The Minneapolis Lumber Exchange Fire of 1891 *and* Fire-Resisting Construction

Sara E. Wermiel

When it was completed in 1887, the Lumber Exchange Building, rising ten stories on Fifth Street at the corner of Hennepin Avenue in Minneapolis, became Minnesota's first skyscraper. A few years later, a two-story addition to the top of the original section and a 12-story extension along Hennepin Avenue more than doubled its floor area, creating one of the largest, as well as tallest, buildings in the city. Newspapers of the day reported no concern about the possible fire hazard posed by this large, high building, perhaps because it was of fire-resisting construction. It was built using two different systems. The original section was semi-fireproof or "slow-burning," as Minneapolis's building regulations would call it, and the additions were of fireproof construction.

Nevertheless, a fire in the early morning of February 26, 1891, engulfed the Lumber Exchange and burned out most of the interior of the original section. The fire received a fair amount of attention in professional and trade publications, being one of the first serious blazes in a modern fire-resisting structure. Some in the nascent field of fire-protection engineering considered it an important side-by-side test of the two construction systems. The Lumber Exchange blaze and the lessons contemporaries drew from it about the relative merits of the two systems open a window onto changing technology and building regulations at the time. This incident in Minneapolis contributed to the demise of the semi-fireproof system and rise of fireproof construction in the United States.

Brand-new Lumber Exchange Building, towering over Fifth Street and Hennepin Avenue, about 1887

Since the beginning of European settlement in North America, local governments have prescribed how buildings—or parts of them—should be built, with the aim of preventing urban conflagrations. Early laws generally dealt with exterior materials; typically, they forbade structures with wooden walls from being erected in the densely built-up section of a town. This area was demarcated and known as the fire limits. Minneapolis adopted a law with fire limits in 1865, two years before the town became a city.[1] But these laws, even when building developers observed them, did little to prevent or reduce the impact of general fires because buildings with stone and brick walls had combustible wooden interior structures. Ordinary masonry buildings were simply great woodpiles inside masonry shells.

The idea emerged that buildings without wood in their structures—inside as well as outside—would be truly noncombustible. Wood might be used incidentally, for window frames, doors, finishes, and so on, but not for any load-bearing parts. Buildings constructed this way came to be called fireproof. Over time,

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technologies—both materials and assemblies—for erecting fireproof buildings evolved. The first experiments in constructing buildings without wood, made in England in the mid-eighteenth century, involved using only masonry in walls and piers and making floors of brick arches. Buildings of this type appeared in America around the end of that century, but they were massive and impractical and, therefore, the system was little used.[2]

Fireproof construction got a boost in the mid-nineteenth century following the introduction of structural iron made in shapes that could substitute for wooden structural members. In the 1870s, a new material was introduced: hollow masonry blocks, designed to replace brick arches to build floors. They were also used to make roof decks and partitions *and* to protect structural metal. This was the decade of the great conflagrations: Chicago in October 1871 and Boston in November 1872. One important lesson architects took from these fires was that structural parts made of iron and steel, although they could not burn, could still weaken and fail in a hot fire.

Noncombustible materials cost much more than ordinary ones and, therefore, the vast majority of owners declined to use them.

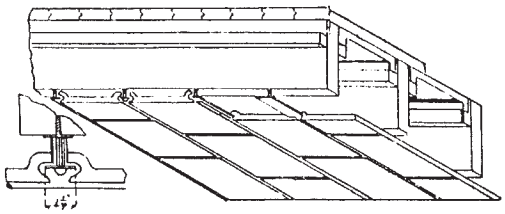
Placing insulating blocks around the metal helped keep it intact despite high temperatures. Hollow blocks were usually made of clay but also of concrete; regardless, they were often called tile. Used in combination with a metal structure—iron columns, girders, beams, and roof frames—they made a true fireproof system.

While one might assume that prudent owners in booming and haphazardly built cities would embrace these fireproof materials and systems in order to safeguard their property and human life, one would be mistaken. Noncombustible materials cost much more than ordinary ones and, therefore, the vast majority of owners declined to use them.

