECTURE

Teaching an Old Material New Tricks

Three projects under construction in North America demonstrate that timber can be used as an alternative to concrete, steel, and even masonry.

As a building material, wood's appeal has endured at least as long as humans have been constructing shelters. However, since the industrial revolution, the range of potential building materials has expanded, putting wood at a disadvantage—until now, that is. In the last several years, designers have taken a new interest in wood, even for structural applications in commercial and institutional projects—the kinds of buildings that as a matter of course have been constructed of steel or concrete.

Taking Timber Taller

What is behind wood's new allure? The attribute increasingly cited as a reason to substitute it for other materials is its ability to store the greenhouse gas carbon dioxide—so long as the wood doesn't burn or decompose. These storage properties are among the key factors that interested Vancouver- based architect Michael Green in developing a hypothetical scheme for a 30-story tower with a structure made almost entirely of wood. He has now built a wood "tower"—albeit one that is only six stories: the Wood Innovation Design Centre (WIDC) now nearing completion in Prince George, British Columbia. Topped out in April at just under 100 feet, it is the world's tallest wood building, says Green.

The $23 million (U.S.) WIDC, owned by the province, is intended as a showcase for the region's expertise in designing and constructing innovative timber buildings. It relies almost exclusively on engineered wood components, left largely exposed, and made from a variety of species grown in the region, Iincluding Douglas fir, spruce, and pine. Starting this fall, the approximately 51,000-square-foot structure, which takes the form

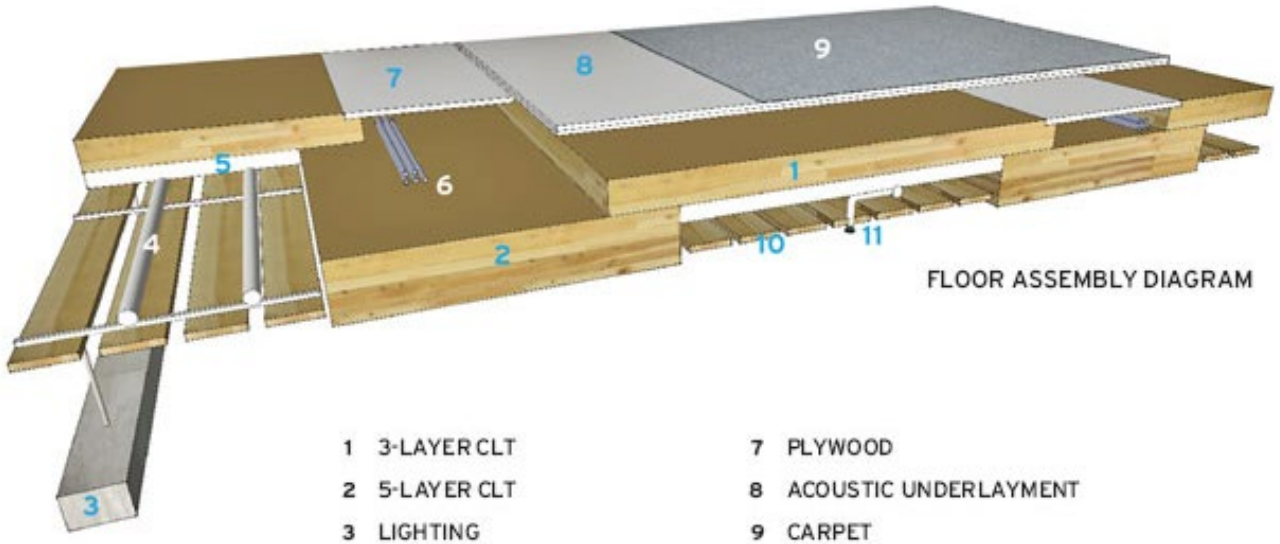
SECTION-PERSPECTIVE

The Wood Innovation Design Center contains siz full stories, a mezzanine, and a mechanical penthouse and is almost completely made of engineered wood components. It is supported by a glued-laminated post-and-beam structure with cross-laminated timber core for lateral load resistance.

IMAGE COURTESY MICHAEL GREEN ARCHITECTURE

of a straightforward box, will house the University of Northern British Columbia's wood-engineering program and office space for other tenants.

Clad in cedar siding that has been charred (to reduce flame spread, explains Green), the WIDC is supported by glued-laminated timber (glulam) post-and-beam structure. Even its stair and elevator-core walls, which make up the primary lateral load-resisting system, are wood. These consist of cross-laminated timber, or CLT (spruce strips glued under pressure in perpendicular lamellae) anchored to the foundation and connected vertically with self-tapping screws. But the WIDC's most ingenious feature is its wood floor slabs made of overlapping panels of 3- and 5-layer CLT joined together with adhesives and a mesh connector. The configuration provides troughs, above and below the slab, for services such as sprinklers and lighting. The finished floor assembly sits on top of the slab, while removable wood slats conceal the service trenches from below.



