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Hybrids on the Way to the Western Platform Frame: Two Structures in Western Virginia

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Because of the availability of water-driven sawmills, lumber producers in small towns in the Appalachian Mountains did not invest in the steam-powered saws and kilns needed to produce moisture-stabilized framing lumber. Carpenters were therefore unable to reproduce platform-framing practices common in the Midwest. This required the Appalachian carpenters to make significant adaptations of platform-framing practices to cope with the shrinkage and settlement problems associated with “wet” building materials.

Systems and strategies for wood-frame construction have largely emerged from the material knowledge of the timberwrights, homesteaders, and carpenters responsible for the house, store, church or hotel they were building. Three major approaches to building with wood were employed after the Civil War: the braced frame, the balloon frame, and the platform frame (Lanier

and Herman 1997). The braced frame is distinguished by its use of large, heavy timbers, more intricate hand-cut mortise-and-tenon connections, and the large numbers of people needed to raise it. These large crews made the raising of a braced frame an inherently social process. The balloon and western platform frames, the focus of this paper, are distinguished by their use of lightweight, thin, factory-milled lumber, one- to two-inches thick, simply cut, with nailed connections, and requiring a minimally-skilled workforce, rudimentary tools, and small building crews (Lanier and Herman 1997).

Figure 1 illustrates corners of the balloon, platform, and hybrid frames. It is easy to distinguish that the balloon frame’s second-floor joists do not support the wall, the signature of foundation-to-roof continuous framing. By contrast, the platform frame positions the floor “platform” between the first- and second-floor vertical wall studs, while the hybrid “Blacksburg” frame

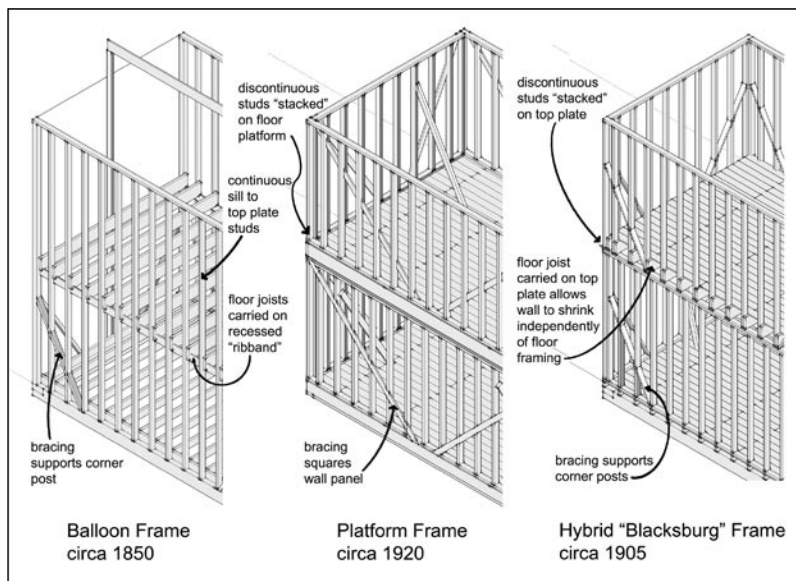


Fig. 1. Comparison of balloon, platform, and hybrid “Blacksburg” frames (Illustrations by author unless otherwise noted).

Table 1. Defining characteristics of braced, balloon, and platform framing

Characteristic	Braced Frame	Balloon Frame	Platform Frame
Utilization	1500s to present.	1830s to present.	1850s to present.
Material	Rough timbers 4 to 12 inches thick.	Milled lumber, 1 to 2 inches thick.	Milled lumber, 1 to 2 inches thick.
Joint prep skill	Knowledge of descriptive geometry.	Ability to cut a square (90 degree) end.	Ability to cut a square (90 degree) end.
Wall framing length	9 to 12 feet tall.	14 to 16 feet tall.	8 to 9 feet tall.
Tool set complexity	High, chisel set, planes, mallets, in addition to squares, saws, levels, and hammers.	Medium, some chisels for timber sills on foundations, squares, saws, levels, and hammers.	Low, squares, saws, levels, and hammers.
Joint fastener	Interlocking timber ends, wooden pegs "trunnels."	Cut or wire nails.	Wire nails.
Defining aspect	A series of heavy timber frames linked by horizontal timber girts, infilled with lighter materials.	A full building height wall built up from milled lumber studs and joists spaced 16 to 24 inches apart, vertical wall studs extend from foundation sill to roof plate.	A single story height wall built up from milled lumber studs and joists spaced 16 to 24 inches apart but supported on the floor joists and subflooring instead of directly bearing on the foundation sill.
Lateral bracing	Timber "knee" braces upsloping from post to girt. Installed prior to frame raising to keep frame square.	Milled lumber downward sloping brace from upper third of corner post to foundation sill installed before wall studs to hold corner posts plumb.	Milled lumber downward sloping at 45 degree angle from building corners within the plane of the wall studs, installed as wall panels are fabricated.
Construction crew size	Large, components are heavy, requiring many people to raise the frames with ropes and pike poles. Diverse skill set required to refine logs into timbers, lay out and cut joints. Community-scale effort requires significant advanced planning to erect frame in one workday.	Small, components are lightweight and easily handled by one to two people. Simple components and joining offer flexibility in preparation and construction schedules.	Small, components are lightweight and easily handled by one to two people. Simple components and joining offer flexibility in preparation and construction schedules.
Advantage	Traditional, durable.	Innovative, lightweight components, easily shipped and simply joined.	Makes use of shorter lumber lengths and facilitates multi-floor buildings, Solves problem of fire transfer through stud cavities with cross grained lumber plates acting as firestops.
Disadvantage	Requires close proximity to forest as large timbers are heavy, difficult to transport. Requires onsite refinement of log into timber and further refinement for joint fabrication. Frame becomes redundant as infill walls of "scantling" (2 inch thick materials), are seen as capable of supporting residential loads.	Requires long lumber length for two-story buildings, practically limited to two-story construction by available lumber length. Sill to plate stud lengths make vertical propagation of fire a significant problem.	Supporting wall studs on floor joist/subfloor platforms and capping stud assemblies with horizontal plates introduce a significant quantity of shrinkage-prone, cross-grain lumber into the wall plane. Differential settlement due to shrinkage results in doors/windows becoming inoperable.

