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Column

On the Home Insurance Building as the First Skyscraper

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I wrote a paper "The First Skyscraper Revisited" with my colleague Mir Ali in 2022. For the March 2024 issue of the IJHRB, Jason Barr's article "A "Radical Departure"? How The Home Insurance Building "Won" the First Skyscraper Debate" is published. As the two papers are about the first skyscraper from quite different viewpoints, I write again about the Home Insurance Building designed by William Le Baron Jenney to explain why this building can still be considered the first skyscraper in my opinion.

Those who are skeptical to consider the Home Insurance Building the first skyscraper argue that "Jenney did not invent the skyscraper" or "Jenney did not invent the steel skeletal structures." I also agree. Considering the many thousand-year long history of architecture, skyscrapers that emerged in the late 19th century are still a relatively new architectural phenomenon. Many have been interested in identifying the first skyscraper. The emergence of the new building type required multiple critical architectural concepts and related technologies, which were not developed by one person as the "inventor." The debate on the first skyscraper is to identify which building was designed and built for the first time with all the critical attributes of skyscrapers and who the architect was.[1)]

Old vs. New Breed Skyscrapers

About 10 stories were significantly taller than most other buildings in the late 19th century, and office buildings of around that height already existed from the 1870s. An essential architectural concept of the skyscraper, i.e., tall office buildings, was already accomplished in other buildings before the Home Insurance Building of 1885. Therefore, this already disqualifies Jenney as the inventor of the skyscraper. In addition, early tall office buildings were designed and built with skeletal interior iron frames and masonry exterior walls. As the iron skeletal frames were already widely used for the interiors of early tall office buildings before the Home Insurance Building, this also disqualifies Jenney as the inventor of the iron/steel skeletal frames. However, another critical architectural concept and related technology to place early tall office buildings on the critically new stage were regarding the exterior walls, and the significance of the Home Insurance Building and its designer Jenney stems from this.

With heavy and thick exterior masonry, the early tall office buildings had serious limitations in terms of growing taller and introducing ample daylights into the interior space for desirable work environments. To introduce more daylights, Jenney employed iron/steel skeletal frames for the 10-story tall Home Insurance Building's streetfront walls and this was the first application of the skeletal frames for streetfront walls of a tall office building of that height. This was a so important step for the *new breed skyscrapers* to come after the *old breed skyscrapers* built with masonry exteriors. Yes, in the late 19th century, early tall office buildings built before the Home Insurance Building were already called skyscrapers. And I call them old breed skyscrapers, which were stopped to be built from around the turn of the century due to the limitation of masonry exterior walls. When the Home Insurance Building was built, while there already were tall office buildings even taller than the Home Insurance Building, these buildings were built with masonry exterior walls, resulting in very thick facade walls especially on the lower levels and poor daylighting for the interiors. These old breed skyscrapers could not survive to be developed further for today's tall and supertall buildings. With its skeletal frames not only in the interior but also on the streetfront walls, the Home Insurance Building was the first tall office building that has all essential attributes of modern skyscrapers. Therefore, when we consider skyscrapers today, the Home Insurance Building designed by Jenney can be considered the first built modern skyscraper – the new breed with skeletal structures. Jenney alone did not invent the skyscraper.

[1)] Advances in different technological fields, i.e., structural systems, foundations, building facades, vertical transportation, materials, fire safety, constructability, lighting, HVAC, plumbing, electrification, etc. have all contributed to the development of modern skyscrapers. Thus, multiple first skyscrapers can even be considered under different technological fields. However, some technologies are primary or more fundamental in the development process of modern skyscrapers, while some other technologies are secondary to the primary technologies. This column is about comprehensively selecting the first skyscraper designed and built with all the critical architectural concepts and primary technologies for the building type.

However, the Home Insurance Building can be considered the first built modern skyscraper and Jenney was the designer. Are there any other buildings that can have the title of the first skyscraper.

To discuss this further in more detail, we need to define what a skyscraper is. There have been various opinions by many historians, architects, and engineers, including Mujica (1929), Weisman (1953), Webster (1959), Ali and Moon (2022). Considering various previously defined attributes of a skyscraper, I extract essential attributes of a modern skyscraper – the new breed skyscraper. I believe not too many arguments can be made about these essential attributes.