Thus, inventors devised materials and systems that would offer protection and be more affordable than fireproof construction. They reasoned that if metal could be protected by tile blocks, so, too, could wood, thereby making a fire-resisting building at a lower cost. A system was invented involving masonry tiles that covered the underside of floor and roof frames to create a barrier against fire. These tiles, flat but often hollow, were made of clay or concrete. And like the hollow blocks used with structural metal in fireproof buildings, the tile-protected wood systems came on the market in the 1870s. Because the latter buildings had wooden structures,

Advertisement, Inland Architect, *May 1885, for the Midwest's first and leading manufacturer of hollow structural blocks. The illustrations show hollow-block floors (flat and curved arches), column protection, and partitions.*

this method was usually called "semi-fireproof" to distinguish it from true fireproof construction. And while it cost much less than fireproof construction, it was still more expensive than traditional methods.



Example of a semi-fireproof system for protecting wood floors: flat clay tiles, suspended from metal hangers, create a barrier against fire. Here, a second layer of clay blocks fills between the joists under the floor deck.

As owners erected ever-taller buildings, concerns about their fire safety led to calls for regulation. How could firefighters extinguish blazes in buildings six or seven stories and taller? These concerns were most prominent in Chicago, which by the 1880s was seeing pioneer skyscrapers proliferate in its business center.

Among the architects designing these buildings was the hot new Chicago firm of Daniel Burnham and John Root. In 1880 they designed the seven-story Grannis Block, which the *Chicago Tribune* soon called "the handsomest building in the city." The Grannis had a wooden interior structure, and its columns and roof were protected with fireproofing tile; however, the floors were not protected. The following year they designed the Montauk Block (1881–82), the first ten-story building in the world. The Montauk was built fireproof, designed this way entirely at the owner's option since Chicago did not require any building to be fireproof at the time. The next large Burnham and Root structure, the nine-story Calumet (1882–84), was semi-fireproof, with clay tiles covering its wooden floor beams and joists. Then in February 1885, the beautiful Grannis Block burned.[3]

This fire, in such an admired and apparently well-built structure, increased calls in Chicago for regulations to better safeguard the city. One solution was to limit building height, and many cities took this approach. But another was to require that tall buildings be fireproof. In the mid-1880s, Chicago, along with Boston and New York, enacted rules mandating fireproof construction for certain kinds of buildings, notably those exceeding a specified height. Professional and trade publications disseminated information about the changing technologies and building regulations.

Around 1885, the Minneapolis architectural firm of Long and Kees received the commission to design the Lumber Exchange Building. When completed, in 1887, this office building was the first ten-story structure in Minnesota and, with it, Minneapolis beat out its rival St. Paul in the skyscraper race. The Globe Building, St. Paul's first ten-story edifice (no longer extant), materialized shortly afterwards.[4]

The original Lumber Exchange was a tall, narrow structure fronting Fifth Street. At the time, Richardsonian Romanesque architecture was all the rage, and the Lumber Exchange displayed features of that style, filtered through the commercial work of Chicago's John Root. It was relatively plain, with granite and sandstone walls on its street façades. The building's uniform façade was relieved by a projecting and decorated

Detail of the Lumber Exchange's rock-faced façade, 2014. This section was the terminus of the original building's Hennepin Avenue side.

section around the main entrance, which was located in the center of the Fifth Street side. Its architectural elements—including treating the corner to suggest a tower, turrets, rock-faced stone walls, mainly rectangular windows, and minimal decoration—had become popular in Minneapolis and were found on a number of buildings of the era. Architect Franklin Long, even before he partnered with Frederick Kees, had incorporated these features into his Kasota Block on Hennepin Avenue (ca. 1884; now demolished), which is considered a prototype for the form.[5]