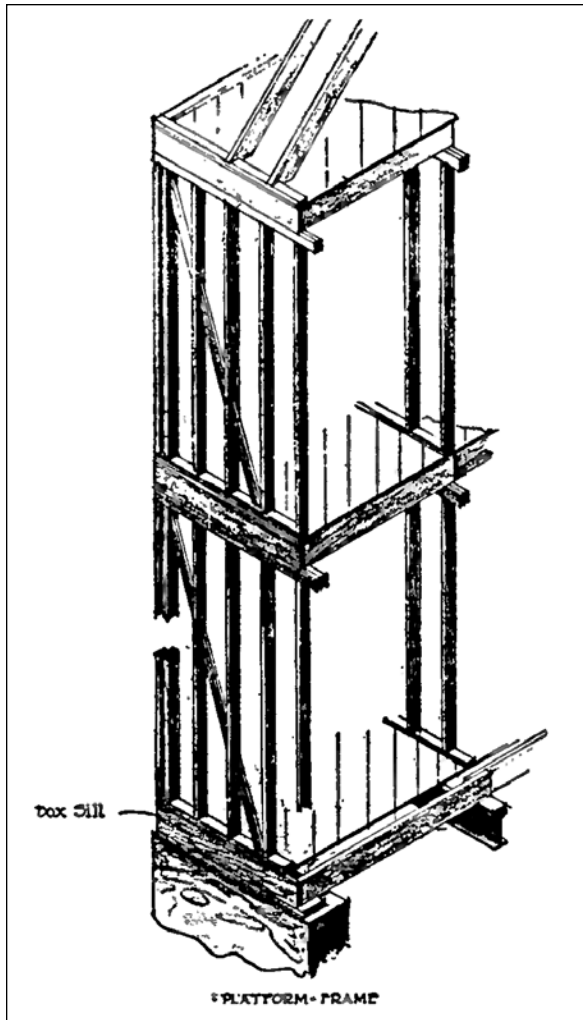


Fig. 2. Platform frame showing studs spanning floor to ceiling (Walsh 1923).

employs the stacked wall of the platform frame and the second-floor joist bearing independent of the wall studs. The platform frame has emerged as today's home-building industry's framing method of choice (Thallon 2008) because of its stacking approach, where walls and floor platforms allow it to be applied easily to multistory construction and to prefabrication methods (Loeb 2001).

Table 1 shows the key characteristics of each approach to wood framing. These systems were drawn and described in narrative by Maginnis (1896), Bell (1858), Fair (1909), Walsh (1923), Graham and Emery (1923), and authoritatively by the Federal Security Agency's U.S. Office of Education's 1931 publication *Light Frame House Construction* (Hambrook 1931). Prior to the definitive articulation and advocacy by the

federal government, the platform frame developed in hybrid systems, where the insight of the carpenter into problems of shrinkage, economy, and stability is clearly apparent. This paper illustrates one such hybrid and argues for the need to document and preserve such ordinary-appearing buildings that bear valuable lessons beneath their siding.

In *The Construction of Small Houses* (1923), Walsh illustrates a two-story plus attic platform frame with down braced corner studs, a double top plate made with side by side 2x4s (perhaps an error in illustration), diagonal wood subflooring, and a box-sill (Fig. 2). One particular innovation, first shown and described here by Walsh, is the inclusion of a steel I-beam to support the mid-span of the first floor and bearing walls above. That Walsh recommends placing a "2 inch thick timber"

on top of the I-beam confirms his concern with cross-grain shrinkage. Placing this piece of lumber on the I-beam would equalize the amount of cross-grain lumber supporting first-floor joists at the outside wall and at the I-beam mid-span support. Walsh's publication is the first to specifically describe the construction sequence of the platform frame.

The *Audels Guides*, a definitive source of methods and techniques for the building trades, illustrate the western framing method for the first time in the 1923 edition of *Audels Carpenters and Builders Guide #3* (Graham and Emery 1923). A full-page illustration (Graham and Emery 1923, 874-4) shows the distinctive wall-on-floor platform configuration that remains the defining characteristic of the platform frame today (Fig. 3).

In "Framing the American Dream," David Monteyne (2004) identifies the sill, single-floor stud length, and connection between floors as the key differences between the balloon and western platform. The balloon-framing process is summarized as follows (Fig. 4): first, sills are laid out on the foundation walls or piers and squared, corner posts extending the full two-story height of the wall are set and braced in place with downbraces; second, plates that span from corner to corner are nailed to the top of the posts; third, the full wall-height studs are placed in the wall one at a time

and nailed to the sill and plate: fourth, studs are cut over the braces; fifth, studs are notched just below the level of the second floor to receive a ribband or ledger board to carry the joists; sixth, the second-floor joists are installed followed by subflooring; seventh, the first-floor joists are notched into the sill and wood subfloor is attached; and, eighth, the ridge board is set to prepare for roof framing. Finally, wood sheathing is attached to the studs, creating a semi-rigid shell.

The platform-framing process is summarized as follows (Fig. 5): first, sills are laid out on the foundation wall or piers and squared; second, subflooring is nailed to the joists to make a work platform; third, one-story-high stud walls are laid out on the work platform, with studs held apart at sixteen-inches-on-center by top and bottom plates; fourth, a diagonal brace is notched in to the exterior face of the studs to square each wall panel; fifth, the wall panel is tipped up into vertical position and temporarily braced to the work platform; sixth, this wall panel process is repeated for each wall; seventh, the splice plates, a second top plate, are nailed to overlap and tie together adjacent wall panels at each corner; eighth, the second floor joists are nailed to the second top plate; ninth, the subfloor is installed to create a work platform upon which the process repeats for the second floor (steps 10-12).

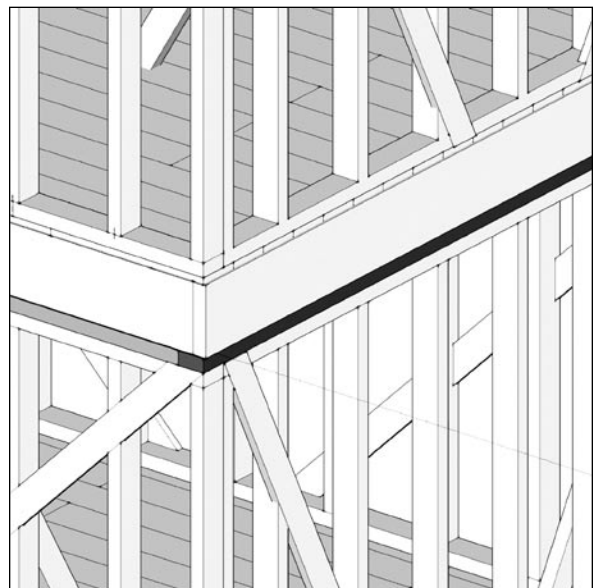


Fig. 3. Detail, platform frame double top plate splice. (Based on Graham and Emery 1923, 874-4).

