



Maison Dufort

**Restoration training to save
Haiti's Gingerbread houses**

A report by World Monuments Fund supported by the Prince Claus Fund and FOKAL

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Haiti's Gingerbread houses**

Report Author

WILL RAYNOLDS





Front cover: Maison Dufort,
the restoration training site

Above: Carpenters at work
prior to door reinstallation.

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Norma Barbacci, Program Director for Latin America and the Caribbean
Ken Feisel, Art Director
Ben Jeffs, Program Director
Yiannis Avramides, Program Manager

Project Partners

FOKAL was the principal organizer and administrator of the training school, and with the support of George Soros Open Society Foundations, was able to provide the majority of the funding necessary to see this project through to completion. However, this project would not have been possible without a number of critical partnerships.

The Institut du patrimoine wallon (IPW) with the financial support of Wallonie-Bruxelles International (WBI) played an instrumental role in supervising the training of the group at the Maison Dufort. IPW, an organization that routinely hosts advanced training sessions in the restoration arts for diverse groups in Belgium, and also has international experience with collaborative restoration projects in Senegal, Cambodia, Cuba, was well positioned to provide the technical oversight and hands-on practical training needed at the Maison Dufort. The support from WBI allowed master craftsmen from IPW to pass their skills onto the trainees at Dufort, and also provided a modest stipend for the trainees as they participated in the course.

Following their involvement in the inventory of Gingerbread houses after the devastating earthquake of 2010, World Monuments Fund (WMF) helped launch the training school at Maison Dufort. WMF dispatched consultants with engineering expertise to insure the structural stability of the building and devise a system of seismic reinforcement that would be compatible with the historic fabric, a process that was conducted in close consultation with the master craftsmen of IPW and FOKAL. With the support of the Prince Claus Fund, WMF also supervised the organization and production of didactic materials used in conjunction with the training school and that will serve as a resource for similar projects in the future. WMF also supervised and funded the production of this report.

L'Institut de sauvegarde du patrimoine national (ISPAN), Haiti's national heritage authority, supplemented the pedagogical experience of the trainees at the Maison Dufort by facilitating a series of lectures on the diverse nature and importance of heritage sites in the Haitian context.



Patrick Lacroix from IPW and Steve Kelley from WMF work together to prepare rebar reinforcement for the foundation of the house.



Representatives from FOKAL, WBI, and IPW gather at the Maison Dufort.

Origin of the Training School

In the aftermath of the earthquake of January 12, 2010, the local and international community responded to take stock of the loss and begin to rebuild. Fondasyon konesans ak libète (FOKAL), with headquarters located on Avenue Henri Christophe, sought ways to contribute to the rehabilitation of the surrounding neighborhoods of Pacot, Bas-Peu-de-Chose, Bois Verna and Turgeau. In partnership with the Haitian Education and Leadership Program (HELP), FOKAL devised a proposal to restore the gingerbread houses in these neighborhoods, representative of an eclectic and highly decorative style that has become synonymous with Haitian heritage.

The Gingerbread houses of Port-au-Prince had previously been recognized as a priority for conservation, having been nominated in 2010 to the World Monuments Fund Watch List, an advocacy tool designed to raise awareness about cultural heritage sites facing uncommon challenges. FOKAL assisted a team of conservation architects and engineers dispatched by WMF and ICOMOS, the International Council on Monuments and Sites, with the support of the Prince Claus Fund and the Institut de sauvegarde du patrimoine national (ISPAN) in April 2010.

This expert team managed to visit and inventory more than two hundred gingerbread houses over the course of a two-week survey, assessing the overall condition of these properties after the earthquake. Generally, the team was pleased to discover that the gingerbread houses had withstood the earthquake much better than many structures built more recently in reinforced concrete.¹ Nevertheless, a number of the gingerbreads were damaged during the earthquake. Others continued to suffer from the lack of maintenance and incompatible additions mentioned when they were first nominated to the 2010 Watch List.

While it was clear that rebuilding would be a long process, it was also necessary to select a manageable way to begin. FOKAL initially imagined restoring one of the Gingerbread houses following the most demanding international standards. However, the lack of expertise amongst local artisans made such a project daunting. Therefore, it was decided to treat this restoration project as a training school, restoring one house while at the same time managing to transfer skills to a new generation of artisans.

The Maison Dufort came to FOKAL's attention during the course of the post-earthquake survey. It was an appropriate house to host a training school for a number of reasons. First, the house had suffered a significant amount of damage during the earthquake, and it was threatened by those who imagined that there was no choice but to tear it down, like so many of the other damaged structures. At the same time, both local and international advocates believed that Maison Dufort and other gingerbread houses like it could still be restored. If the training school was successful and the house was restored, it would provide a strong example that an alternative approach was possible and potentially generate support for other similar projects at gingerbread houses throughout the city.

Second, the house had a representative mix of materials, consisting of a masonry first floor that supported a mixed timber frame and colombage second floor. While many of the other gingerbreads are entirely timber frame and some are entirely masonry, the Maison Dufort would provide trainees an ideal opportunity to engage with multiple materials in the course of a single project. The skillset they learned at the Maison Dufort could be successfully transferred to restore any other gingerbread house ever built in Haiti.

Finally, and perhaps most importantly, the owners of the house, the Dufort family, recognized the potential of such a training school and were willing to sell their property according to agreeable terms, allowing the project to proceed.

At its essence, this training school sought to restore a single historic house in a neighborhood of Port-au-Prince that, in addition to the earthquake, had long suf-

1 To download the full report from this survey, visit: http://www.wmf.org/sites/default/files/wmf_publication/WMF%20Haiti%20Mission%20Report%20FR%20reduced.pdf.

fered from neglect. The Maison Dufort, now restored, serves as solid proof that it is not only possible but also worthwhile to reinvest in the gingerbread houses, even in cases where they have suffered significant damage from neglect or the earthquake

Beyond that, the Maison Dufort training school provided in-depth experience in the theory and practice of restoration under the close supervision of master artisans. The group of stagiaires working at the Maison Dufort now has a foundation of basic skills and a critical eye more attuned to the demands of restoration work as compared to new construction. Undoubtedly, they will continue to improve their skills through ongoing practice at other job sites, but will draw lasting benefit from the strong fundamentals instilled in them during their time at the chantier-école.



A gingerbread house on Avenue Lamartiniere damaged by the earthquake

History of the Maison Dufort



The western façade of the Maison Dufort before and after the earthquake of Jan. 12, 2010; the staircase on the interior of the house collapsed.

