Rudy R. Christian

Resurrecting the Detroit Central Farmers Market

Resucitar el Central Farmers Market de Detroit

Ressuscitando o Central Farmers Market de Detroit

Abstract | Resumen | Resumo

This article discusses the 162-years history of the only known nineteenth-century timber-frame farmers' market in existence today. Designed by an architect, this immense building required great skill from the tradespeople who built it from old-growth Michigan white pine timbers. No machinery was used in planing the surfaces or cutting the mortise-and-tenon joinery that holds the structure together. It is without question one of the most highly finished and decorated timber frames known to exist today. Its reconstruction in Greenfield Village at the Henry Ford Museum will guarantee its continuing existence for generations to come.

Este artículo analiza los 162 años de historia del único mercado conocido del siglo XIX con estructura de madera que sigue existiendo en la actualidad. Diseñado por un arquitecto, este inmenso edificio exigió una gran habilidad de los artesanos que lo construyeron con madera de pino blanco de Michigan. No se utilizó maquinaria para trabajar las superficies ni para realizar las uniones de caja y espiga que conforman la estructura. Es, sin duda, una de las estructuras de madera más finamente decoradas y acabadas conocida en la actualidad. La reconstrucción de la estructura en el Museo Henry Ford de Greenfield Village garantizará su permanencia durante generaciones.

Este artigo analisa os 162 anos de história do único mercado de agricultores construído no século XIX com estrutura de madeira que é conhecido na atualidade. Concebido por um arquiteto, este imenso edifício exigiu grande perícia aos comerciantes que o construíram a partir da madeira de pinho branco proveniente de florestas virgens do Michigan. Nenhuma maquinaria foi utilizada no aplainamento das superfícies ou no corte das montagens de caixa e espiga que mantém a estrutura unida. É sem dúvida a estrutura de madeira mais bem acabada e decorada que existe hoje em dia. A sua reconstrução em Greenfield Village, no Museu Henry Ford, garantirá a continuação da sua existência ao longo das gerações vindouras.

Figure 1. The Detroit Central Farmers Market with the timber-framed vegetable shed in the foreground and the masonry meat market in the background, c. 1880 (From the collections of The Henry Ford)

The City Market (1860 - 1892)

The Detroit Central Farmers Market was built by the City Council as a matter of civic responsibility. The city had grown a lot since the opening of the Erie Canal in 1825 and the railroads that soon followed. What had been a small trading center and fort grew into a thriving hub of agriculture and forestry. In 1860 Detroit Mayor Christian Buhl stated that "Our public markets should be far improved so as to offer protection from the inclement weather to those compelled to do business upon them." Architect John Schaffer, originally from Austria, was hired to design the market building. Joel Gray was hired as building contractor and by September of that year the market was nearly complete. It was praised by the *Detroit Free Press* as "...an ornament as well as a great convenience to that important branch of city commerce" (Fig. 1).

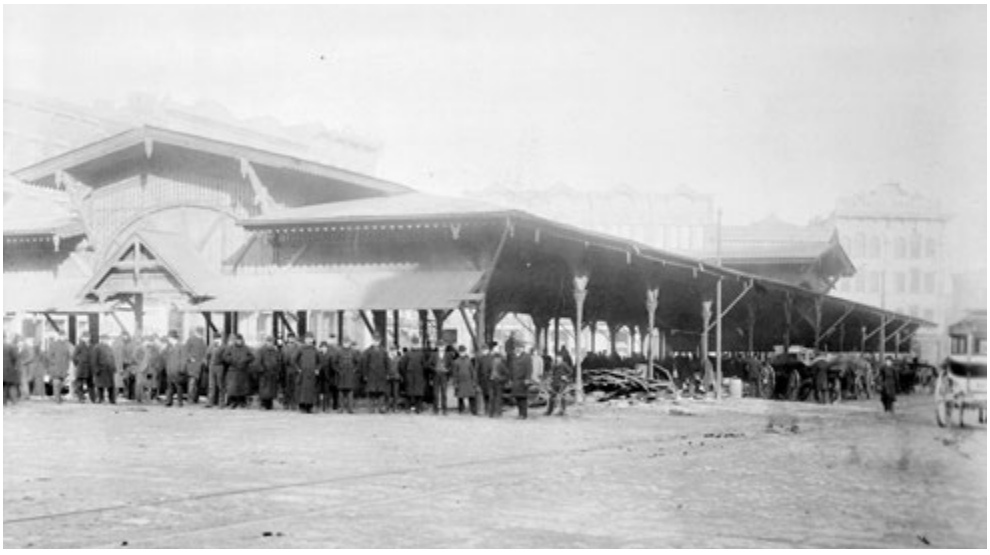

Figure 2. The timber frame market building being deconstructed in 1892 under police guard (From the collections of The Henry Ford)