The WDIC's floors consist of overlapping CLT panels to create chases for building services.

IMAGE COURTESY MICHAEL GREEN ARCHITECTURE

Green points out that one of the chief advantages of the arrangement is the absence of a topping slab, which should make post-occupancy modifications to the building systems relatively straightforward. And, at the end of the structure's life, he says, it will be easy to disassemble it and reuse the timber components due to the limited use of concrete.

To go beyond the code-permitted height for commercial wood buildings—four stories—the design and construction team received a special exemption from the provincial government, following a peer-review process. But the system deployed at the

Studio Gang Architect's Arcus Center for Global Justice Leadership on the campus of Kalamazoo College, in Michigan, has exterior cladding made of cordwood masonry—a construction method first used in the region by its early homesteaders.

IMAGE COURTESY STUDIO GANG ARCHITECTS

WIDC could be used for buildings at least as tall as 20 stories, says Eric Karsh, principal of Equilibrium Consulting, the project's Vancouver-based structural engineer. In order to build to that height, more tests for fire and lateral load resistance would be needed, but he is confident that the system would perform well. The current height limitations are based on the properties of light-frame construction, he explains. "Post-and-beam systems behave differently, as does solid-panel construction," he says.

Play on the Past

Performance attributes such as structural properties and fire resistance are just one set of issues that design teams consider when selecting a material. Chicago-based Studio Gang Architects clad its Arcus Center for Social Justice Leadership, nearing completion on the campus of Kalamazoo College, in Michigan, with stacked white cedar logs harvested in the northern part of the state. They chose the material, known as cordwood masonry, for the outside of the boomerang-shaped steel-framed building, in part because of its connection to the place: it was first used in the region by early homesteaders. "The material is renewable and has a history there," explains Todd Zima, a Studio Gang design principal.

The building's cladding and construction method also offered a number of other "synergies" with the center's mission to support

the pursuit of human rights, says Zima. In addition to its tie to a vernacular building technique, each of the log sections has its own color, shape, and size, reflecting the diversity of the population that the center will serve. He describes the process of building a cordwood masonry wall as "democratic"—it doesn't depend on sophisticated technology or machinery and allows people with a wide range of abilities to participate.

As it turns out, professional masons are constructing the 10,000-square-foot center's cordwood walls. "For various reasons, like liability, it was better to have professionals build them," says Zima. But despite such real-world concerns, project stakeholders—including the architects, the contractors, and the client—did get a chance to try their hands at the technique. They took part in workshops led by cordwood-masonry experts Rob and Jaki Roy, from Earthwood Building School of West Chazy, New York. The training sessions, held during the design and construction phases, helped generate enthusiasm for the method and provided the project team with a solid foundation for experimenting with the material. For example, it gave the architects the necessary knowledge to detail the building's curved walls and allowed them to understand the criteria involved in selecting a mortar mix—one that wouldn't cure too fast and pull moisture out of the wood, creating unsightly cracks.

Because of the building's boomerang shape, its cordwood walls are curved, complicating construction.

PHOTO © STUDIO GANG ARCHITECTS

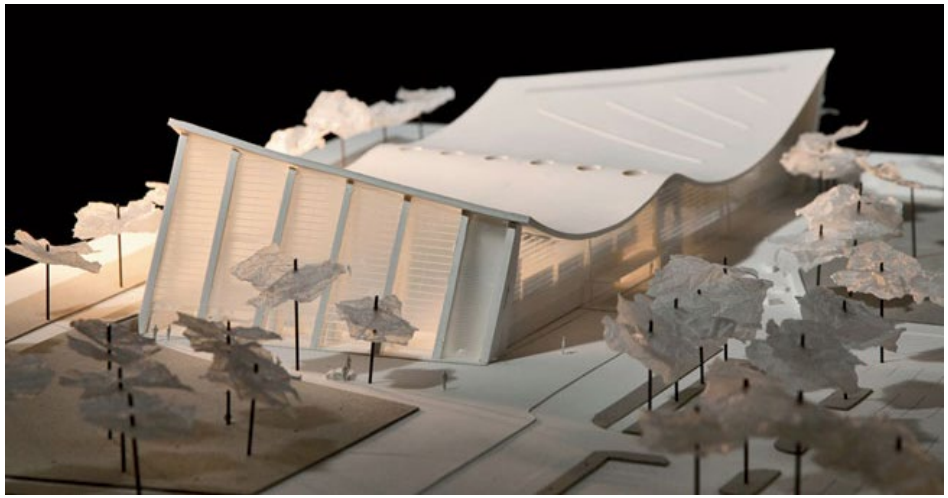
Although cordwood is inherently a good insulator, the project

team improved its performance by incorporating it into an assembly that is similar to a brick cavity wall. In addition to the wood, which is 11 inches deep, and a 1½-inch cavity, the exterior enclosure also includes continuous insulation, air and waterproof barriers, and a stud wall. Like a typical brick cavity wall, it also has weep holes. The entire system is almost 2 feet deep and provides a thermal resistance of R 30.25—an insulation value that comfortably surpasses the minimum set by the code. The wall section, points out Zima, also serves to update a traditional material, making it appropriate for a modern, pressurized building.