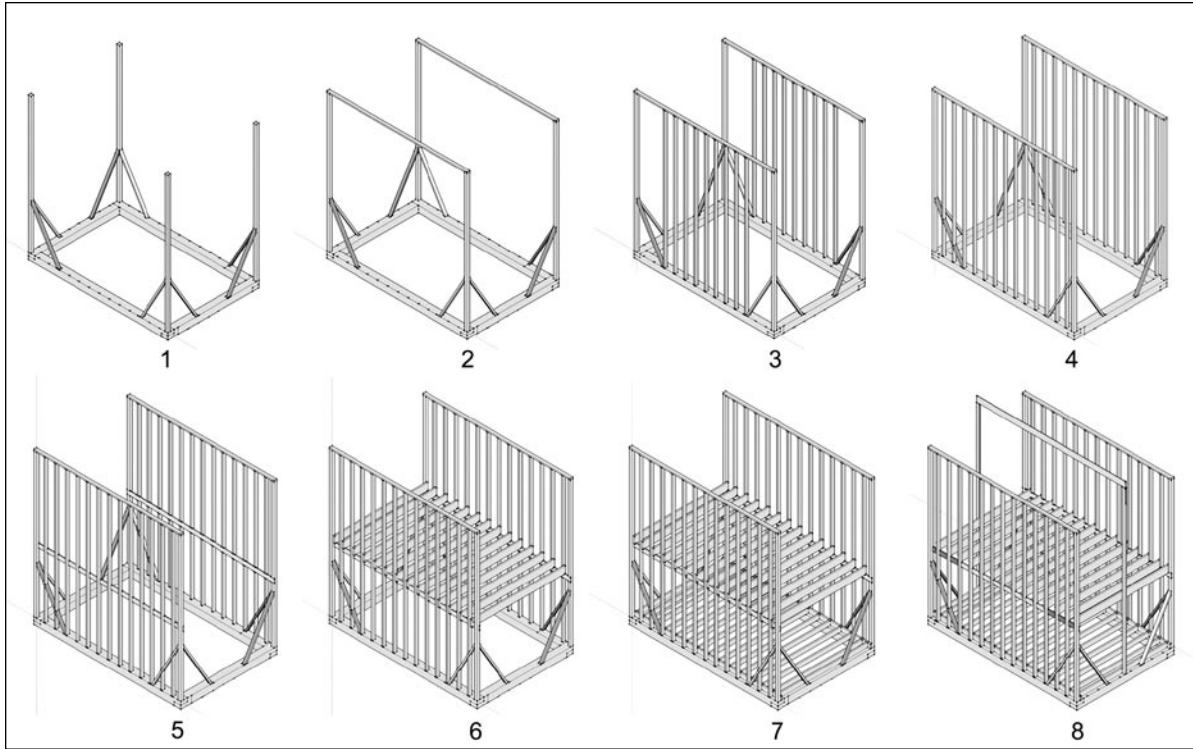


Fig. 4. Balloon frame floor construction process.

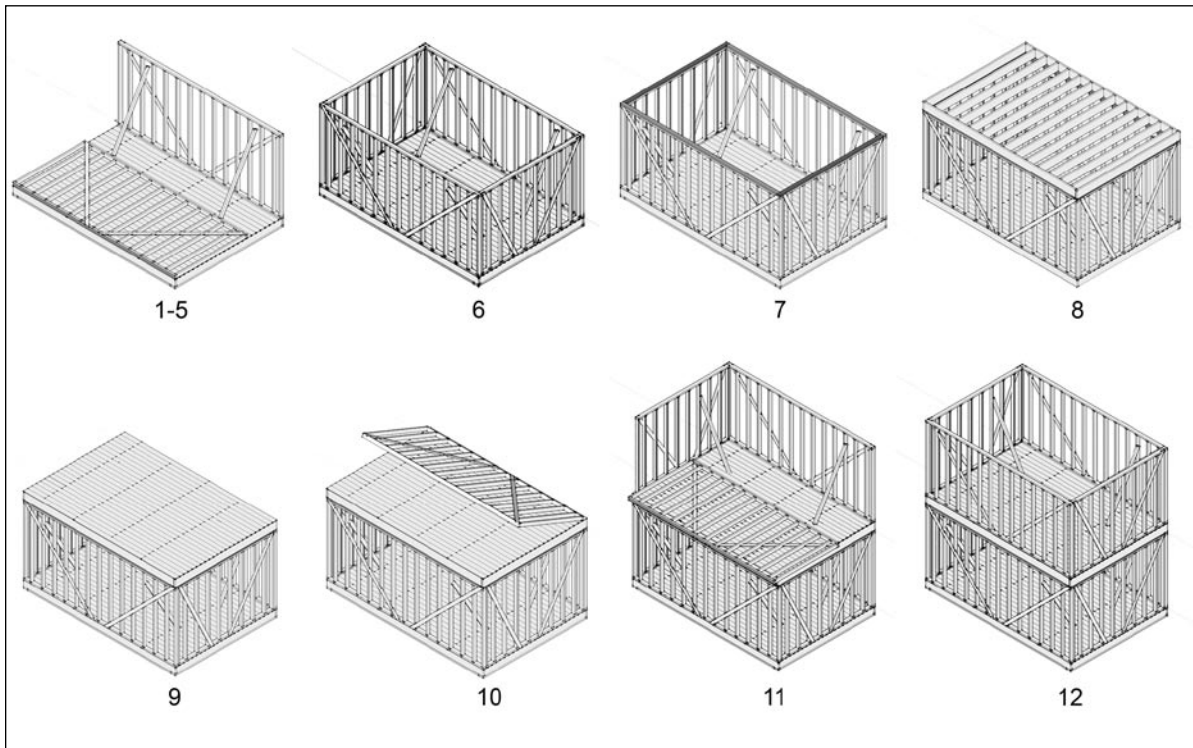


Fig. 5. Platform frame construction process.

HISTORICAL ORIGINS

That carpentry is a progressive art is a truism that the observer will not hesitate to admit, and a careful examination of the timber structures being erected in the United States to-day will impress the examiner with the fact that it is also a liberal art.

— (Maginnis 1896, 18)

The historical origins and development of the balloon frame have been widely discussed by such prominent researchers as Sigfried Giedion (1963), Fred Peterson (1992), Paul Sprague (1983), and more recently, Ted Cavanaugh (1997). Details and drawings of the balloon method had been disseminated in agricultural and trade journals of the middle to late 1800s, such as *The Country Gentleman*, *The Practical Carpenter*, and the *American Agriculturist*. Trade publications have also illustrated the balloon frame and its associated details since 1858 in *Carpentry Made Easy* (Bell 1858), *Practical House Framing* (Fair 1909), and *Audels Carpenter's and Builder's Guide #3* (Graham and Emery 1923). The federal government's "Committee on Wood Utilization" was still extolling its virtues in 1931, almost a century after its assumed invention (Hambrook 1931).