- *Quality of tallness with many stories of enclosed occupiable space*
- *Skeletal structure and consequent curtainwall*
- *Elevators*

The first and third attributes are must-have for both the old and new breed skyscrapers. About the skeletal structure, both the old and new breed employ it in their interiors, while the only new breed uses it on the exterior walls and this perimeter application results in curtainwalls. Though not in the fully developed form as will be discussed, the Home Insurance Building was the first tall office building that had all the above attributes for the first time.

Which other buildings have been considered the first skyscraper?

Identifying the first skyscraper has been a topic of debates for many decades. The most well-known competitor of the Home Insurance Building for the title is the Equitable Building of 1870 in New York. The reason why the Equitable Building was alternatively considered the first skyscraper is that at its 7-1/2 stories including the half-story attic height this was the first multistory office building with passenger elevators. This building also used skeletal structures with cast iron columns and wrought iron beams for its interior framing. However, its exterior walls were entirely masonry.

Nonetheless, the Equitable Building, being the first multistory office building of that height with passenger elevators, paved the way for taller buildings with masonry exterior to come, such as the New York's Western Union Building (230ft: 70m) and Tribune Building (260ft: 79m) of 1875. These buildings were already much taller than the Home Insurance Building (138ft: 42m). Therefore, these masonry tall buildings were also called "sky-scrapers" from around the early 1880s (Landau & Condit, 1996), and the Equitable Building can be considered the first skyscraper of these old breed skyscrapers with masonry exterior walls. Alternatively, the Western Union Building and Tribune Building were considered the first skyscrapers by Montgomery Schuyler (1899) and Winston Weisman (1953)[2], and "proto-skyscrapers" by Carson Webster (1959), as the Equitable Building was much shorter than these two buildings to be considered the first skyscraper.

However, as the old breed skyscrapers with masonry exteriors had serious inborn limitations to grow taller, it naturally died out in the tall building industry before the turn of the century. While this old breed was still widespread in the 1880s, a new breed of tall buildings with skeletal structures for both the interior and exterior walls emerged, competed with the old breed, and eventually won the competition and have evolved to today's tall and supertall skyscrapers.

Architecture, including tall buildings, is time-dependent and cannot be considered without the context of its era. When the first skyscraper is considered today, it should be the first of the breed to which today's tall buildings belong. The Home Insurance Building, as the first tall office building that was designed and built with the skeletal frames not only in the interior but also on the streetfront walls and consequent rudimentary curtainwall concept, is well qualified as the first skyscraper. In terms of the developments of technology, the Home Insurance Building did not have fully developed forms of the essential skyscraper-defining technologies from today's standards. However, no technology is expected to be perfect from its very beginning. In facts, structures and curtainwalls for skyscrapers are still and ever in their path of evolution toward better performing and more sustainable built environments.

Why is the Home Insurance Building questioned to be considered the first skyscraper?

One of the most criticized facts about the Home Insurance Building in terms of its qualification to be considered the first skyscraper is its streetfront skeletal frames. It is criticized that the frames were different from modern metal frames composed typically of beams/girders and columns. The frames of the Home Insurance Building were different as the lintels and vertical mullions of the exterior wall windows were designed to perform as the perimeter beams and columns of the sub-frames (Figure 1). But these sub-frame components together with the main perimeter columns and spandrel beams provided primary structural frames on the streetfront walls of the 10-story tall office building for the first time. It is also criticized that the connections between the lintels, mullions, spandrel beams and columns were not tightly

[2]It is interesting to note that in Weisman's case, while he originally chose the New York's Western Union Building and Tribune Building as the first skyscrapers in his article "New York and the Problem of the First Skyscraper" of 1953, he changed his position in his later article "A New View of Skyscraper History" of 1970. His revised vote "after much contemplation" was given to the Equitable Building. Weisman (1953) defined a skyscraper as merely "a tall office building," and perhaps this too simple definition impacted his change of minds without governing critical attributes.