The Lumber Exchange was designed to be fire-resisting using the semi-fireproof system, at the owner's option. At the time, Minneapolis did not require fire-resisting construction for any sort of building. Still, the city's developers undoubtedly knew of the growing concerns about the fire safety of tall buildings. Many in town considered the eight-story Tribune Building at Fourth Street and First Avenue South (today, Marquette Avenue), built in 1883–84, to be a firetrap. The *St. Paul Daily Globe* reported in 1889 that the issue of the Tribune's fire safety was "considerable agitated" as early as 1886—just as the Lumber Exchange was rising nearby.[6]

Perhaps to forestall controversy and reassure prospective tenants, the Lumber Exchange's developers chose to make it semi-fireproof. Its structure featured load-bearing walls and an internal frame of cast-iron columns, rolled iron girders, and wooden joists. The underside of the floors, as well as the columns and the girders, were covered with clay tiles and blocks, similar to the system recently used in Chicago's Calumet Building. In fact, the same firm manufactured and installed the tiles in both the Calumet and Lumber Exchange: Pioneer Fireproof Construction Company of Chicago.

In about 1889 the owners of the Lumber Exchange decided to expand the two-year-old building and commissioned Long and Kees to design the addition. An early drawing of the enlarged skyscraper shows the new section, which would front Hennepin Avenue, to be ten stories, the same height as the original section. But as built, the addition was 12 stories, and two stories were added to

Kasota Block, Hennepin Avenue, credited with starting the fashion for a style of rock-faced architecture in Minneapolis. It and its neighbors have been razed.

Early design for enlarging the Lumber Exchange. The addition (left side) along Hennepin Avenue is ten stories, like the original section, and preserves the original roofline.

the original Lumber Exchange, creating an overall 12-story block.

By then, concern in Minneapolis about the fire safety of tall buildings had intensified. In 1890 the city passed a new building ordinance with stricter rules. No doubt, the previous year's disastrous fire in the Tribune Building was a factor; it had killed at least seven people and injured many more.[7] The city now limited the height of new buildings to 100 feet which, as a practical matter, meant ten stories or fewer. It also required that certain kinds of structures be fire-resisting. Tall residential buildings (hotels, apartment houses, and the like, six stories or more) had to be built fireproof. Stores, factories, and mills six stories or more had to be "slow-burning," which the ordinance defined in two ways, essentially allowing two different structural systems to meet the requirement. The first was the semi-fireproof, tile-protected system. Floor and roof joists or rafters had to be protected underneath with clay tile one-and-a-quarter inches thick; tiles could be thinner if a one-half-inch air space was left between the tile and the joist. The other system involved heavy timber framing with wooden joists and rafters of large dimension, not less than eight-by-eight inches in section, floored over with matched plank at least three inches thick. In either case, partitions were to be brick, tile, or three-inch plank; iron columns and beams were to be covered; and wooden partitions and wooden lath along the walls (for holding plaster) were forbidden.[8]

The height limit in the new ordinance was consequential for the Lumber Exchange's owners. They hastily added two stories to the proposed structure and took out a building permit before the law went into effect. Indeed, they got a much larger building on the same lot. But the additions disfigured its architecture: the modest articulations on the original part were overwhelmed by the new overall mass, and the new roofline was flat.

Being an office building, a type not mentioned in the new ordinance, the Lumber Exchange was not required to be either fireproof or slow-burning. Nevertheless, the owners must have seen the expedience of reassuring tenants, the public, and lawmakers that their massive structure would be safe. Moreover, the Tribune Building was known to have had tile-protected wood, which clearly did not prevent its complete destruction.[9] Thus, the owners opted to build the new sections using fireproof construction: metal interior frames and, between the iron joists set seven feet apart, curved arches made of hollow clay blocks, five inches thick.[10] Exactly what the floor blocks look like is unknown, but they probably resembled those of a contemporaneous tall building also designed by Long and Kees: the Masonic Temple (1887–90, now the Hennepin Center for the Arts), which also is fireproof. The owner of this building, although it was only eight stories, had changed the plans from slow-burning to fireproof construction.[11]