The Maison Dufort, situated between the 2nd and 3rd Avenue du Travail in the neighborhood of Bois Verna, was typical of houses built in the gingerbread style. Prior to the earthquake, the house had a ground floor made from rubble-masonry panels bounded by vertical pillars of brick and a timber-frame in colombage on the second floor, infilled with rubble masonry bound with a lime based mortar. Constructed in the middle of a relatively generous rectangular lot of approximately 1,200 m², the house had both a front courtyard and a rear garden, as well as a shaded porch that ran along its eastern and western façades.

The house was built in 1910 according to the design of the Haitian architect Léon Mathon (1873-1954). Mathon was one of the most sought-after architects of his generation. In 1895, he had travelled to Paris to formally pursue his studies in architecture at the École des Beaux Arts, accompanied by Georges Baussan and Joseph-Eugène Maximilien, two additional Haitian architects who would rise into prominence. Upon his return, he and his former classmates all worked to refine the gingerbread idiom, adopting an architectural style then in vogue at European resorts to the Haitian context. Mathon designed and supervised the construction of a number of gingerbread houses elsewhere in the neighborhood of Bois Verna, including one at No. 9 1^{ère} Avenue de Travail and one at 32 Avenue Lamartinière. The latter house was built for Haitian president Tancrède Auguste, suggesting the high-profile nature of Mathon's work.

Dr. Charles Mathon, the brother of the architect, originally commissioned the Maison Dufort as a private residence. It may have only been one level at the time of completion, according to an assessment of the house carried out by the firm IDCO. Antoine Dufort, a coffee exporter, purchased the house for his family in 1939. Over time, the family adapted the property to meet changing needs. A partition was added to one of the rooms on the second floor in order to accommodate the installation of a bathroom, bringing plumbing to the interior of the house for the first time. Previously, all facilities, including bathroom and kitchen, had been outside. Additionally, on the second floor, the floor plan was modified to create a small annex concealing a climate control system. While the high ceilings and good cross-ventilation provided for adequate cooling at night, air conditioning made the second floor more habitable, particularly as the house was converted into offices. Finally, in the front courtyard, a small outbuilding was constructed to serve as additional office space for family members. This building would go on to serve as the project office and guard's quarters for the duration of the restoration project.

Prior to its purchase by FOKAL, the house was owned by Albert Dufort, a representative of the second generation of Duforts associated with the property. While it no longer served as a family residence, the house remained in use, having been converted into offices.

On the morning Jan. 12, 2010, the Maison Dufort was in good condition. While termites had infiltrated some of the timbers of the staircase and second floor, these portions of the house remained structurally sound. Since the house had been in continuous use, a certain degree of ongoing maintenance and vigilance on the part of the Dufort family had mitigated any serious problem.

The earthquake arrived as the house entered its hundredth year, and when it struck on the evening of Jan. 12, the house was severely damaged. The masonry walls of the first floor struggled to withstand the seismic waves. In many instances, the panels of rubble masonry disassociated from the bordering pillars of brick, and they fell to the ground. Cracks propagated, and the old tie rods designed to hold the masonry walls together at the corners moved so much that they blasted out the surrounding bricks, weakening the entire structure.

On the interior of the house, doors were knocked loose from their frames, and frames detached from the surrounding walls. Plaster fell from the walls, and some interior partition walls collapsed. The staircase pulled apart from the adjacent walls and many of its treads fell to the ground. On the exterior, the pillars supporting the rigid awnings

that once provided shade for the porches buckled and failed. The courtyard was filled with debris from the collapsed masonry. The comparative flexibility of the timber frame on the second floor allowed it to flex and sway in response to the earthquake. Though it had suffered some termite damage since the time it was first assembled, it survived relatively unscathed. However, a number of the colombage panels did fail during the quake, and the entire second floor slid by as much as 12 cm. to the west. The Maison Dufort was no longer a safe or tenable place to live or work. The damage was so extensive that it would not be easy to stabilize let alone repair the structure. The Dufort family had little choice but to abandon the house, fearing that it would be necessary to raze it to the ground.

Fortunately, following the post-earthquake inventory of gingerbread houses, it became evident that the needs of the Maison Dufort closely matched the kind of restoration project that FOKAL envisioned for its training school. FOKAL was able to purchase the damaged house from the Dufort family at a favorable rate, ensuring that the house would be repaired and opened to the public. Through its restoration, the house has become a community resource designed to last for at least another century.

Maison Dufort as it appeared as the restoration works were nearly completed.



Selection of Trainees

Selecting the trainees to participate in the restoration was critical to the success of the training school. Rather than hiring a team previously employed by established construction firms, FOKAL decided that it would be more prudent to select members of a younger generation with less confidence in their skills but with fewer bad habits. Whatever they lacked in practical experience, they would make up for with an eagerness to learn. Ideally, these individuals would begin the training without any pre-conceived notions about the best way to build or rebuild, and their minds would be more open to the demanding techniques of a conservation approach.

The selection process was facilitated by the fact that a number of other entities had already launched projects to train young builders in construction. Canada Techno had welcomed a large group of more than thirty trainees in Ottawa for a crash course in general construction. FOKAL selected the majority of the trainees who would work at Maison Dufort from amongst the group which had first participated in the Canadian training. The background of the individuals in this group was generally similar; nearly all of them had graduated from programs at local technical schools, many of them having trained as electricians. Nearly all of them had no construction experience outside of their time in Canada. Not a single one had ever worked on a restoration project.

At the beginning of the Maison Dufort project, the group was entirely raw, inexperienced and untested. While their minds were open to new techniques, these trainees required considerably more training on site, and their work required closer supervision, a burden that fell on the shoulders of the master craftsmen of IPW. The training was rigorous; frequently trainees would work six days a week. Yet those trainees who persevered and learned first hand how to approach and execute the complex tasks involved with restoring a gingerbread house, ultimately proved to be the greatest success of the Maison Dufort project.



Michèle Pierre-Louis, President of FOKAL, meeting with a group of prospective trainees.



Prospective trainees inspect the Maison Dufort from the exterior.



Trainees learn more about Gingerbread style architecture under the guidance of representatives from ISPAN.



Trainees raise their trowels in a salute to their own progress.

Description of Major Works

On September 26, 2012, the project partners convened to officially launch the training school at Maison Dufort. By that time, more than two years had passed since the earthquake, and the situation at the house had already begun to change. After successfully securing the title to the Maison Dufort, FOKAL identified competent local firms to carry out the work. IDCO would serve as the local project architect charged with submitting plans for the restoration process. The local contracting firm GATAPHY was selected to implement IDCO's plan for the initial stabilization of the structure, and they had installed a system of shoring throughout and around the house.