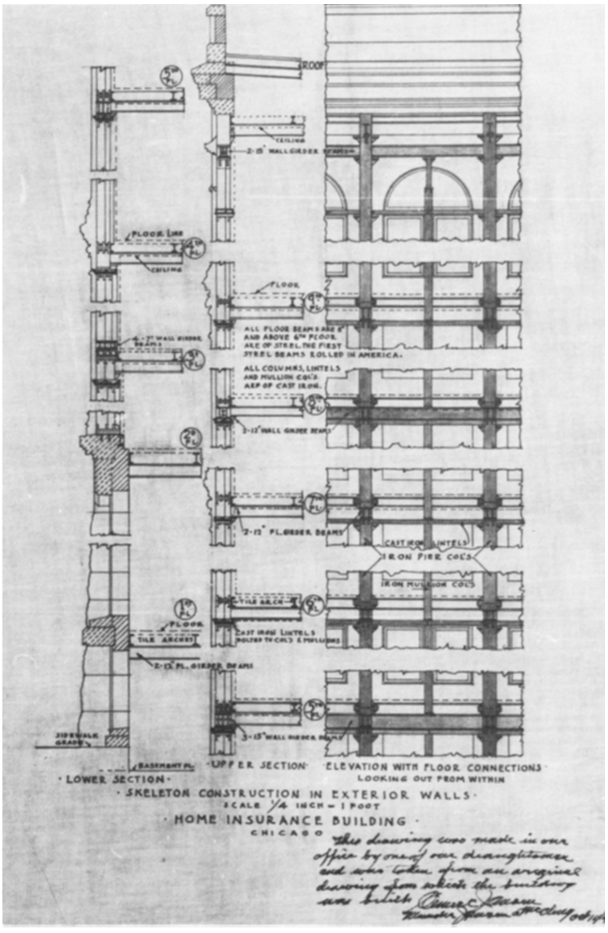


Figure 1. Streetfront exterior wall's skeletal metal frame configuration of the Home Insurance Building [Jensen & Halstead, Ltd., Chicago]

bolted. Some scholars even unjustifiably criticize that the connections were not rigid or moment connections. Rigid beam-to-column connections were not yet known at the time of the construction of the Home Insurance Building and practically not conceivable due to the brittleness of cast iron. However, masonry party walls and other masonry elements in the Home Insurance Building still resisted wind loads as today's shear walls do. When shear walls are employed, skeletal structures around them are often not constructed with rigid connections even today. For skeletal structures, rigid connections are not always needed.

The use of the masonry party walls is, in fact, another criticism about the Home Insurance Building's qualification as the first skeletal structure because this means the building only partially used the metal frame on the perimeter. That is true. The Chicago building code at that time required heavy masonry party walls, and the Home Insurance Building had to be accordingly designed with masonry party walls in two primary directions of the building (Figure 2). It is reasonable to assume that Jenney as an architect and structural engineer logically envisioned that the metal frame for a building of 10-story height did not require substantial additional wind bracings due to the already provided masonry walls in the building. Based on this configuration, the building performed like shear-wall-supported hinged metal frames.

Curtainwall facade is a natural outgrowth of the skeletal structure. However, the curtainwall concept did not entirely materialize in the Home Insurance Building as some deviation from a fully developed form of curtain walls was present. While most masonry walls were