The contractor for fireproofing

Lumber Exchange Building, 1896, with its extension along Hennepin Avenue and two-story addition to the Fifth Street side

the additions was, again, Pioneer Fireproof Construction Company. Still headquartered in Chicago, it now had a branch office in the Lumber Exchange. The firm had worked on several Twin Cities buildings by this time, including the West Hotel in Minneapolis (1881–84, Leroy Buffington, architect) and the Ryan Hotel in St. Paul (1885, James J. Egan, architect). Companies in this business commonly made tiles and blocks for both the semi-fireproof and fireproof systems, and Pioneer was no exception.

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The Lumber Exchange

Building had neighbors of various sizes and types of construction. Behind the new section stood the two-part Edison Light and Power Building, with an ordinary timber-frame interior.[12]

In the depth of winter, on February 26, 1891 at about 12:30 A.M., a fire began in the Russell Block. Just days before, a paint dealer had moved into the building, and the fire started in the section that this business occupied. Firefighters arrived soon after an alarm was sent in, but the Russell Block was ablaze and the fire spread to the Robinson Building, which was occupied by H. B. Gardner's hardware store and, above it, a lodging house.[13]

Then, to the great surprise of those at the scene, fire was noticed in the upper floors of the original section of the Lumber Exchange. It seems that there had been so little concern about the building's safety that no provision had been made to fight a fire inside it. That the firefighters had water at all on a freezing night seems miraculous, but the streams from their hoses could not reach the upper floors. The fire blocked access to an exterior standpipe. In a short time, the Lumber Exchange was burning: the blaze spread to the floors above the seventh, igniting the wooden window frames. To get at the fire, firefighters entered the Lumber Exchange's new, not-quite-completed fireproof extension and fought the blaze from there. Not until the afternoon of that long day did they manage to get the fire under control. Mercifully, no lives were lost.

Firefighters at work in the early morning hours, dodging downed power lines covered with ice. Hoses and equipment froze to the ground.

Minneapolis photographer Charles Jacoby's close-up of the Lumber Exchange as ice palace

Aftermath: The Lumber Exchange, Russell Block, and Robinson Building, after fire and ice.

In its reporting on the fire the following day, the *St. Paul Daily Globe* noted that the building "was supposed to be fireproof. Probably it was fireproof as fireproof buildings went in those days, but yesterday morning demonstrated that it was only slow burning, and not slow burning, at that." And yet, the newspaper pointed out, "the new part of the Exchange escaped entirely."[14]

The blaze attracted the attention of the building community because it was one of the first major fires in a modern fireproof building—specifically, the new section, which had hollow tile floors and structural metal protected with tile. Although manufacturers of fireproofing products conducted fire and load tests to prove the value of their materials to prospective customers, the tests did not necessarily reproduce the conditions of an actual fire. Thus, "All interested have waited for that rare occasion, a fire in a fireproof building," wrote the editor of *The Inland Architect*, a periodical for the design and building community, published in Chicago. The journal sent a reporter to Minneapolis to investigate the fire and meet with the building's architects and owners. In the article that resulted, published in the August 1891 issue, the editor wrote that the building's two different construction systems made the event a perfect "fire test of modern fireproofing material and methods."[15]

But from the report, one can see that this was not a perfect test. First, the contents of the two sections differed: the original building was occupied and contained combustible furnishings, while the new section, not quite completed, did not. More important, construction that was underway had compromised the safety of the original section. A large hole had been cut through its upper floors in order to raise a water tank up to the new roof, and the ends of wooden floor joists around the hole were supported by a temporary wooden structure. This unprotected wood, the reporter wrote, "caught fire and burned away, allowing the tank to fall upon the joists, destroying them and the fireproofing upon the girders below."[16] This statement suggests that the falling tank dislodged some of the fireproofing, which allowed the flames to get behind the tile barriers and burn through the floors.