While IPW training had already started at the beginning of 2012 with Anselme Dutrecq's short course on preventing termite attack, practical hands-on training at Maison Dufort began with masonry. IPW dispatched Patrick Lacroix, a master mason with more than thirty-five years of experience working on and managing some of the most demanding restoration jobs across Europe. Lacroix had expected he would be working with trainees who already had some experience with masonry. As soon as he understood that this was not the case, he revised his planned approach towards the site. It would be necessary to slowly build the basic competencies of the team, controlling the quality of the work with constant feedback.

Due to the structure of the project and ongoing commitments in Belgium, it was not possible for the IPW trainers to remain full-time at the Maison Dufort. However, a rhythm was quickly established. FOKAL prepared a briefing, including photographs, describing the progress and difficulties encountered each day. While it was not possible to maintain direct contact on a daily basis due to the time difference between Haiti and Belgium, there was an exchange regarding the progress of works at least several times a week. Lacroix followed these briefings particularly closely, often responding with written explanations and diagrams, and occasionally building and photographing scale models to illustrate a more difficult concept. Whenever necessary, Lacroix communicated directly with members of the team at Dufort via Skype in order to ensure that his explanations had been well understood.

Though he might not have anticipated this level of involvement at the outset, Lacroix quickly came to have a deep affinity for the progress of the jobsite as well as the team. His was the most frequent outside voice advising the project, and it was often critical. He insisted on high-quality results at every step, pushing the trainees to always demand the best from themselves and from others.

What follows is a brief description of the major steps that the team accomplished during the course of the training school. A series of illustrated technical briefs have also been developed to address many of these topics in greater detail.

Representatives of IDCO discuss plans for stabilizing the house; Trainees learn about best practices for preventing termite damage from IPW trainer Anselme Dutrecq.





The official launch of the training school at Maison Dufort.

IPW trainer Patrick Lacroix gets to know the team of trainees at Dufort; Lacroix explains the work that he expects the team to accomplish in his absence.



Stabilization of Structure

SEPTEMBER 2012-SEPTEMBER 2013

Often, so many elements of shoring had been installed that it was difficult to access spaces on the interior of the house; In other cases, portions of the damaged masonry did not seem to have been properly stabilized, and were leaning dangerously out of plumb; The team dismantles some of the existing shoring to make way for the new system; The eastern facade of the house supported only by wooden shoring, with the masonry walls of the first floor entirely dismantled.

Before the training school could begin in earnest, the structure itself had to be sound enough to safely accommodate the arrival of the trainees and the beginning of work on site. Lacroix reviewed the site alongside Steve Kelley, a structural engineer for the firm Wiss, Janney, Elstner Associates in Chicago and consultant for WMF, and both agreed that the shoring that had been installed GATAPHY according to the plans IDCO was insufficient.

Basic training could continue in the courtyard of the house before the structure was stabilized. Lacroix taught the team to build a wooden shoring system. Together, they removed elements of the previous shoring that were no longer functioning, and then went on to stabilize the load bearing walls of the first floor and add braces to reinforce the timber frame of the second floor.

As the team dismantled the masonry walls of the first floor to prepare to replace them, they deployed these same techniques, always ensuring that the load from above was properly supported. The damaged masonry walls were replaced gradually once the load had been removed. At one point, the entire eastern third of the building was supported by nothing but this system of wooden shoring.





The team had the chance to visit the IPW training facilities at La Paix-Dieu; At La Paix-Dieu, they worked on some of the basic skills they would need during their training at Maison Dufort, including building a support for a masonry arch; The team also got more practice building masonry arches.



Trip to Belgium, September 2013

While the team labored to stabilize the structure, to dismantle the old masonry walls on the first floor, and to rebuild the eastern façade, they had the opportunity to travel to Belgium to visit the staff and facilities of IPW. For the course of a week, the team studied at Paix-Dieu, a thirteenth century abbey that IPW had converted into a training academy. IPW normally offers courses for artisans, architects, and engineers seeking to refine their skills or understanding of the heritage trade. They also offer courses for school children of various ages, giving them the opportunity to stay overnight at their training center and learn about restoration crafts. In this case, they prepared a special training module that introduced the spectrum of sub-disciplines that the trainees would have a chance to work on over the course of the training school in Port-au-Prince, as well as provide them with a stronger theoretical basis for their work.

The team learned how to prepare lime mortars and finishes, how to conduct a detailed investigation of the physical history of a building, and how to construct a masonry arch with greater precision. They were also introduced to treatments for termites.

Rebuilding the Walls

SEPTEMBER 2012–NOVEMBER 2014

Most trainees at the Maison Dufort lacked even basic masonry experience, and Lacroix anticipated that the learning process would be slow. For weeks, the team did nothing but lay course after course of brick, building practice walls in the courtyard. Whenever Lacroix noticed an error in the alignment, spacing or overall bond of the bricks, he would ask the mason to disassemble this work and start again.

Once the team proved that they could reliably produce small walls, they graduated to more complicated tasks, beginning to practice building masonry arches as they began to dismantle and restore the northern façade. These were the rudiments of what would be necessary to restore the masonry of Maison Dufort.

The original walls of the first floor of Maison Dufort had included panels of rubble masonry bordered by pillars of brick. Most of these panels had failed during the earthquake, meaning that every wall of the first floor had to be rebuilt. Since this lightly consolidated masonry had fared so poorly during the earthquake, there was no choice but to replace these walls with a material that offered better seismic resistance.

It was decided that while restoring Dufort, the walls should be rebuilt according to their original dimensions but in solid brick without rubble masonry panels. This decision precipitated another, the choice of a suitable bond for the brickwork. Lacroix selected the “appareillage croisé” or Flemish bond, commonly found in historic structures throughout Belgium. This bond was sturdy and proved to be relatively easy for the trainees to learn. While some bricks could be reclaimed from the walls of Dufort, the majority of bricks were salvaged and supplied from other buildings that were torn down after the earthquake.

Trainees make measurements prior to laying their first course of brick; A trainee checks the plumb of a practice pillar.





Lefevre inserts small rods to reinforce the second-floor masonry.



THE TRAINEES

Jean Lucknor Lefevre

Construction has always been a part of my life” Lefevre explained while admiring some of his favorite parts of the Maison Dufort. “My grandfather was a mason, my father is a mason, and I’ve been going to job sites to help out since my childhood.” With a taste for building, Lefevre embarked on his studies as an electrician at the Centre Pilote because he thought electrical work might keep him employed in construction but be a bit less tiring. “I tried to become something other than a mason, but life took me back in that direction,” he smiles, leaning on a decorated brick wall that he helped to build.