Although professional engineers played a role in the development of the steel frame, wood construction methods were seldom backed by an engineer's analysis. Rather, the best wood-framing practices emerged from traditions disseminated in the popular press of the mid-to-late 1800s. Formal description and standardization of material sizes and moisture content did not occur until 1910, when the Forest Products Laboratory (FPL) was established by the federal government in Madison, Wisconsin, and began conducting research and publishing research-backed standards.

Some of the earliest details of the balloon frame were published in 1863 in *Woodward's Country Homes* (Woodward and Woodward 1863). In this publication, the Woodward brothers illustrate key framing details and narrate the construction process of the balloon or basket frame. They begin with the sill and quickly

move on to describing the construction of the corners out of two 2x4s, plumbing them in place, bracing them, and installing the intermediate studs individually. The Woodwards describe the studs, typically 9 to 14 feet long, being toe-nailed into the sill, placing a first-floor joist adjacent to each stud, nailing the joist to the side of the stud, and nailing what we now call the ribbon or ribband into a notch cut at the inside face of the stud wall. With this ribband in place, a second-floor stud is notched to overlap the ribband and is placed and nailed adjacent to the face of the stud. Once all the studs and second-floor joists are installed, the Woodwards directed the carpenter to "saw off all the studs to an equal height" and then install the 2x4 top plate "laid flat on top of the studding." This means that prior to the plate's being installed, and particularly before the ribbon is installed, each stud is flopping precariously in the wind, restrained only by the toe nails and first-floor joists. This also means that the top plate, as a single plate, was not used to splice together the end walls by overlapping the end wall plate, as is common practice today. The Woodward brothers illustrate end walls framed full-height from the sill to the underside of the roof rafter (Fig. 6).

The Woodward brothers' book, and their active participation in advocating and debating the techniques and merits of the balloon frame in the pages of the popular series titled *The Country Gentleman*, contributed

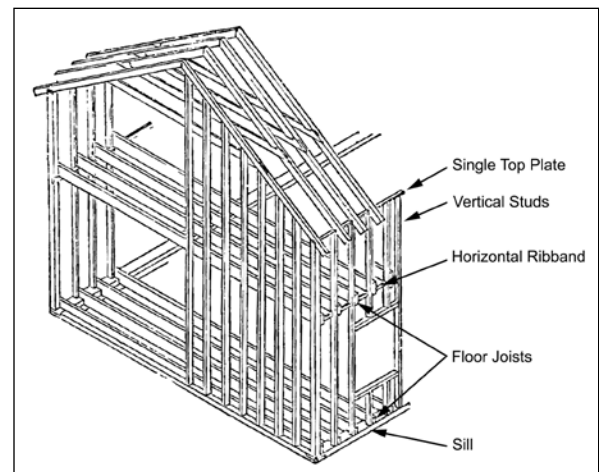


Fig. 6. Diagram of balloon frame showing vertical wall studs extending from sill to rafter (Adapted from Woodward and Woodward 1863).

to the widespread adoption of the light wood framing method for houses and agricultural buildings across the Midwest. However, the popularity of the previously dominant braced timber frame method of construction persisted well beyond the adoption of the balloon frame. As late as 1922, *The House-Owners Book* voiced suspicion of the balloon frame and compared braced and balloon framing types:

These (Braced Frame and Balloon Frame) are the two types of frame in common use. The braced frame is stronger, the balloon frame the more economical. In the braced frame, each wall consists of the sill, at the bottom, the plate at the top, two corner posts, one or more girts supporting the upper floors, diagonal braces at each corner, and studs running from sill to girt. In balloon framing, the studs run from sill to plate, and there are no braces and no girts. A horizontal piece, called a ledger-board, or sometimes a 'ribbon,' is set into the studs at each story, to support the floor joists. Balloon framing is comparatively modern, and is looked upon with disfavor by many (Churchill and Wickenden 1922, 69-71).

In *Technics and Architecture*, Elliott (1994) concludes that the balloon frame was dominant until the turn of the century, when it was slowly replaced by western platform framing. But how did this happen? Did the western platform frame emerge in full form as we know it today, or were there hybrids developed from braced and balloon framing in combination with the key single-floor-height wall studs that distinguish platform framing from balloon framing?

An argument can be made that the distinguishing characteristic of the platform frame, the method of framing bearing walls in multistory buildings with single-floor-high studs, dates back as early as 1855, a mere twenty-two years after the balloon frame is said to have been developed. Gervase Wheeler (1855) attributes this early citation to Paul Stillman, who affirmed Solon Robinson's advocacy of light framing. Stillman describes a building method observed in the California gold fields. This first observation of western platform

framing was published with only this following sparse description and no illustrations: "Paul Stillman said that he had seen a whole block of houses built in two weeks at San Francisco, and better frames he never saw. They were put up a story at a time-the first two floors often laid and lower part of the frame sided and in use before the upper part was up" (Wheeler 1855, 413).

This is all we have of the first possible description of what has become the dominant light framing method in North America, largely responsible for the home ownership rates that underpin the development and emergence of the middle class (Monteyne 2004). Fifty-four years after Stillman's description, Albert Fair (1909) illustrated a key feature of what will become the platform frame (Fig. 7). Fair accurately describes the process of preparing the stud wall for raising: "When there are a number of men it is a good custom to space the studding on sills, plates and ribbon; nail ribbon in place, also spike a 2x4 on top of the studding for plate, and raise eight to twelve studs, etc., at a time, afterwards spiking on another 2x4 to complete the plate" (Fair 1909, 49-50). We might assume he intends the wall to be assembled while lying on the first-floor subfloor. This is a key characteristic of the platform frame recognizable on construction sites even today.

Specifics of the platform frame, which employs the same standardized sizes of studs, plates, and joists as the balloon frame, get little mention and even less

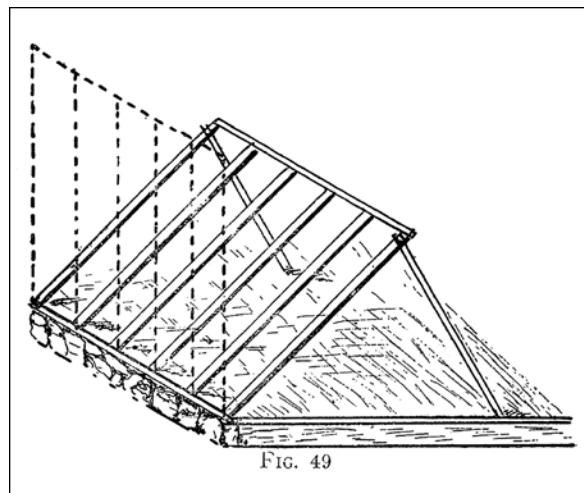


Fig. 7. Platform frame construction process, showing braced wall panel construction on floor platform (Fair 1909).

description in either academic or trade publications.¹ As late as 1970, *Architectural Graphic Standards* (Ramsey and Sleeper 1970) fails to differentiate the dominant platform frame from the rarely-used balloon frame and the braced frame.