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Although the new part was exposed to the heat of the fire burning in the old part through large openings in the walls between the two sections, it suffered little damage. Since it was unoccupied and had little to burn, this is not surprising. What *was* surprising was that the two-story addition on the original building survived. Despite the prolonged fire beneath it, which burned out the floors below, the iron frame of the building remained intact and supported the top two floors, which likewise remained intact. And despite the interior damage, the exterior walls of the original section survived. They were repaired, and the old section was completely rebuilt inside. This time, only fireproof materials were used.

The fact that the fireproof system performed well, regardless of the special circumstances in each section, proved to *Inland Architect's* editor that "the regulation fireproofing system" could live up to its name. This fire, he wrote, should "enable architects to convince clients how advisable it is to fireproof all important structures, and also that fireproofing by a standard system does fireproof."[17] In other words, not only was fireproof construction superior to other methods, it worked.

And so, this Minneapolis blaze entered the lore of the emerging field of fire-protection engineering as a case study. *British Architect* soon reprinted

Tenth-floor ceiling in the original section after the fire, showing uninjured fireproof arches; Inland Architect, *August 1891, page 9.*

the *Inland Architect* article. In 1904 fire-protection engineer Joseph K. Freitag included the incident in his article "Fire Lessons," presenting it as an early and important one. Later, he also offered it as a case study in his fire-protection handbook.[18]

The Lumber Exchange fire spawned changes in building laws and building-construction technology in Minneapolis and nationwide. Over the course of the 1890s, many fire-protection professionals drew conclusions from the blaze—principally, that semi-fireproof construction was inadequate and fireproof construction was the only safe system, especially for vulnerable kinds of buildings. These conclusions were taken to heart by city building-inspection departments and lawmakers, who wrote them into local building laws.

Fireproof construction was, and ever would be, more expensive than ordinary brick-and-wood construction, but a number of developments in the 1890s made it more acceptable to owners. First, by that decade experience showed that fireproof buildings could contain and withstand a fire. Second, owners wanted tall and ever-taller buildings, which were inevitably erected with metal frames. Adding tile or concrete floors and fireproofing to these already-expensive buildings was acceptable to their developers. Third, around the turn of the twentieth century a new fireproofing technology was introduced: reinforced concrete construction. This proved to be a more affordable option than steel and hollow blocks for smaller buildings. The laws were always a compromise among interests—between what seemed best for public safety and what could be required of property owners, both practically and financially. But as fireproof construction technology became mainstream, opposition based on its cost waned.

In Minneapolis, public acceptance of stricter requirements resulted in a 1903 revision to the building law that added smaller buildings and more types, serving different purposes, to the list of those that had to be fireproof. It required institutions such as hospitals; hotels, schools, and public halls; and apartment houses, over a specified number of stories (two, three or four, respectively) to be fireproof. Factories, office buildings, and retail stores six stories or higher had to be fireproof. Two years later, the building ordinance was revised to require *every* building five or more stories to be fireproof, with some exceptions. Warehouses, wholesale stores, grain elevators, and factories could be of "mill construction." The law defined mill, or slow-burning, construction in only one way: as heavy timber construction. Significantly, it no longer accepted tile-protected construction as slow-burning.[19]

Indeed, in the 1890s the semi-fireproof system fell out of favor and ceased being used anywhere in the U.S. According to fire- protection expert Peter B. Wight, whose Wight

Still standing: Lumber Exchange, 425 Hennepin Avenue, 2014.

Fireproofing Company in Chicago manufactured this product, demand for the system dropped off around the time of the Lumber Exchange fire. He noted a case, a warehouse in Chicago, where the semi-fireproof system had done its job: a serious fire in the building was confined to the floor where it started, and the burned area was easily repaired. But he acknowledged that altering floors in ways that compromised the tile barrier, such as cutting holes through them, and the possibility of an accident that could dislodge the tiles—two elements of the Lumber Exchange case—made the semi-fireproof system less reliable than fireproof construction.[20]

Presumably these possibilities, combined with the discredit brought to the system by its failure in several fires, subsequent changes in technology, and trends in building, caused the demise of semi-fireproof construction. And so, a technology introduced as a safety improvement disappeared. Fortunately, the Lumber Exchange still stands: a contributor, not only a witness, to the process of technological change. ⊡

Notes

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1. Augustine E. Costello, *History of the Fire and Police Departments of Minneapolis* (Minneapolis, 1890), 39–40.