Even though he had more experience than many of the other trainees, he found that when we started training, he still found it difficult: “I didn’t have a solid technique. It took me a while to feel comfortable with a trowel in my hand.” But after laying more than ten thousand bricks in the course of the project, he supposes that he now has the hang of it. While he had the chance to do carpentry work as well at Dufort, he feels most comfortable working with masonry. Recently engaged to be married, he hopes that he’ll be able to build a home for his family, just as his father once did.

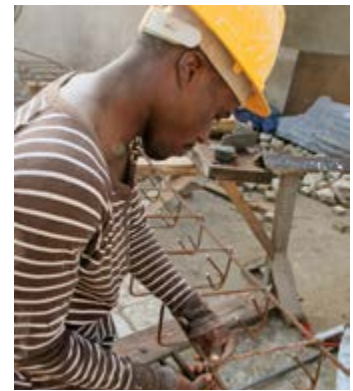
Before arriving at Maison Dufort, every job site he had been involved with was new construction. He had never imagined the potential of restoration, though he was surprised with the amount of devotion required. “If my father started to work on a restoration project, he wouldn’t like it because it requires so much precision and patience. Through the experience at Dufort, I think that I have become patient enough to see these works through to the end.”

Trainee Jean Paul Casimir cleans the joints of the masonry arch; The team works to complete a masonry arch like those that they need to rebuild on the ground floor of the house; Rubble masonry of the eastern façade.





Marc Daniel assembles the rebar to be used in the foundation.



THE TRAINEES

Marc Daniel Jean-Jacques

Long before the earthquake, Marc Daniel had known tragedy. Both of his parents died in quick succession while he was still young. Facing uncertain prospects in his hometown of Baie-de-Henne, he looked towards the capital. His hope was to become an engineer or an architect, learning how all parts of a building work together as a whole, but he was not in a position to pay for those studies.

Thanks to the assistance of one of his cousins, Marc Daniel was able to enroll at the professional school of Saint Trinité, following a course in construction. After the earthquake, while he was amongst the group selected to train in Canada, he struggled to find stable work after his return, and had yet to gain much experience working on job sites.

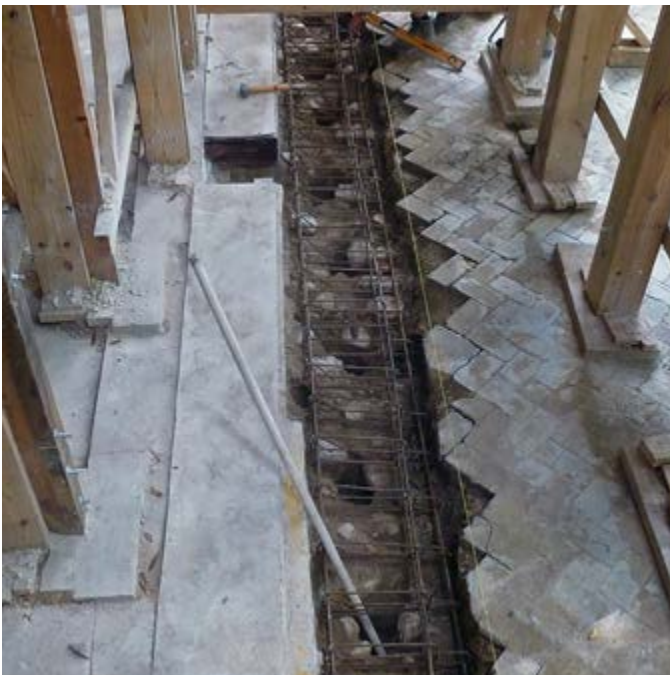
He joined the team at Maison Dufort from the very beginning, but then left to pursue an opportunity to learn techniques of seismic reinforcement for reinforced concrete, a subject closer to his studies at Saint Trinité. While it was not easy for him to reintegrate into the Dufort team upon his return, Patrick Lacroix vouched for his solid work ethic and believed that he would make a valuable contribution to the team. Lacroix was correct.

At Dufort, Marc Daniel was struck by the way in which the scale of the project surpassed anything he had previously attempted. Though it wasn't always easy, it was vital for the team to stay in contact with Lacroix whenever he was back in Belgium in order to better resolve problems as they arose. The job site became his life. His fiancée would frequently stop by the site to see what he was doing and admire the progress. Marc Daniel is optimistic about the future; just as the work at Dufort will finish, he and his fiancée will be wed.

As the trainees began to work on the house itself, they followed a sequence of tasks to rebuild the masonry walls. First, they would stabilize the area surrounding a section of wall, supporting the entire weight of the floor above with shoring. They would prepare a detailed diagram, ensuring that had measured and counted the bricks associated with any decorative work or openings for doors along that particular section of wall. Then, they would dismantle the masonry damaged by the earthquake and prepare and pour a new foundation. Finally, they would begin to rebuild the wall in solid brick masonry according to their diagram.

In certain cases, it was necessary to replicate more complicated decorative elements, particularly on the ornate western façade. There, the masonry work was more demanding, and individual bricks often needed to be shaped by hand. Still, the fundamental principles remained the same as they had been while laying the first practice bricks in the courtyard. If a brick was out of place, Lacroix demanded that the section of wall be dismantled and redone correctly. Descriptions and photographs from Dufort arrived in his inbox several times a week, enabling him to closely follow the progress on site and suggest corrections as necessary.

Bricks salvaged from other buildings damaged in the earthquake; The team dismantles one of the interior masonry walls; reparation for pouring a new foundation for the eastern façade; Honoré Evins, one of the trainees, builds a decorative pillar on the western façade.





Bélanger checks that a pillar in the west gallery is plumb.



THE TRAINEES

Donel Bélanger

Donel has always loved repairing things. Growing up in the neighborhood of Bas-Peu-de-Chose, he had a knack for tracking down broken televisions or radios and managing to get them to work again. He pursued this inclination towards electronics, studying to be an electrician at Canado Technique, the Centre de Formation Professionnelle d'Haïti.

After the earthquake, he was given the opportunity to participate in a four-month post-earthquake skills training program in Ottawa, Canada, sponsored by the Cité Collégiale. The course focused on timber frame structures to provide temporary housing. As he was exposed to the larger domain of the building arts, he realized two things. First, by diversifying his skill set, he could move away from working around live wires, an aspect of being an electrician that he had always found risky. Second, he imagined that he could apply his natural inclination towards fixing things on a larger scale, particularly since so many repairs were needed in the aftermath of Jan. 12, 2010.

Though he never imagined he would have the chance to learn to restore historic houses, he has taken to the work with enthusiasm and is proud of the results at Maison Dufort. "Have you ever seen anything so beautiful?" he asks, gazing at the western façade of the house which he and his teammates had worked steadily to restore. Donel wants to continue restoration work, honing his skills until he becomes truly excellent at the job. He reflects, "There are many other gingerbread houses in my neighborhood, Bas Peu de Choses, that are also in need of attention."