Detroit continued its rapid growth and by 1890 it was a major industrial center. At the heart of the city that had grown up around it, in what is now Cadillac Square, the market was becoming a problem. Farmers' wagons and horse carts were causing congestion and agriculture was no longer seen as vital to civic prosperity. The Eastern and Western Markets were beginning to take over from the Central Market and in 1892 the latter was closed – but its closure met with resistance and its occupants had to be forcibly removed by police (Fig. 2).

Belle Isle (1894 – 2003)

Rather than demolishing it, the city transferred ownership of the market building to the Parks and Boulevards Department, so it was carefully dismantled and reconstructed in 1894 on Belle Isle, Detroit's main park. It was used as a stable and park-vehicle shed, and then when horses were no longer required for city services it was leased to the Belle Isle Riding Academy. Significant modifications were made, including the addition of brick walls to the perimeter. A full-length monitor roof was installed to let sunlight into the now enclosed building. Horse stalls were added inside and offices were created on both the first floor and an added second floor (Fig. 3).

Figure 3. The Belle Isle Riding Academy still in use in 1978 (From the collections of The Henry Ford)

Figure 4. The abandoned Riding Academy building showing evidence of the car crash and ensuing fire as well as general dilapidation in 2003 (Christian & Son, Inc.)

Figure 5. The interior of the Riding Academy building revealed a very well-built and highly decorated timber frame plus the added monitor and support framing (Christian & Son, Inc.)

Recreational tastes changed in the late twentieth century and horse-riding slowly fell out of fashion, and by the 1990s the building was abandoned and falling into disrepair. A car had run into it, causing a fire which was thankfully extinguished. The place had become derelict and efforts to restore it never gained traction. But before its demolition was scheduled, it was offered to the Henry Ford Collection, and in early 2003, Jim McCabe, then curator for Greenfield Village, was asked to take a look at it. From outside, the building clearly did not appear worth including in Henry Ford's Collection of American Innovation (Fig. 4).

Documentation, deconstruction and storage (2003 – 2020)

In April 2003 Jim McCabe invited me – Rudy R. Christian, President of Christian & Son, Inc. – to visit the building to help him decide if it might be worthy of the Collection, and if it could be dismantled and salvaged. What was inside was magnificent. The timber-frame structure was an outstanding example of its type in the mid-nineteenth century and the decoration was amazing. The braces along the perimeter were adorned with hand-carved filigree "snowflakes". The bolsters under the two-piece rafters were supported by hand-carved brackets, and every timber in the structure was carved with chamfers and stop chamfers (Fig. 5).

The challenge in documenting and deconstructing the market building was to determine what was part of the original structure and what was not. It had undergone slight alterations in 1894 and major ones later on, and when the weight of the monitor roof system was added, plank trusses had been installed between the original purlin posts. Those were easily discernible, but the damage done to the original down braces would have to be repaired. Luckily the original rafters were left in place below the monitor. And when the brick walls were added, the masonry was laid around the decorative rafter ends, so most of these also survived. But when the second-floor offices were added, the upper rafters, bolsters, and bolster brackets were removed and discarded, as were many decorative details in the office area. All these would have to be remade. The decision was taken to deconstruct and document the historic components and to put them in trailers for storage on Greenfield Village land.

Reconstruction (2020 – 2022)

Seventeen years of storage in semi-trailers had not damaged the timbers, which was an advantage when restoration work began at last in 2020, although first the lead paint on every timber had to be abated. A warehouse space in Romulus, Michigan, was rented and partially converted into an abatement facility. And before excavation began for the new foundation, it was critical that all the dimensions shown on the drawings be accurate. I was concerned that there might be mistakes in the drawings generated in 2009 because the bay spacings were unequal. This seemed illogical, as with three different spacings, many of the pieces would have to be cut to custom dimensions, compromising the interchangeability common to square-rule frames made in the mid-nineteenth century. The building originally had eleven bays longitudinally but this was reduced to seven in order to fit into the Greenfield village site. The drawings (Fig. 6) showed the second, third, fifth, and sixth bays as having their columns on 20'-11" centers, but the first and seventh bays appeared as 20'-8" and the fourth bay as 20'-10". After measuring every piece in the inventory, we determined that all the bays had been 20'-11", and the drawings were updated.