LONGITUDINAL SECTION

Making waves in Wood

While some designers are attracted to timber for its ability to store carbon and some for its cultural and historical associations, other project teams are using the material to creatively solve the problem of longer spans. The $42 million (U.S.) Grandview Heights Aquatics Centre is the result of such an approach. Here Vancouver-based Hughes Condon Marler Architects (HCMA) has devised an undulating timber roof to cover a municipal swimming pool complex under construction in Surrey, British Columbia. The roof structure is made up of glulam beams, only 5 inches wide and 10½ inches deep, which span 425 feet with just



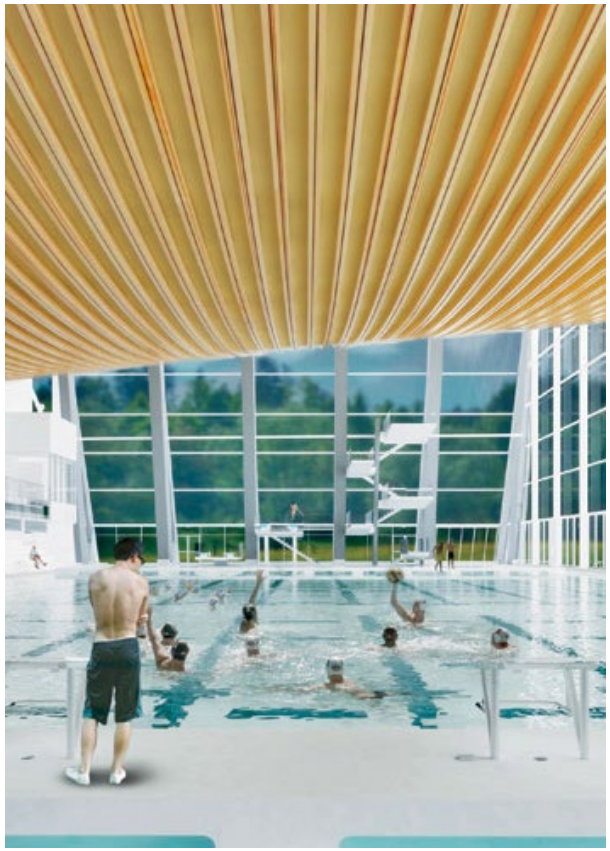
The swooping roof over the pool complex at the Grandview Heights Aquatics Centre spans 425 feet, with only one set of intermediary supports.

IMAGES COURTESY HCMA

one set of intermediary supports. Even HCMA's project architect, Melissa Higgs, says the beams, placed in pairs every 30 inches on center, are "astonishingly thin."

These beams behave, in fact, like cables, performing in tension. Suspended from a line of post-tensioned concrete buttresses at each end of the building, and a set of V-shaped concrete columns at midspan, they form catenary curves that dip from a maximum height of 72 feet to a minimum of about 29 feet. The impetus for this swooping profile was the need for the roof to clear a set of diving platforms at the deep end of the complex's competition pool. The architects considered the height unnecessary for the rest of the 86,000- square-foot building, which also houses a leisure pool, a waterslide, a café, and a fitness center. All are enclosed within a curtain wall that combines glass and translucent polycarbonate.

The team explored other options for supporting the roof, including steel trusses. However, these would have needed to be almost 10 feet deep, making the structure even taller. That would have made the conditioned space within the building envelope greater, raising construction costs (for the additional curtain wall enclosure) as well as energy costs. Designers also considered a traditional steel cable. But such a solution would have provided "zero bending stiffness," says Derek Ratzlaff, an associate at Fast + Epp, the project's Vancouver-based structural engineer. In order to prevent it from deflecting too much in the wind, the steel cable version of the roof would have needed to be heavier, as well as less elegant, he adds. The glued-laminated elements have bending stiffness, so extra weight was not required.



The impetus for the wavy profile was the need to clear a set of diving platforms.

IMAGE COURTESY HCMA

The timber structure also offered the advantage of being better suited than steel for the potentially corrosive pool environment. But the biggest benefit of the wavy wood roof is its drama, says Higgs: "The ceiling ends up being a big part of the visitor's experience." It is such possibilities, in addition to its structural and environmental characteristics, that make wood so alluring. The material's aesthetic value, as well as its performance attributes, will continue to push architects and engineers to find new applications, create longer spans, and reach for new heights. ■

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