Installation of Seismic Reinforcement

MAY 2013–JULY 2015

One of the principal challenges in the restoration of Maison Dufort was devising a system that would help the structure better resist a future earthquake while respecting the historic nature of the house. When debating the best way to replace the masonry of Dufort, FOKAL, WMF and IPW considered a number of options. Steve Kelley contributed his substantial experience and expertise to the project, having previously contributed to numerous projects to retrofit historic buildings with seismic reinforcement. To greatly strengthen the resistance of the ground floor, the initial proposal included a cage of steel-reinforced concrete punctuated with masonry panels, with the ensemble clad in brick. While potentially offering greater resistance, this approach was discarded in favor of an approach which maximized the use of traditional building techniques and materials.

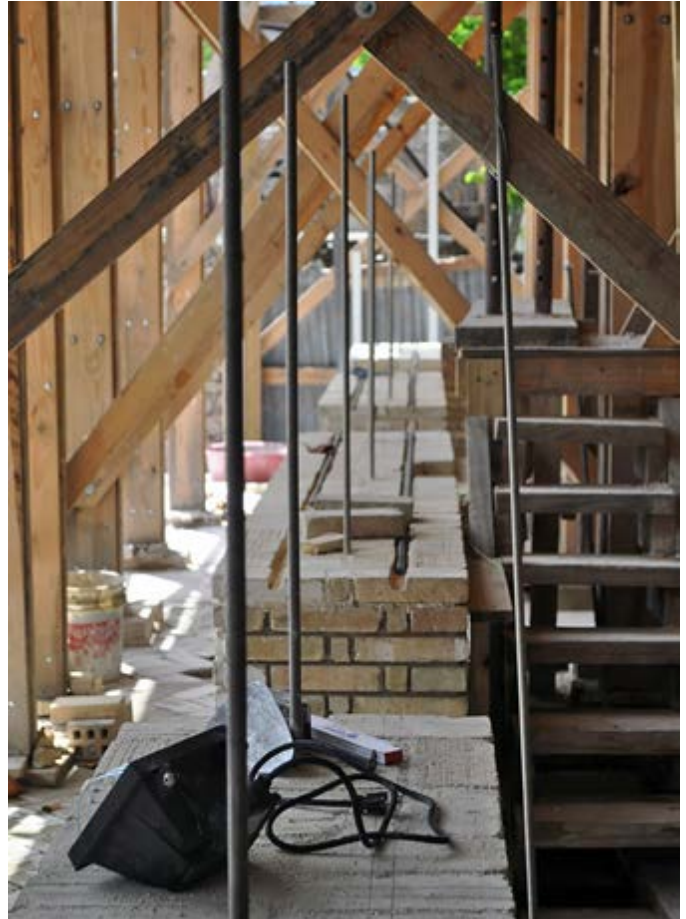
Over the course of three months of discussions in early 2013, the parameters of the seismic reinforcement evolved. Rather than build a large frame in reinforced concrete, Kelley proposed an alternate system in which stainless steel tie rods would be embedded into the brick masonry as it was rebuilt, reinforcing the walls of the first floor. With this option, the trainees would still have the opportunity to gain experience building in brick rather than concrete, more faithfully fulfilling the goals of the training school. The partners agreed that this approach would offer additional seismic reinforcement while aligning more closely with the spirit of the project.

At the level of the ceiling of the ground floor, additional reinforcement was added, including wooden cross beams and further tie rods connected to the sills installed on the top of the masonry walls. These sills provided the link between the vertical tie rods embedded in the masonry and the horizontal tie rods at the level of the ceiling, minimizing deformation in the case of a future earthquake. Haiti does not produce stainless steel domestically, nor was it possible to import less expensive rod stock and thread these stainless steel rods locally, since this process would have stripped the protective coating. Therefore, this solution for seismic reinforcement was also relatively expensive and may not be practical for every similar restoration project.

Given that the flexibility of the second floor enabled it to survive the earthquake almost entirely intact, no metallic reinforcement was added to the timber frame. Beams that had been damaged by water and termites were simply identified and replaced.



Installation of a plaque joining a tie rod to a sill on top of the masonry.



Horizontal stainless steel tie rods were embedded in the masonry walls to make them more seismically resilient; vertical tie rods also reinforce the walls and contribute to a stronger connection between the masonry and the timber frame above; trainee Donel Belanger works to embed the stainless steel tie rods; end plates of stainless steel tie rods on an exterior masonry wall; additional wooden reinforcement installed at the ceiling of the ground floor.



Termite Treatment

DECEMBER 2012–JULY 2015

The humid environment of Haiti negatively impacts the durability and desirability of wood as a construction material. While some local resinous hardwoods are more resistant, imported pine of the type used for the timber frame at the Maison Dufort is relatively more prone to insect attack. Indeed, signs of termite activity were pervasive throughout the wooden portion of the house, and termite attack was most severe in locations where wooden beams had been routinely exposed to moisture. Almost all of this activity appeared to have occurred prior to the start of the training school, and even prior to the earthquake. While even the beams that subjected to the heaviest attacks remained an integral part of the timber frame and were still capable of bearing their load, this restoration project provided an opportune time to replace these deteriorated elements with something more solid.

IPW dispatched one of their trainers, Anselme Dutrecq, to advise the team on a reasonable approach to the termite problem. In the context of an historic structure with a significant quantity of wood, it is not always possible or practical to kill every termite with a chemical treatment. Based on Dutrecq's experience and observations on site, the most important preventative measure he could recommend was to keep all of the wood on site as dry as possible, whether it was in storage or already part of the house. Though some species of termites are capable of attacking dry wood, the species that are most abundant in Port-au-Prince prefer attacking wood that has been softened by moisture and rot.

On site, lumber was always covered by a tarp to protect it from rain and isolated from the moisture of the ground by risers. These measures only offered limited protection, and it was best to limit the amount of time that any lumber spent in storage on the site. Lumber was generally ordered in small batches, since storage space was also limited. The envelope of the roof had remained intact during the earthquake and the crawl space below the first floor isolated the house from rising damp, so the interior of the house generally remained dry. At the same time, the windows of the second floor needed to be closed as much as possible during rainstorms.

A limited amount of chemical treatment offered additional protection. Prior to pouring any new foundation, the trench was treated with insecticide to prevent termites from establishing nests at the base of the building. Before adding a new piece of wood to the house, it was first coated with insecticide to ward off attack.