The timbers themselves had survived intact but little had changed in the understanding of the strength of historic building materials between 2003 and 2019, when the Museum decided to move forward with reconstruction. The engineer present when the 2009 construction drawings – which allowed for reuse of the historic timbers and columns – were created had retired by 2019 and his replacement had little experience of historic structures. To further complicate the issue, the timber roof system was originally constructed on highly ornate cast-iron columns. These had been cleaned, prime-coated and put into storage (Fig. 7), but the new engineer of record considered not enough was known about the strength of the cast iron and preferred not to use half of them, opting instead for steel columns of known design value. She was also concerned about the strength of the historic timbers and suggested to the Museum's construction committee that they consider not using them, given their age, and that all the major historic wooden members be replaced with select structural Douglas fir. There was also to be a "moment frame" to resist lateral loading and replace many of the historic wooden members with steel I-beams. Such engineering work clearly involved replicating the structure rather than restoring and reusing it.

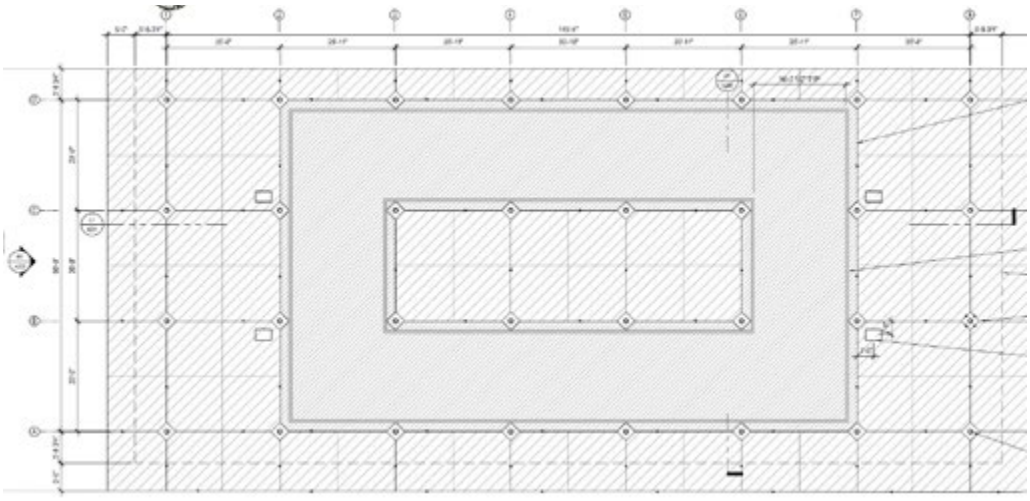

Figure 6. 2009 plan view showing unequal bay spacing which would have to be corrected (Quinn Evans Architects)

Figure 7. The original cast-iron columns were cleaned, prime-coated and put into storage (Christian & Son, Inc.)