The balloon frame is well documented compared to the platform frame, which doesn't make a full, illustrated appearance in print until trade books present it in the 1920s. This may be due to its dependence on kiln-dried lumber, which was emerging in the early 1900s as a by-product of the heat from sawdust-fired steam boilers that powered the saws in the mills. This relationship seems to be confirmed in *The Houses We Live In* by Frank G. and Frances Carpenter (1906). In this children's book, the authors follow a log from felling in the forest through transport to mill, through the saw-and-sanding process, to the "last stop," the drying room.

We walk through huge piles of lumber lying out in the sunshine, green wood. It (the steam kiln) does this work (taking moisture out of the wood) much more quickly than will the sun's rays. But the sawyers say that lumber dried out of doors in the fresh air is often preferred (Carpenter and Carpenter 1906, 54-55).

BALLOON FRAME VS. PLATFORM FRAME: WHICH SHRINKS MORE?

As late as 1931, wood shrinkage and its associated problems — uneven floors, doors and windows sticking — must have been a significant problem in light wood framing. The government's earliest studies of house construction discuss the western platform frame saying "Its chief merit, in strictly all lumber construction, lies in the fact that if any settlement, due to shrinkage, occurs, it will be even and uniform throughout and so be unnoticeable" (Hambrook 1931, 8). During this era of emerging governmental interest in standardization of materials and construction methods, lumber was still being shipped, stored, and sold in various stages of dryness. Meanwhile, the federal government was promoting the platform

frame as the solution, although with the caveat that it was not appropriate to use in combination with masonry veneer.

Problems related to shrinkage in light frame houses had been well known some years earlier. In *The Construction of the Small House*, H. Vandervoort Walsh (1923), an instructor at Columbia University, describes the platform frame as a solution to cross-grain ("cross-section") timber shrinkage and may have been the source of the federal government's advocacy.

For all the derisive commentary leveled at the balloon frame and its continuous sill-to-roof plate studding, this method placed very little cross-grained lumber within the plane of the wall (only a 2-inch sill and 2-inch top plate, for 4 inches total) so overall, the wall would experience very little shrinkage, helping to keep doors and windows fully functional and allowing the homeowner-builder to use green, that is, wet lumber, fresh from the sawmill, having a moisture content at the time of construction between 11 and 26 percent (Hoadley 1980, 76-79).

The platform frame's characteristic connection of floor joists and subfloor to the wall above and below gave builders a good reason to be concerned about shrinkage. When the wood grain is oriented horizontally, as it is in the plates and joists of the platform frame, it experiences significant shrinkage. Thus, the platform frame, with its three horizontal wall plates (top plate first floor, splice plate, bottom plate second floor), plus the depth of the floor joist itself and the subflooring, places considerable cross-grain lumber within the plane of the wall, typically adding up to 34 inches. The movement associated with shrinkage (up to 10 percent) in this exterior wall plane seriously compromises the operation of windows and doors, particularly if the floor joist does not bear on equal quantities of cross grain at each support point. In total, the platform-framed walls may move up to three-quarters of an inch in the first few years as they dry (Hoadley 1980, 76-79).

Given the availability of kiln-dried lumber emerging from the steam-powered sawmills in the forests of Wisconsin, Michigan, and Minnesota, moisture-related stability was becoming less of an issue in many midwestern and western housing markets.



Fig. 8. Kanode Sawmill, 1901, showing water-driven frame or "Muely" saw outside Blacksburg, VA (VT ImageBase [<http://imagebase.lib.vt.edu/>]) housed and operated by Digital Library and Archives, University Libraries; scanning by Digital Imaging, Learning Technologies, Virginia Tech [<http://spec.lib.vt.edu/imagebase/localhistory/full/BI-6.jpeg>]). Used with permission.

In the hardwood forests of the Appalachians, however, water-powered mills persisted well into the early decades of the 1900s, driving both frame and circular saws (Fig. 8). The lumber produced by most of these small local mills was typically hardwood, locally harvested oak, cherry, and chestnut used for both heavy-braced frames and the platform frame. This lumber was cut and either air-dried or put in use shortly after milling, because the steam kilns were not seen as a necessary investment for the water-powered sawmills that had been in use for decades. This frequently resulted in lumber's having a high moisture content and being susceptible to shrinkage as it dried. Therefore, Appalachian builders had to employ framing methods that could reduce the problem of wood shrinkage while simultaneously profiting from the inherent advantages of the platform frame over the balloon frame. These techniques produced hybrid methods of construction utilizing the key characteristics of the platform and balloon frames (Table 1): wall framing lengths common to the platform frame; top and bottom plates between floors from the platform frame providing vermin barriers and fire stops; and a combination of tilted-up stud wall panels common to the platform frame on first-story floors and sequentially placed studs from the balloon frame on second-story walls.

FIELD OBSERVATIONS: TWO LIGHT WOOD HYBRID FRAMES

Two buildings in Blacksburg, Virginia, serve as the examples of this hybridization: one a social hall that was accidentally damaged by a vehicle, and subsequently repaired, the other a house that was intentionally demolished. In both cases, the frame was only partially exposed, but distinguishing details (e.g., sill, corner post, top plate, and wall-floor-wall connection) were visible. These exposed features showed unique applications of the platform framing method.

At the time these two light wood frames were constructed, between 1905 and 1919, the recently established Institute for Agriculture and Mechanics, now known as Virginia Tech, anchored the town's economy. Blacksburg was emerging from its frontier-town origins, slowly converting its building practices from owner-built log cabins to carpenter-constructed wood homes and structures. As a university town, it was a place where the faculty and students pursued classical studies, new knowledge, and innovation. It had a single rail spur that dead-ended in Blacksburg, primarily serving as transportation for people and locally mined coal. Among the roughly four thousand residents, Blacksburg had several professional carpenters, who appear on the tax roles.

The Odd Fellows Hall

The older of these two buildings was constructed in 1905 as an Odd Fellows Hall, Lodge 6184, in the African American "New Town" section of Blacksburg (Fig. 9). No records exist to shed light on the carpenter/designer of this building, but the founding members of Lodge 6184 were James Anderson, John Anderson, Gordon Mills, John Rollins, Grandville Smith and Robert Evans. Early in the year 2000, a truck collided with the building, shifting it slightly on its foundation and removing a portion of cornerboard and siding to expose the framing beneath. A number of interesting characteristics were observed along the building's short axis (Fig. 10):

- The walls use a double top plate, with the 2x4s oriented horizontally.
- The double plates are arranged to splice the corner together.
- No rim joist or floor joist is present between the first- and second-floor wall studs.

The building thus appears to be based on a distinctive framing type, neither balloon frame, nor braced frame, nor western platform frame as it was illustrated around this time.