A wooden post on the eastern facade of the second floor had suffered heavy termite attack





Kénold juices bitter oranges to prepare a Haitian formula for whitewash.



THE TRAINEES

Kénold Dutreuil

Most of the Maison Dufort team only came to the house to work. Kénold actually lived on site. He had been initially hired to serve as a guardian for the site, living in a small outbuilding that the Dufort family had used as an office. The interest he took in the work on site made an impression on the IPW trainers, who petitioned to have Kénold brought on board as a member of the training team.

“The work on a site like this one is difficult,” Kénold admits, “but somehow it has to get done.” A native of the mountain town of Beaumont on the road to Jérémie, Kénold farmed for most of his life and is no stranger to hard work. When others lost momentum on a particularly tedious task, Kénold was always the one who could keep going. He is uncommonly patient, and he enjoys work that requires focus and repetition, like repointing the joints of a masonry wall of applying coat after coat of lime wash to decorate surfaces.

After the rest of the team had dispersed at the end of the workday, Kénold was always the one who tidied up around the site. Frequently, he would spend most of Saturday cleaning as well. During that time, he could appreciate the overall changes that had occurred on site, no matter how small. “A little work, day after day, and eventually you get the job done.”

Timber Frame Repairs

JULY 2014-JULY 2015



The timber frame of the second floor had shifted significantly on its masonry base during the earthquake;

Even though the timber frame of the second floor had resisted the earthquake, the entire ensemble had slid as much as 12cm to the east, leaving the eastern façade of the second floor completely unsupported by the masonry walls below. Interior bracing and a system of tensioned cables stabilized this deformation, but eventually it needed to be mended. Once the restoration of the masonry of the first floor had been completed, it was finally possible to budge the second floor back into its proper alignment.

Marcel Osvald, a master carpenter from IPW, worked closely with Patrick Lacroix to devise a system that would enable this difficult work with the minimum amount of impact on the historic structure. They installed a series of five come-along winches, each one braced in a stationary position along the western façade at the floor level of the second story. The cable from each winch ran from the come along to an attachment point along the eastern façade. Gradually, the team tensioned these cables, pulling the eastern façade to the west a centimeter at a time until the second floor had regained its proper place.

Osvald also worked with the team to inspect all of the individual beams of the timber frame. His scrutiny revealed that many had suffered termite damage, and he

Marcel Osvald measures the gap remaining between the timber frame and the masonry base of the ground floor; Lacroix and Osvald inspect a series of Tirfor come-along winches which they used to move the second story of the house back into place; Lacroix reviews the proper placement of the come-alongs with members of the Dufort team.





Lacroix gets one of the come-alongs into proper position along the western façade with the help of Yvesnault Noel and Jean Paul Casimir, two of the trainees; trainee Kenold Dutreuil deploys one of the come-alongs to move the timber-frame back into place; Marcel Osvald inspects the base of the timber-frame with Bijou Lifaite.



guided the trainees as they worked to retain the maximum amount of original timber in the house while replacing damaged portions. Osvald helped the trainees identify instances where a beam needed to be replaced, either entirely or in part. He showed them how to cut out a damaged section and graft in repair, as well as how to join two adjacent pieces with a variety of joints.

Rather than using nails or screws to hold the joins together, Osvald taught the trainees the preferred approach for restoration carpentry deployed in throughout Western Europe. While many of the joints of the timber frame of Maison Dufort had been nailed together quickly, others were the product of a more refined touch, using mortise and tenon schemes similar to those in use for centuries throughout Europe. A well-made assemblage of wooden beams should hold together without nails if the joints have been properly crafted. Osvald insisted that wherever it was physically possible, the trainees should take the time to create a mortise and tenon assemblage. For an added measure of solidity, Osvald would then reinforce each joint using an epoxy. In the end, as much as seventy percent of the timber frame was replaced as the trainees gained confidence in preparing assemblages.

A damaged section of a post is replaced with new wood; preparation of a mortise; Tenon prepared at the end of a post; Mortise and tenon joints were fastened in place using epoxy resin.





Délicat assembles shoring elements.



THE TRAINEES

Jean Soner Délicat

After completing his studies at Jean-Jacques Dessalines high school and the Centre Pilote, Délicat was brought on as an assistant teacher for the plumbing course at the Centre Pilote. In this role, he had started to become accustomed to being the one helping train rather than receiving training himself. But the practical approach of the Maison Dufort training school attracted him.

“When I first arrived at Dufort, I couldn’t even set a single brick!” Délicat explained, laughing at his previous inexperience. “But I’ve really come to love masonry. I enjoy working directly with a trowel and some mortar in my hand, much more than working with power tools.”

But Délicat can’t shrug off his former responsibilities as a trainer. “Now that we’ve reached the end of the training school at Dufort, I see that there aren’t that many of us compared to all of the potential restoration projects that are out there. It doesn’t make sense to do this kind of project unless you can find a way to pass on some of the knowledge you have gained.” Délicat hopes to do exactly that on other jobsites and through academies like the Centre Pilote in the future.

Fine Carpentry

NOVEMBER 2014–FEBRUARY 2016

While the original group of trainees advanced in their understanding of restoration carpentry, a number of tasks at Dufort exceeded their capacity. An additional team of six fine carpenters was hired by FOKAL to complete the restoration of the following elements: the interior wooden flooring, the door frames and doors complete with their built-in wooden blinds, the window frames and windows, the exterior awnings, the drop ceiling, the balustrade of the second floor, and the staircase.

This group was composed of individuals who were already accomplished professionals prior to their arrival at Dufort. However, none had any experience working with restoration. Lacroix and Osvald sought to advise this team as much as possible.

The fine carpentry team quickly established a small workshop in one of the sheds previously used to store materials, and began to work on some of the most time-consuming tasks first. Recreating the 1500 wooden slats necessary for the Venetian blinds occupied a portion of the team for several months.

Likewise, the work to rebuild the staircase and surrounding balustrade was particularly exacting. There were no as-built plans for the original staircase to follow, and the team needed to study the surviving pieces carefully to determine how best to replace damaged sections while retaining as much of the original as possible. Occasionally, modifications were made to showcase these features. Such was the case when the second floor bathroom, which was not an original part of the house, was replaced with an extended balcony, allowing more natural light to pass through to the stairwell.

Two of the fine carpentry team prepare slats for the Venetian blinds; two of the fine carpenters repair one of the original doors of Maison Dufort; the team works to install a door along the eastern façade.





Jean Louis Augustin works to repair a post from the original staircase; Jean Louis Augustin, Pety and Ricardeau repair a section of the banister; on the second floor, a small balcony was installed around the stairwell.



