

BY WILL WALLACE-GUSAKOV

Helping Rebuild Notre Dame

On the evening of April 15, 2019, a fire broke out in the attic of Notre Dame cathedral during a maintenance project (1). The blaze would go on to destroy the entirety of the Gothic church's roof, including its iconic 19th-century spire. A majority of the estimated 400 tons of lead roofing and cladding vaporized from the high temperatures, and the underlying oak timber framing, most of which dated back to the 12th and 13th centuries, was destroyed. Hours later, after the fire was contained, French President Emmanuel Macron set a five-year deadline to restore the sacred structure in the heart of Paris.

An accurate replica. Last year, French colleagues associated with Charpentiers sans Frontières (Carpenters Without Borders, of which I'm a member) contacted me because their company, Ateliers Desmonts, had won the contract to rebuild the timber-framed roof over the cathedral's nave and choir areas. They hired me to help create an accurate replica of the medieval timber frame, down to individual details in each truss and framing member destroyed by the fire. Starting this past January, I spent six months working in Normandy, a few hours outside of Paris, hand-hewing oak beams with a Gothic-style broad-axe (2) and laying out and cutting wood joinery.

An important concern was the hand-tooled finish of the oak timbers used (timbers "hand hewn with a broad-axe" was written into the spec of this big government job—a watershed moment for traditional hand-tool carpenters). We researched historical sources and tool marks in extant contemporary frames and set criteria for the hewing axes to be used. We studied historical photographs and experimented with axes, adzes, and chisels to create full-scale prototypes of joinery and sculptural details, which were then reviewed by the project architects. Every effort was made to reproduce the famous medieval roof frame (affectionately known as *la forêt*—"the forest") both in detail and in spirit.

The nave frame. I worked mainly on the principal roof trusses over the cathedral's nave. To help re-create the nave's 11 principal trusses and 46 secondary trusses, we drew from Point Cloud scans, archival photographs, and technical documents from the architectural team. We used traditional *piquage* (French plumb line scribe) methods to lay out the frame. Joinery was cut using modern tools such as chain mortisers and circular saws as well as hand tools like chisels, planes, drawknives, and side axes. To verify everything fit together, we raised the full-scale nave frame at the Normandy worksite. The completed nave frame measured 46 feet wide by 33 feet high by 115 feet long (the 11 principal trusses are spaced roughly 12 feet apart) (3).

I returned home in July just as the nave frame was beginning to be disassembled bay by bay and transported piecemeal to Paris. Because of jobsite constraints, the trusses are being reassembled one at a time on site and hoisted into place. This methodical, bay-by-bay truss installation over the nave and choir areas will take roughly six months.

According to French officials, the cathedral will be partially open for mass and to visitors in December 2024. The final restoration work will take years to complete.

Will Wallace-Gusakov operates Goosewing Timberworks in Lincoln, Vt.



Photos: 1. Adobe Stock by David Henry; 2. Will Wallace-Gusakov; 3. Miles Jenness