Additional characteristics become apparent when examining the exposed framing along the long axis of the building (Fig. 11):

- There is no sheathing below the siding.
- There is a down brace on the built-up corner post.

The Odd Fellows Hall exhibited distortions in the siding, as well as binding doors and windows. Visual inspection of the foundation showed it to be substantially intact, not having suffered settling, but it had been undercut by years of erosion from an adjacent street and required underpinning to stabilize the building and allow for regarding of the soil adjacent to the building. The vehicle impact, which removed a length of corner trim and siding, revealed vines originating from within the crawl space, confirming the presence of a consistent water source that had substantially deteriorated the timber sills.

Stabilization and remediation of the deteriorated sills at all four sides of the building and corner framing at one corner were completed in 2008. The lower 30 inches of siding and trim were removed to gain access to the crawl space where the building was jacked back into a plumb and level state. Jacking under the floor joists raised the frame sufficiently to remove the rotted timber sill and replace it with a similar-sized treated wood timber sill. Where corner framing had rotted, siding and trim were removed, the rotted framing cut back to the sound wood above the deterioration, and the cut-out pieces replaced with treated wood framing. To ensure a structural tie between new and old framing, galvanized steel straps were used to fasten each existing stud and joist to the treated wood. The siding and trim were replaced, existing paint removed, and the repainted building stands today as the site of a future interpretive center.



Fig. 9. Front of Odd Fellows Hall, restored 2007 (Photograph courtesy of the Blacksburg Museum).

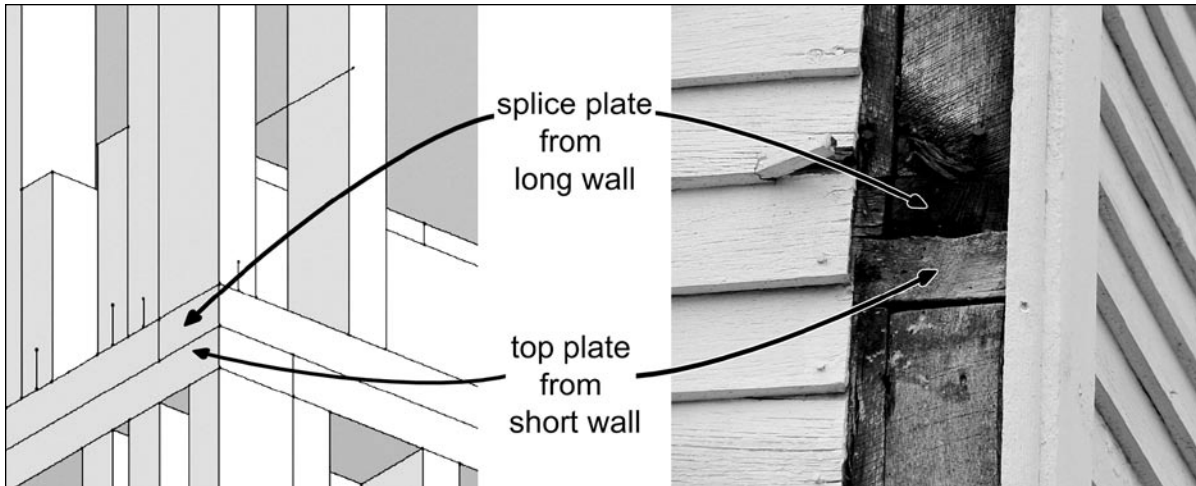


Fig. 10. Cornerboard of Odd Fellows Hall removed in the accident reveals that the stud walls are supported on each other's plates, a significant difference from the traditional platform frame.

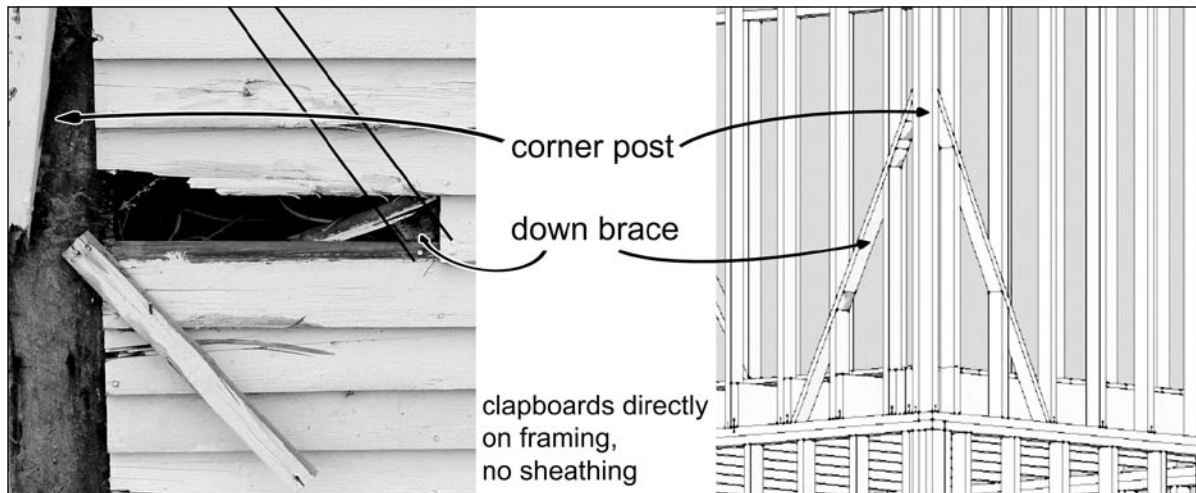


Fig. 11. Corner trim and siding of Odd Fellows Hall following impact; exposed framing reveals the presence of a down-brace from the corner post to the foundation sill.

209 Wall Street

The second example was observed during the disassembly of an 1850s-era log cabin at 209 Wall Street, which was systematically tagged for storage and reassembly by the Town of Blacksburg (Fig. 12). This one-room cabin was the original structure on the property. An I-type light frame structure was added to form an L-shaped house footprint, with the original cabin functioning as the kitchen. A receipt issued by Blacksburg Hardware found in the wall cavity during

demolition indicates that it was the materials supplier for the frame's construction and strongly suggests 1919 as the date of the hybrid frame addition.

The disassembly of the original cabin and demolition of the later addition were the results of a change in ownership. Because the addition was constructed in the most economical way possible, it had little visual appeal to make it stand out as a clear exemplar of an architectural style. The family that built the house and subsequent owners were similarly anonymous. Although unique for its building technology and

construction, this house was overlooked during the local historic properties survey. The property was sold to an adjacent landowner for expanded parking, and the cabin was disassembled and donated to the municipal museum.