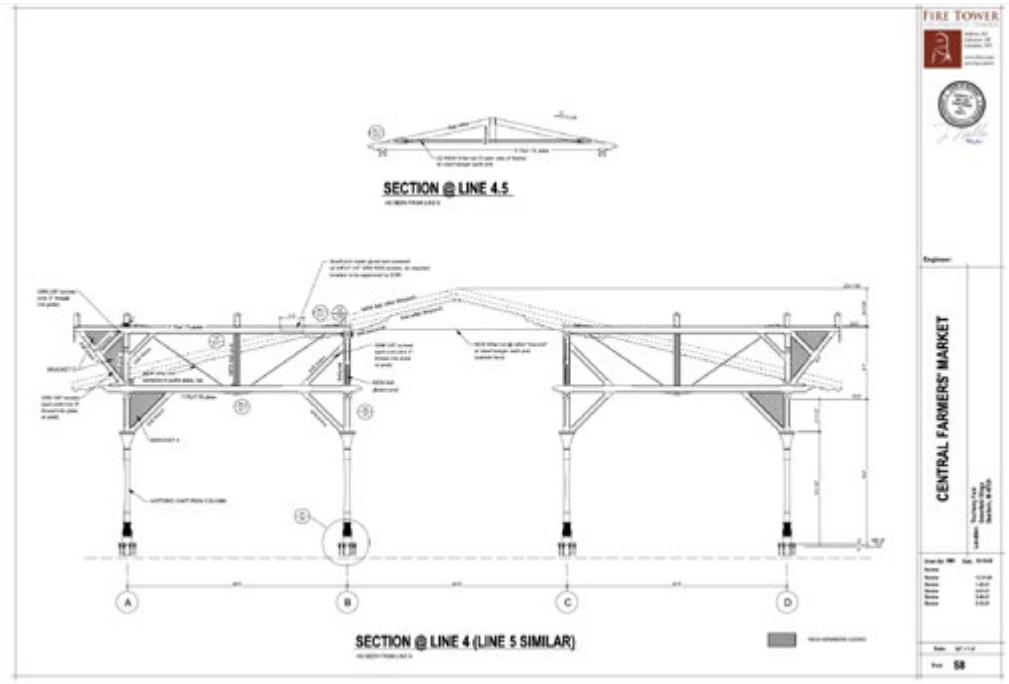

Figure 8. Sheet from the Fire Tower Engineered Timber drawing set showing the use of tension rods, steel brackets and compression posts to stiffen and reinforce the historic timbers (Fire Tower Engineered Timber)

Several members of the construction committee were becoming dismayed at the suggested changes, as was I. In discussions with Jamie Corcoran, project supervisor for the general contractor (O'Neal Construction), I said that if this design went ahead, Christian & Son was not the firm for the job, which would require builders familiar with steel. He asked if I had any suggestions for getting a restoration back on track, and so we had a Zoom call with him, Bart Fraley, construction superintendent for the Museum, myself, and Ben Brungraber, owner of Fire Tower Engineered Timber, who I had worked with for over 35 years. Ben has experience with historic timber structures and was hired as the new engineer of record. He judged that modern white pine was not a suitable replacement for the old-growth white pine, and that select structural Douglas fir was unnecessary and hard to source.

Figure 9. View of the finished frame showing the added compression post/tension rod system installed (Christian & Son, Inc.)

Figures 10 and 11. The decorative ends of timbers removed in the twentieth-century alterations would require replacement, using sections salvaged from other parts of the frame (Christian & Son, Inc.)

Douglas fir also does not hold paint well, and the entire frame was to be painted to match the historic colors. Ben specified glue-laminated southern yellow pine for any timbers needing to be replaced or remade. He too was concerned about the historic timbers handling the loads required by modern building codes and so a system of tension rods and compression posts was added (Figs. 8 and 9). He also devised a way of moving the moment frame into the foundation, eliminating the need for steel in the roof. Thus all the restorable historic timbers could be used.

Following the decision to reuse the historic timbers, a plan was created to minimize material handling. Being pine, the timbers were prone to impact damage, and considering their importance, the less they were handled the safer they would be from mishaps. As the timbers were documented and reassessed in the Romulus warehouse space they were sorted according to whether they needed no repair, minor repair, or significant repair. The latter were shipped to Christian & Son's shop in Burbank, Ohio, and the rest remained at Romulus, where a satellite workshop was created for minor repairs. Several of the historic timbers had considerable cosmetic damage, and decorative ends had been cut off in the modifications to create offices (Fig. 10). These ends were replaced with sections of unused timbers salvaged from the market frame and joined to the timber being repaired with blade-and-fork joints, sawn with a portable band saw and chamfered to match the original pattern (Fig. 11).

A common structural repair in historic timber-framed buildings is to fix "relish blowout". This is primarily the result of racking forces causing movement which puts the braces under strain, although it can also occur as the frame is raised or dismantled. The example shown was probably caused by improper handling by the deconstruction crew because the missing wood has surfaces with no

Figures 12, 13 and 14. Brace tenons with "relish blowout" and dovetail infills (Christian & Son, Inc.)