Finishing Touches

NOVEMBER 2014–FEBRUARY 2016

After the restoration of the first and second floors was largely complete, there remained a number of smaller tasks to finish before the building could be opened to the public. These projects were started as early as possible and often carried out simultaneously as the circumstances of the project permitted.

The team coated the masonry walls in lime plaster, just as they had been originally. First, a series of rough coats of lime mortar were applied to the panels of each wall, followed by several coats of a finer lime plaster. Upon the advice of Eddy Pierret, a lime artisan and IPW trainer, the team devised a recipe based on the traditional lime wash used in Haiti. Rather than use milk as a binder as is often done in Belgium, the team used sour oranges, which help solidify the lime wash as it dries. This technique remains common throughout the Haitian countryside and was likely the technique originally deployed at Maison Dufort.

The joints of the bricks that were not covered with a lime coat needed to be repointed. Lacroix prepared samples of a number of different mortar mixes for the pointing, evaluating each for workability as he mixed it, as well as the resulting color after it had dried for a week. FOKAL selected a mortar relatively close in color to the surrounding brickwork. The repointing work demanded patience and persistence on the part of the team, but they gradually improved and increased in efficiency.



Eddy Pierret explains the process of preparing lime plaster to Marc Daniel, Jean Jacques and Donel Belenger; Jean Soner Delicat, Kenold Dutreuil, and Donel Belenger apply a scratch coat of lime plaster.



Héril reinforces the house's timber frame with steel rods.



THE TRAINEES

Ambroise Héril

Héril is a man of diverse experience. He's been a fine carpenter and furniture maker. He's taught mathematics to eighth graders. He's studied law. He trained as a librarian and led youth outreach programs on Haiti's natural caves.

Since his boyhood in Dondon, in the Nord Departement of Haiti, he has been interested in historic houses and construction. Many of the old houses near his home lay vacant, and even then, Héril knew that it would require an enormous effort to bring them back. When he became a furniture maker, he always enjoyed it when clients brought in old furniture in need of repair. Fixing a broken chair, for instance, would remind him of those old houses. He sensed it must be possible to restore them, even though he knew it would take a considerable amount of work.

The chantier-école at Dufort was a natural fit for him. But working on the scale of an entire building required a kind of coordination and teamwork that was new for Héril. At first, he admits, many members of the team kept to themselves. He was no better, having only met a handful of the team before during a post-earthquake training in Ottawa, Canada. "As we focused on improving our technical knowledge, we started to work together more and more. It was this process of each individual refining his technique, side by side, that made us come together as more than a team, as a family."

Héril is currently pursuing a degree in civil engineering. He has two children, a boy and a girl, and he plans to return to the north of Haiti so that they have a chance to grow up there. He hopes to put his combination of skills to use in order to train others and restore the historic houses in the northern countryside.



Patrick Lacroix demonstrates the appropriate mortar consistency for repointing; According to a Haitian technique, juice was extracted from sour oranges to provide an additional binder for the lime wash; Bijou Lifite applies a coat of lime wash.





Bruno uses a Tirfor come-along winch to realign the house on its foundation.



THE TRAINEES

Bruno Raymond

Having left his native Jérémie to seek greater opportunities in the capital, Bruno picked up carpentry while working on a variety of job sites around Port-au-Prince. Eventually, he began working for the construction firm, GATAPHY, which FOKAL had contracted to put up shoring throughout the Maison Dufort.

By chance, he began to speak to Patrick Lacroix after the Belgian trainer had arrived on site for the first time. Lacroix was dissatisfied with the way in which GATAPHY had installed the shoring, and Bruno wanted to know why. Lacroix explained to him the importance of appropriately selecting the places in need of shoring and using a system of shoring that could be easily modified or replaced as the restoration works progressed.

To Bruno, the shoring solution proposed by Lacroix was obviously more elegant. Despite his family and two children who depended on him, Bruno decided to leave his job with GATAPHY in order to work full time at Maison Dufort and invest in his future. For him, the chantier-école represents the most comprehensive professional training he has ever received, and he imagines that he will use the skills he has learned on other restoration projects wherever and whenever he is needed.

On the interior of the house, a team of electricians worked to install ductwork through the ceilings and floors, ensuring that the outlets would have the minimum possible visual impact in each room. Additional infrastructure was put in place to provide for Internet connectivity throughout the building.

The atelier of Mme. Celcis, a local glass artisan, prepared seventeen lampshades for the interior of the house. In her workshop, Mme. Celcis created these handmade lampshades in the style of Tiffany using colored glass assembled into geometric patterns according to the same techniques as a stained glass window.

On the exterior of the building, the porches and awnings were restored, providing additional areas of shade. Tiles similar in color and size to those that were there originally were installed. A series of floodlights were installed along the exterior façade to make the house more visible at night. Following a workshop in 2012, Lighting Designers Without Borders made a proposal to light up the roof of the building as well. The participants in this workshop had identified the roofs of the gingerbread houses as one of the most distinctive and poetic elements in the neighborhood, and sought to bring greater attention to these roofs by lighting them at night.

Toilet facilities were created in a separate new construction, designed in a manner sympathetic with Maison Dufort, and an additional shaded porch was added to the quarter of the eastern façade that had previously been unshaded, replacing the previous bathroom. FOKAL asked Jeannine and Bernard Millet, two Haitian architects with a firm that has experience dealing with heritage restoration projects, to design these interventions.

Christine Chenet, a landscape architect who grew up in the neighborhood, created and oversaw the implementation of a plan to surround the house with elements from traditional Gingerbread gardens. Some existing trees were removed to make room for new plantings, many of which were drawn from the nurseries and grounds of Martissant Park.

Patrick Lacroix and Donel Belenger take a step back to assess the overall progress on site.





Casimir installs the rebar for the foundation of the west gallery.



THE TRAINEES

Jean-Paul Casimir

Jean-Paul has always been curious about the way things work. From a young age, he figured out how to take apart and put together electronics. Through workshops at his church, he had the opportunity to learn even more, eventually attending the Centre Pilote to become an electrician.

He was among those selected to continue his training in Canada after the earthquake, and contributed to the construction of a model house in Bois Patate after his return. This was his first experience being involved with the construction of an entire house, and it was a challenge for him. “However, once I started to master the basics, I proved to myself that I was able to adapt.”

In his opinion, one of the main strengths of the program at the Maison Dufort was bringing together the team through the training. “If we stay together as a team, I’m hopeful for the future.” He believes that they are now capable of tackling progressively more ambitious projects on their own. “If we split apart, then I’ll have no choice but to go back to being a simple electrician. But in any case, at the end of this experience, I’ll come out ahead.”