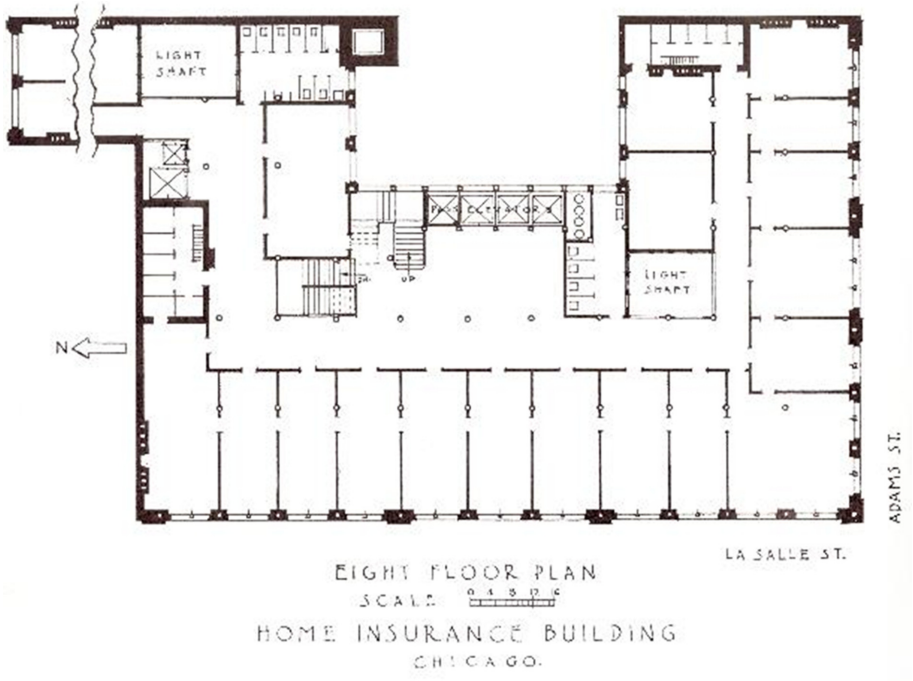


Figure 2. Typical floor plan of the Home Insurance Building [Tallmadge, 1931]

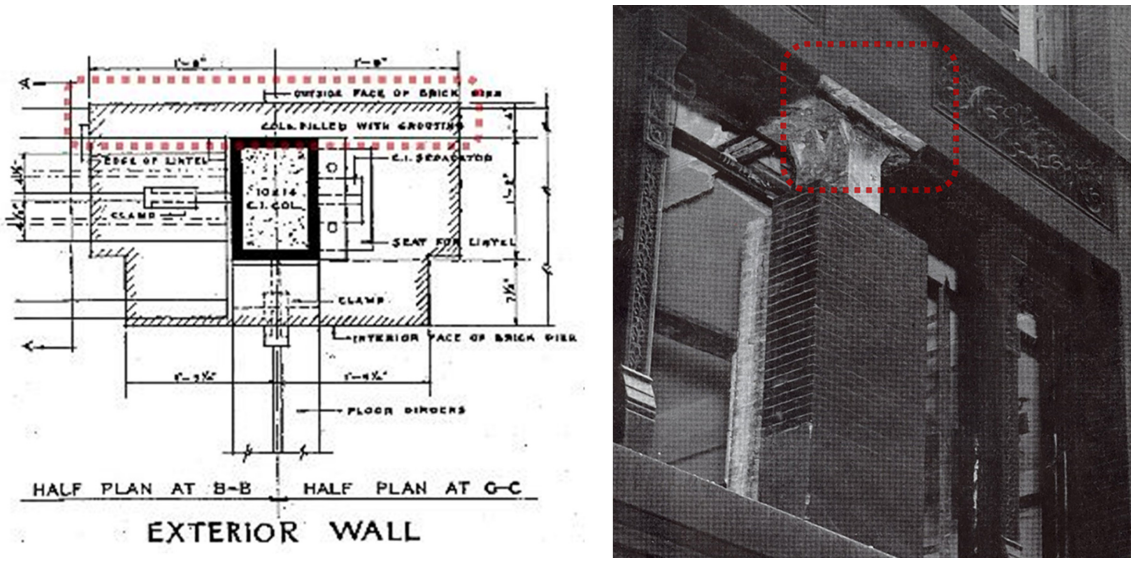


Figure 3. Left: Exterior wall plan of the Home Insurance Building around the junction of an exterior column, spandrel beams, lintels and interior girders from field-measured drawings; exterior masonry layer inside the dotted rectangle was not particularly constructed to be supported by the skeleton of the building [Tallmadge, 1931]. Right: Partially destroyed masonry around a third-floor exterior column and lintels of the Home Insurance Building; White horizontal strip inside the dotted rectangle is the masonry not supported by any frame member [Tallmadge, 1941].

supported by structural frames, a small portion of the exterior masonry layer was not supported by the frames (Figure 3). Nonetheless, the Home Insurance Building's introductory curtain wall concept certainly acted as the precursor of latter-day fully developed curtainwalls of skyscrapers.