During the hours required to disassemble the log cabin, it was possible to photograph key details before the entire hybrid frame was demolished. The significance of the exposed framing, however, was not evident at the time of demolition. Like the 1905 Odd Fellows Hall, this house had hand-hewn heavy timber sills atop the stone foundation. The sill timbers were joined with a traditional scarf joint common in Chicago balloon frames² and braced frames of this time period (Fig. 13), and the sills appeared to be in excellent condition. Also visible were the ends of the floor joists, notched to fit around the sill, a rough one-inch-thick subfloor, a rough-sawn 2x4 horizontal

plate, and vertical 2x4 studs. That the studs sat on top of the plate, and the plate sat on top of the subfloor mark this frame as the work of a carpenter who was fully informed on platform framing methods. A less informed carpenter would have nailed the studs directly to the sill, as was the tradition in balloon and braced framing.

The house frame had siding nailed directly to the face of the studs. No wall sheathing was evident — a significant departure from the published platform frame information from this era — and the siding was in a shiplap pattern, fully one-inch thick. In theory, the absence of the wall sheathing (which acts as a structural diaphragm) would have diminished the ability of the frame to resist lateral forces.

Both the Odd Fellows Hall and the 209 Wall Street house frames utilized diagonal 2x4s to connect the corners of the walls to the base plates.



Fig. 12. Log cabin at 209 Wall Street, Blacksburg, VA, in the process of being carefully disassembled for storage and reassembly. I-house with hybrid frame is in the background.

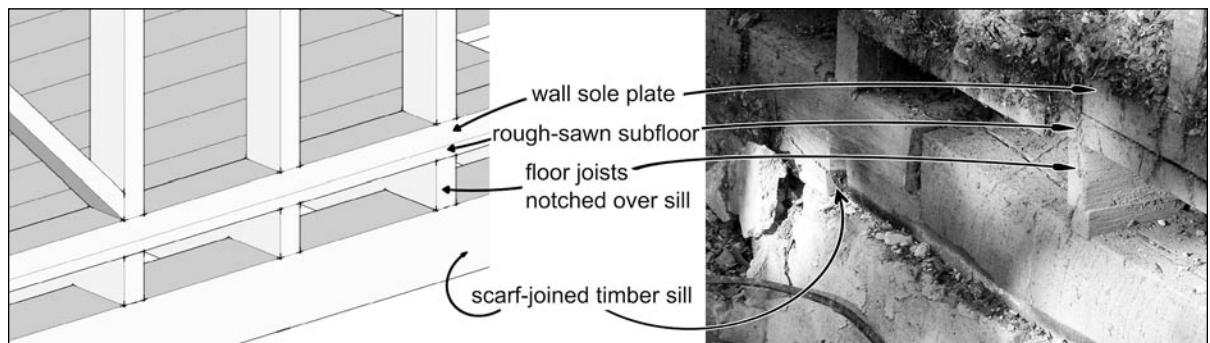


Fig. 13. Joist bearing and scarf joint in timber sill (intact) at 209 Wall Street.

The presence of the down brace in both structures may reflect the carpenter's understanding of the role of the sheathing in stabilizing the building laterally, yet choosing to reduce the costs of construction by omitting the sheathing and compensating for the resulting loss of lateral stability with the down brace (Fig. 14).



Fig. 14. Down-brace for first-floor wall assembly at 209 Wall Street. Studs cut to fit around brace suggest the brace preceded the wall studs.

WALL UPON WALL: THE DISTINGUISHING CHARACTERISTIC OF THE HYBRID “BLACKSBURG” FRAME

The essential distinction history makes between the balloon and platform frame is that in the platform frame the wall studs and their attached base plate rest upon the surface of the subfloor. This distinction continues to apply to wood framing practices today (Fig. 15).

The two “Blacksburg” frames discussed here are very different from either platform or balloon frames of the time. Both the Odd Fellows Hall and the 209 Wall Street house clearly show that the base plate for the second-floor stud wall rests directly atop the top plate for the first-floor stud wall, with the second-floor joists bearing atop this now doubled 2x4 plate; subsequently, they are nailed into the side face of the adjacent wall studs (Fig. 16).

This practice of placing wall upon wall meant that the upper walls may have been constructed elsewhere and lifted into place, the second-floor joists not having been placed. Given even the relatively light weight of stud walls, lifting would have been cumbersome, requiring ropes or hoists. A more likely scenario is that the first-floor walls were built lying flat on the subfloor, raised up, and then nailed in place. Next, the base plate for the second-floor studs was nailed over the top plate of the first-floor

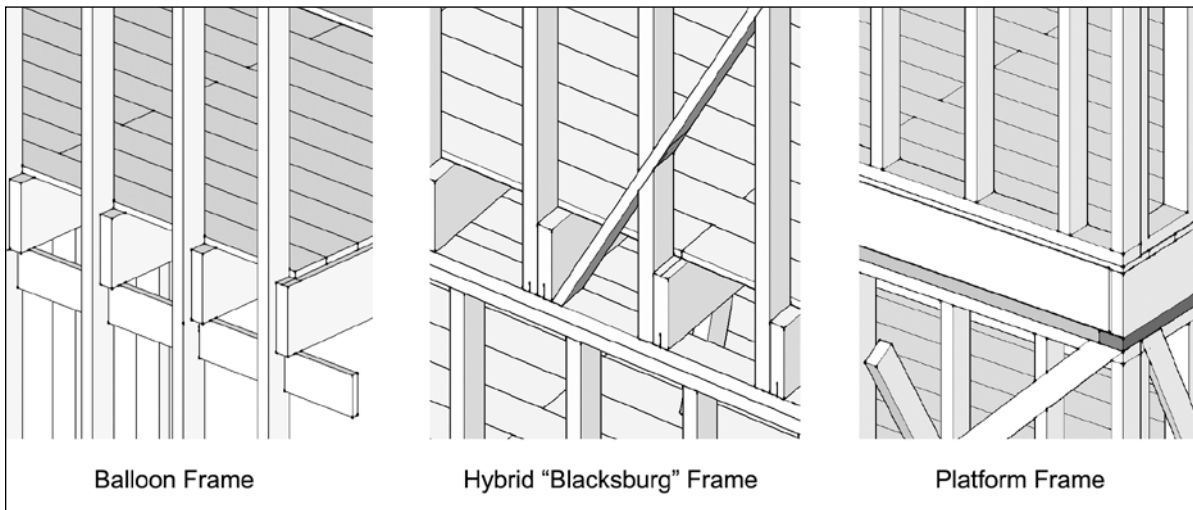


Fig. 15. Comparison of second-floor support at wall for balloon, hybrid “Blacksburg” frame, and platform frame.



Fig. 16. Down brace for second-floor wall assembly. Studs cut to fit around brace. Joists bear on double top/splice plate.