Future Directions

Maison Dufort will serve as a resource to the surrounding community in the years to come. The house was designed to welcome others seeking to learn more about the Gingerbread houses of Port-au-Prince, as well as the proper approach and techniques needed to repair them. In a number of instances, portions of the underlying structure have been carefully laid bare to be appreciated by visitors. For example, it is possible to see sections of the seismic reinforcement below the masonry arches on the northern and southern façades. A panel of masonry on the first floor has been left unfinished so that the Flemish bond of the brickwork is more evident, and another panel has been given only a scratch coat of lime plaster, without a final coating of lime wash. These judiciously placed reveals will enable visitors to better appreciate the nature and extent of the craftsmanship that restored the house.

At the same time, the Gingerbread houses of Port-au-Prince remain threatened. Since the inception of this project, nearly sixty gingerbread houses in the neighborhood have been demolished, as their owners were unable or unwilling to repair them. Neighborhoods such as Bois Verna, Bas Peu de Chose and Pacot have seen tremendous development after the earthquake. Rising property values have led to a greater tendency to tear down historic houses damaged by the earthquake and use the land for another purpose.

FOKAL has purchased an additional house, the Maison Chenet, located on Rue M. It is currently under restoration as part of an ongoing partnership between FOKAL and IPW. Some members of the team who once worked at the Maison Dufort have continued to hone their skills by working on the Chenet project, and will gain the experience and confidence necessary to continue attempt other restoration projects on their own. WMF has also launched a project to restore a small gingerbread in Jacmel, another project that benefits from the momentum established at Maison Dufort.

From the beginning, it was always FOKAL's intention to build a community invested in the long-term stewardship of the gingerbread houses at the larger scale of the

The conditions of Castel Fleuri, one of the most iconic Gingerbread houses in the neighborhood, have continued to deteriorate since the time of the 2010 earthquake.





Honoré levels the top of a decorative pillar.



THE TRAINEES

Evins Honoré

I had been working hard with a group to rebuild a decorative masonry pillar on the western façade, and I thought the work was advancing well. When Patrick saw our work, he asked us to take it down and start over again. When we rebuilt it, I was eager to show him the results, because it the pillar had improved so much. Patrick inspected the pillar again and discovered that our alignment was off. He asked me what I thought we should do. I told him that there was no choice but to take the pillar down again and start over once more.”

According to Honoré, this process of gradual improvement is the only way to learn restoration work. He explains proudly, “After we finally finished that pillar, we went on to build several others without any problem. Now, I feel confident in building any other pillar, regardless of dimension or design. If you need someone to build a beautiful brick pillar, I’m the one to call.”

Honoré was often eager to tackle the thornier problems on the jobsite. Whether getting a problematic pillar finally installed correctly, working to attach the elements of the seismic reinforcement, or reinforcing the timbers of the roof, he poured his energy into his work. “There were times when I thought a certain task would take me two minutes to complete, and instead, it took me an hour.” Patience and his strong desire to see the work through to the end enabled Honoré to keep improving his skills by meeting these challenges.

neighborhood, including an urban design scheme developed in conjunction with the Belgian NGO Quartiers pour Haïti that envisioned pedestrian-only access to parts of the neighborhood and improved green space. These larger ambitions had to be deferred as both the municipality of Port-au-Prince and ISPAN were overwhelmed in the aftermath of the earthquake and poorly equipped to lend their support. Nevertheless, during the course of the Dufort and Chenet projects, FOKAL has continued to monitor developments in the surrounding neighborhood.

FOKAL supported the efforts of Quartier pour Haïti and Lisandre Jardon, an architecture student in Belgium, to conduct a detailed evaluation of more than 40 houses immediately surrounding Maison Dufort. Now that restoration at the Maison Dufort is complete, it is an opportune time to revisit the urban design proposed by Quartiers pour Haïti, to link the Maison Dufort to other gingerbread houses in the neighborhood through greenways and pedestrian trails, increasing their visibility before the public. Additionally, FOKAL partnered with the Graduate School of Architecture, Planning, and Preservation at Columbia University to identify concentrations of gingerbread houses prime for greater community engagement and collective action towards increased care and conservation of these historic resources. Efforts to engage with the gingerbread houses on a larger, urban scale are ongoing.

Ultimately, Maison Dufort is just one house among thousands of properties that were damaged during the earthquake. But its successful restoration and the ongoing success of the team that trained there prove that in a city intently focused on rebuilding, it is possible to restore historic resources while repurposing them toward new uses.

This house, less than a minute's walk from Maison Dufort, is still inhabited but is listing dangerously to one side; a Gingerbread house that once stood on this lot in Pacot was demolished during the summer of 2015; another restoration project has begun at Maison Chenet; much of the timber-frame of the Maison Chenet must be dismantled before it can be properly repaired.





Bijou uses a shim to accurately align floor beams.



THE TRAINEES

Bijou Lafite

Having left Grand-Goâve and come to the capital for secondary school, Bijou pursued technical studies in electronics at Canado Tech, and was part of the group dispatched to Canada for further training after the earthquake. Though he had no experience with restoration work prior to joining the training school at Maison Dufort, he soon gravitated towards the carpentry work overseen by Marcel Osvald.

Concerned by the state of the build environment in Haiti following the earthquake, Bijou was eager to get involved with efforts to rebuild. As he saw it, the lack of applied construction codes in Port au Prince increased the magnitude of the tragedy on Jan. 12, 2010, and he wants to be a part of the solution. He appreciated the experience at the training school, his first opportunity to work directly to rebuild a building, and has found that it complements his studies in civil engineering. He intends to draw upon this experience as he seeks work in an engineering firm in Port au Prince.

Open House

In June 2014, the team opened the gates of Dufort and invited the neighborhood to admire the progress that had been made to restore the house. Though much remained unfinished, the first floor was finally solid enough to permit visitors to safely walk around and through the house. The trainees gave demonstrations of the skills they had learned and answered questions from guests who ranged from professional architects to street vendors to students.

Young and old were on hand, and two generations of the Dufort family were also in attendance. Since progress at the house was not visible from the street due to the high walls and opaque gate installed for site security, residents of the neighborhood expressed their pleasant surprise to see that the restoration of the house was well underway. The trainees themselves were gratified for the opportunity to share their progress.

Honoré welcomes a group of visitors to the open house, a chance to showcase the works at Maison Dufort; Delicat explains the steps necessary to prepare a lime mortar; representatives of the Dufort family were in attendance.



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Above: The team assembles scaffolding prior to installing the seismic reinforcement.

Back cover: Restoring the first floor's masonry panels.

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350 Fifth Avenue, Suite 2412
New York, NY 10118
646-424-9594 • www.wmf.org