2. Here and below, for a history of changing forms of fireproof construction in the nineteenth century, see Sara E. Wermiel, *The Fireproof Building: Technology and Public Safety in the Nineteenth-Century American City* (Baltimore: Johns Hopkins University Press, 2000).

3. "The Grannis Block," *Chicago Daily Tribune*, May 1, 1881, 5; "Chicago Badly Scarred by Another Conflagration," *St. Paul Daily Globe*, Feb. 20, 1885. The Grannis Block burned on February 19.

4. On the Globe Building, see Larry Millett, *Lost Twin Cities* (St. Paul: Minnesota Historical Society Press, 1992), 188–89.

5. Millett, *Lost Twin Cities*, 141. Millett wrote that the Kasota Block was probably the first Richardsonian Romanesque-style commercial building in Minnesota. It was demolished as part of Minneapolis's Gateway district urban renewal project. Many of its stony Romanesque contemporaries likewise have been leveled.

6. "Sorrow and Sympathy," *St. Paul Daily Globe*, Dec. 2, 1889, 1. The Tribune was designed by architect Leroy S. Buffington.

7. "A Life for a Life," *St. Paul Daily Globe*, Dec. 4, 1889, 3. The fire occurred in the evening of November 30, 1889. There had been fires in the Tribune before then, and upper floors were loaded with heavy printing presses, perhaps beyond the weight they could safely support. But the feature that made the building a deathtrap was its lack of adequate egress: it had only one stairway, around the elevator shaft.

8. John M. Hazen, comp., "An Ordinance to regulate the construction, alteration, repair and removal of buildings within the city of Minneapolis," approved Apr. 1, 1890, in *Building Laws Relating to the Construction of Buildings in the City of Minneapolis* (Minneapolis, 1891), sections 10 and 32.

9. Peter B. Wight, "Some Experiences of Modern Fire-proofing Material in Actual Tests," *The Brickbuilder* 5 (Dec. 1896): 230.

10. "A Practical Test of Fireproofing," *Inland Architect and News Record* 18 (Aug. 1891): 10.

11. "A Stately Edifice," *St. Paul Daily Globe*, Sept. 5, 1888, 3.

12. "Three Are in Ruins," *St. Paul Daily Globe*, Feb. 27, 1891, 1; *Sanborn Fire Insurance Map, Minneapolis*, vol. 3, 1912, sheet 257, in Proquest, Digital Sanborn Maps 1867–1970, *www.proquest.com*, a subscription service. A microform copy is available in the Minnesota Historical Society library.

13. Here and below, "The Exchange Blaze," *St. Paul Daily Globe*, Feb. 27, 1891, 1.

14. "Three Are in Ruins," and "The Exchange Blaze," *Daily Globe*, Feb. 27, 1891, 1.

15. "Practical Test of Fireproofing," quotes, 7 and 9. This article has the most detailed description of the building, although it also contains inaccuracies, such as stating that the fire occurred in January.

16. "Practical Test of Fireproofing," 9.

17. "Practical Test of Fireproofing," 10, 11.

18. *British Architect* 36 (Sept. 11, 1891): 192, 201; J. K. Freitag, "Fire Lessons," *Fireproof* 4 (Feb. 1904): 39–41, and *Fire Prevention and Fire Protection* (New York: John Wiley & Sons, 1912), 131–32.

19. *Proceedings of the City Council of the City of Minneapolis, Minnesota, from January 1, 1903, to January 1, 1904* (1903), 340; *Minneapolis City Charter and Ordinances* (City Council, June 1, 1905), 277, 284.

20. Wight, "Experiences of Modern Fireproofing Material," 230.

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