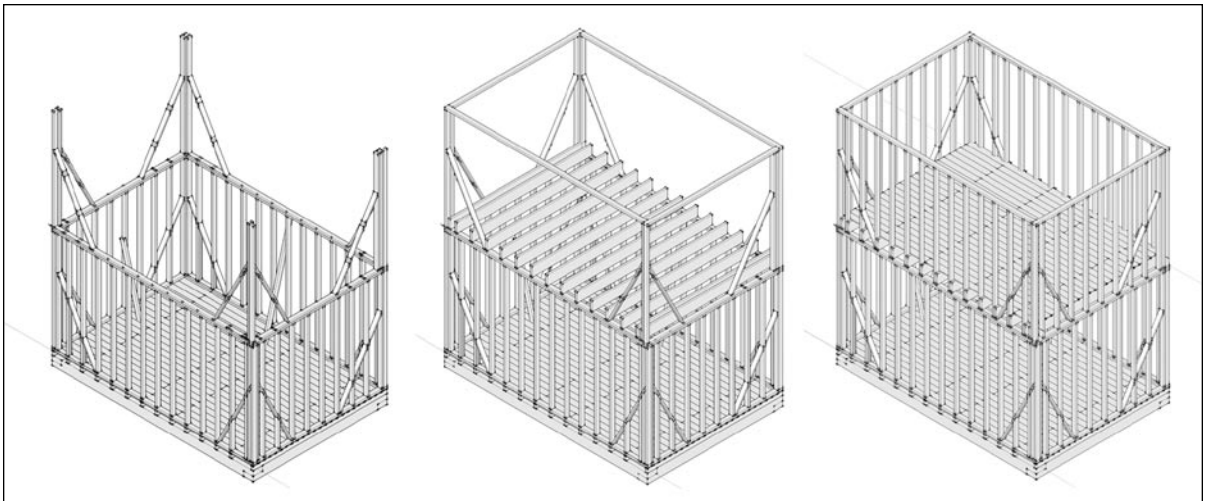


Fig. 17. Construction process for the hybrid "Blacksburg" frame.

wall studs. Following this, the second-floor corner post was nailed in place, down braces were installed to keep the corner plumb, and each second-floor stud was individually nailed to the base plate. As each stud was placed, a floor joist was inserted and nailed to the side face of the stud to stabilize it (Fig. 17).

The result is this hybrid "wall-upon-wall" or "Blacksburg" frame, which uses elements of balloon framing, such as floor joists to stabilize studs, down braces to keep corners plumb, individually placed studs, and a minimal workforce. This unique frame combines these features with elements of platform framing, such as using 8-foot-long studs (instead of 16-foot-long studs), constructing first-floor stud walls lying flat on the first-floor platform and raising the wall as a large

assembly, and integrating fire blocks between first- and second-floor stud cavities in the form of the first-floor wall stud top plate and second-floor wall stud base plate. This combination creates a hybrid form of light wood framing adapted to local material characteristics (moisture content) and exhibiting the benefits of both the more traditional (balloon) and more contemporary (platform) frames.

DETECTION, VERIFICATION, PRESERVATION

Because the buildings under discussion have no outwardly distinguishing characteristics that identify them as having an innovative framing method beneath

the skin, they and others like them are being lost to history each day. Still, their unique contribution to vernacular construction calls for attention.

Methods for detecting these hybrid frames include simple removal of siding near the corner where second-floor joists meet the exterior bearing wall (assuming the span is across the shorter axis of the building). A less intrusive method would be the use of infrared thermography, a non-destructive, non-invasive method of measuring radiated electromagnetic energy (Maldague 1993). This technology is widely available and is often used by builders, researchers, and insulation retrofit specialists in home energy audits. Because the differences in the second-floor-to-wall connection are so distinct among balloon, platform, and hybrid methods, the framing strategy should be readily apparent.

The significance in this building technology lies in the fact that the hybrid frame is no more or no less difficult to adapt to contemporary building standards for insulation than the platform frame. The stacked double plate is an obstacle for insulation placement but requires only that an opening be made below the plate to fill the stud cavity. No other unique preservation issues are apparent with the hybrid frame. This method can be used today for a more sustainable construction that utilizes high-moisture-content wood, saving energy expended in kiln drying while minimizing damage caused by wood shrinkage.

Because these hybrid framed buildings share the same neighborhoods with balloon and platform-framed structures, there is the potential to form a "mini-district," which would expose the framing to the inside spaces, allowing the public and researchers to observe the similarities and differences firsthand. Alternatively, computer models similar to those developed for this publication might be used to demonstrate the innovation and opportunities of the hybrid frame.

Finally, because there is no "style" associated with these hybrid-framed structures, they are perhaps best protected as part of a National Park Service Historic District nomination. There is also the potential for nominations under the Historic American Engineering Record (HAER) designations.

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ENDNOTES

1. Giedion (1963), Sprague (1983), Peterson (1992), Cavanaugh (1997), and Elliott (1994) are primarily focused on the origins and cultural/social/technical factors involved in the emergence of the balloon frame. Monteyne's article (2004) is the only scholarly reference to the platform frame *per se* and quickly generalizes both the platform frame and balloon frame to forward his thesis on the role of light wood framing and the emergence of the middle class.
2. Sprague (1983) documents the heavy sill as a distinguishing characteristic of the Chicago balloon frame. This 8x8 sill was the only portion of the balloon frame to continue the joinery techniques commonly used in timber and braced framing. Most other connections were made with machine-cut nails.

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Hybrids on the Way to the Western Platform Frame: Stone Walls, Cities, and the Law Two Structures in Western Virginia

The historical origins and development of the balloon frame have been widely discussed by such prominent researchers as Giedion (1963), Peterson (1992), Sprague (1983), and more recently, Cavanaugh (1997). It can be documented that details and drawings of the balloon method were widely disseminated in agricultural and trade journals popular in the nineteenth century. Even though the platform frame eventually became the dominant method of light wood construction in post-war America, the balloon frame method lived on as an equal in the professional reference books. As late as 1970, *Architectural Graphic Standards* described the platform frame, the balloon frame, and the braced frame with equal emphasis. Elliott (1994) concludes that the balloon frame was dominant to the turn of the twentieth century when it was slowly replaced by western platform framing. But what were the stages in the platform frame's development? Did it emerge in full form as we know it today, or were there hybrid forms?

This paper traces the development of the platform frame across early pre-cut, prefabricated, and site-fabricated methods and compares balloon, platform, and hybrid platform frames. It presents a process-based rationale and images from case studies in western Virginia, which represent a significant step between the full balloon frame and the western platform frame. Preservation issues (identification, conservation, utilization) related to the utilitarian buildings using these framing methods are also considered.

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This article discusses the significance of stone walls as historic structures and reviews some of the relevant laws and ordinances that regulate them. The authors argue that there is legal precedent for treating stone walls as "structures" per the National Historic Preservation Act; they advocate for new laws and amendments to existing state and local laws to ensure their preservation.

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