Figures 15, 16 and 17. Brace tenons damaged during installation of the added monitor trusses required blade-and-fork repairs with salvaged ends from damaged braces (Christian & Son, Inc.)

patina, whereas if it had happened earlier there would likely be darkening of the broken surface. To make a strong repair without the use of fasteners, a dovetail section was removed from the brace tenon. The matching long-grain repair piece, cut from a salvaged timber, was secured with urethane glue and fixed in place in the brace mortice (Figs. 12, 13, and 14). In some cases the tenon was more severely damaged and had to be replaced. And when the plank trusses were installed in the early 1900s to support the monitor roof, the noses of the braces attached to the lower purlin were cut off so that the built-up struts could abut against them. But as the building was being shortened by four bays, we had surplus braces to work with, and so we removed the damaged ends and created blade-and-fork joints to make one good brace from two damaged ones (Figs. 15, 16 and 17). These joints were secured with urethane glue and all-thread trim-head structural screws.

Quite a few of the scarf joints (end-to-end joints to form longer timbers) were damaged and required full or partial replacement. This meant extending the repair back into solid sections of the timber and creating a matching section of scarf joint with an "undersquinted" abutment to lock the repair in place and withstand axial loading (Figs 18, 19, and 20). These repairs were secured with urethane glue and GRK structural screws, whose head holes were later plugged. A challenge arose when the engineering team determined that the hips and valleys all required replacement glulam timbers with double-depth section. This was accomplished by extending them up into the common purlin over-structure concealed by the beadboard ceiling. The valleys terminated in the roof structure but the hip timbers extended out in nearly 4-foot overhangs, which required carving of decorative ends to match the originals. Figure 21 shows glulam hip timber ends carved to match the original hip in the foreground. The hip affected by the fire caused by the car accident can also be seen in the foreground.

18

19

20

Figures 18 and 19. Damaged scarf joints required repairs that extended back into the solid section of timber (Christian & Son, Inc.)

Figure 20. Infill repair installed with an undersquinted abutment (Christian & Son, Inc.)

Figure 21. The deeper glulam hip timbers needed matching decorative ends duplicating the original pattern (Christian & Son, Inc.)

After repairs and replication work, the timbers were shipped to the building site in Greenfield Village in Dearborn, Michigan. The fact that the timber roof system sat on 15-foot tall steel and cast-iron columns meant that all the installation work had to be done with manlifts (Fig. 22). Extendable forklifts were used to bring the timbers into position and the roof system was assembled piece by

Figure 22. As the historic roof frame sat on top of 15-foot cast-iron and steel columns, installation had to be done with manlifts, extendable forklifts and a crane (Christian & Son, Inc.)

Figure 23. Drone view of the building and surrounding area as slate roofing began (From the collections of The Henry Ford)

Figure 24. Completed market building with added rows of salvaged cast-iron columns to give visitors a sense of its original size (From the collections of The Henry Ford)

Interior view of the finished market during the grand opening, giving a sense of what it might have looked like in the nineteenth century in all its glory (Christian & Son Inc.)

piece. The braces were pegged in place with traditional treenails, but the engineering drawings specified Rothoblaas all-thread structural screws imported from Italy for securing the rest of the joinery. The screws were fitted so as to be unseen from the ground. Some 80% of the original timbers were able to be reinstalled in the structure. Once the roof sheathing was installed, slate shingles matching the originals were laid over the roof (Fig. 23). The entire frame was painted to match the original color, concealing the replacement timbers. And after nearly 20 years of storage, the Detroit Central Market now stands in Greenfield Village where millions of visitors will be able to view the incredible work of craftspeople working entirely with hand tools over 160 years ago and get an insight into how buildings were built when they were made to last for generations (Fig. 24).

Biography | Biografía | Biografia

Rudy R. Christian

Rudy R. Christian was introduced to timber-frame carpentry in 1982. Since then he has built up a company that is world renowned in traditional timber framing, working in the United States, Europe, and Southeast Asia. Rudy's experience with the Henry Ford Museum includes being part of the team that documented and deconstructed Thomas Edison's laboratory #11 from Greenfield Village during major renovation. His team later rebuilt it in its original location in West Orange, New Jersey. His work with the World Monuments Fund includes creating and running a workshop in Mount Lebanon Shaker Village for restoring the last known Shaker granary, and assisting in the restoration of the Golden Palace Monastery in Mandalay, Myanmar.