Another criticism related to the skeletal frame and curtainwall is that the gravity load was shared by the iron columns and surrounding masonry (Sanderson, et al., 1932) and therefore this building was not strictly the skeletal structure. A small portion of the load have probably been shared by the masonry because of the development of bond between the columns and masonry as well as the related underdeveloped masonry curtainwall construction (Figure 3). However, the major portion of the load was undoubtedly carried by the metal with its much higher value of the modulus of elasticity compared to masonry. It is also noted that the thickness of the outermost masonry façade layer in front of the cast iron perimeter columns and notched-back end portions of the lintels (exterior masonry layer inside the dotted rectangle in Figure 3) was constant throughout its height at each column line, while the encased cast iron column sizes were increased toward the bottom to carry accumulated loads from above. This configuration implies that whereas the iron columns were designed as primary structural elements, the outermost masonry layers were not.

The First Built Modern Skyscraper

The modern skyscraper's racing for height would be impossible without the skeletal structure as discussed earlier. For the debate on the first skyscraper, some scholars turn the debate to the first skeletal structure and advocate George Post's Produce Exchange of 1884. This building indeed employed more developed skeletal construction than the Home Insurance Building. However, the application of the skeletal structure was limited to the four-story tall light court walls (Figure 4). The streetfront walls were masonry. Light courts were very common for early tall buildings because the interior lighting of early tall buildings heavily relied on daylights. In fact, the Home Insurance Building also had the light court over the full height of the building and the light court walls were also designed with skeletal frames. While the Produce Exchange Building has been used by many to criticize the Home Insurance Building, the Produce Exchange Building has never been considered the first skyscraper.

Tacoma Building and Masonic Temple in Chicago completed in 1889 and 1893, respectively, were also occasionally considered the first skyscraper. The Tacoma Building had fully developed curtainwalls on the exterior walls and the Masonic Temple at its 21 stories was significantly taller than its competitors for the title. However, these buildings were built years after the completion of the Home Insurance Building.

The Home Insurance Building was built with the essential attributes of a modern skyscraper for the first time for a multistory office building of that scale. This was an epoch-making moment that led not only to the advent of modern skyscrapers but also modern architecture in the 20th century. Since the advent of Gothic architecture many centuries ago, such a technology-based new building type emerged for the first time, eventually leading to new

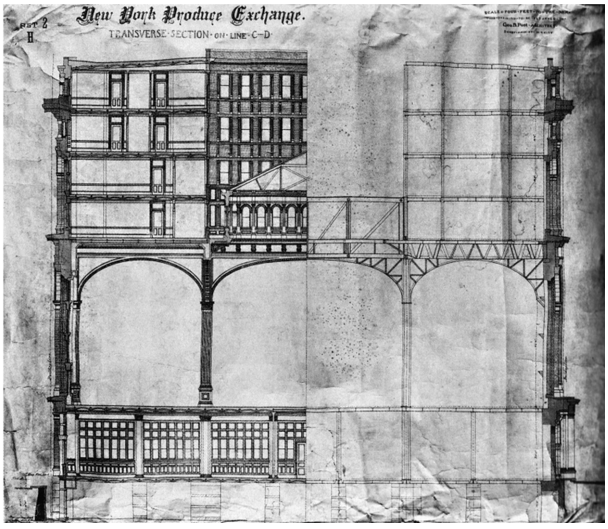


Figure 4. Section Drawing of the Produce Exchange Building designed by George Post.

architectural style as well.

At the time of the initial debate in the mid-1890s to identify the origin of the new breed skyscraper with skeletal structures, as Barr noted, Jenney and his proponents made some exaggerating remarks about the Home Insurance Building due to the fear of losing the title. However, a certain level of exaggeration is understandable to win the title as Jenney's Home Insurance Building indeed deserved it. Certainly, my vote for Jenney's Home Insurance Building is not based on his and his proponents' exaggerating remarks during the initial debate but considering how the building was designed and constructed. It should be noted that when the Home Insurance Building was just built in 1885, its significance as the first new breed skyscraper was not immediately recognized because the old breed skyscrapers were also successfully built continuously up to certain heights for years. However, when it became clear that the new breed skyscraper clearly won the competition, the importance of the first new breed skyscraper was recognized and the Home Insurance Building was identified as the first. Today's skyscrapers still belong to the new breed initiated by the Home Insurance Building.

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